turously were to be found. Bell believes, though, that the most interesting applications of the machine will be in psychological research, diagnosis, and testing.

The PSE can do several other things the polygraph can't. It can chart whole sentences in addition to simple yes-no answers to which the polygraph is limited. The PSE picks up stress instantaneously because the microtremor is the result of an electrical signal and does not have to wait for the flow and ebb of body chemicals as does the polygraph, says Bell. It can also register changes of stress levels within a single syllable. It can be used with more people in more situations because the subject is free to roam about, and intoxication with drugs or alcohol does not, it is claimed, distort the microtremor.

The academic community has not displayed much interest in the instrument to date—Bell explains that this community is "conservative almost to the point of being immobile"—but some researchers have been fooling around with it. One has done a study proving that stage fright increases in proportion to the number of people in an audience; another has analyzed stress among dental patients. One researcher, says Bell, has done psychological diagnoses of alcoholics using an "emotion-producing word test." By charting stress reactions to lists of words, the researcher can

Radioactive Waste Site Search Gets Into Deep Water

The search for a permanent disposal site for radioactive wastes that remain toxic for centuries—one of the key unresolved problems of the nuclear era—hit another snag recently.

Sandia Laboratories, of Albuquerque, New Mexico, which is managing the search for an underground repository in the remote areas of southeastern New Mexico, reports that the latest test hole has discovered unexpected geologic conditions that may render the immediate area under investigation unsuitable.

But Wendell Weart, Sandia's project manager, remains optimistic that a textbook-perfect site can be found by shifting the hunt a few miles to the south and southwest of the current study area, which is due east of Carlsbad on the Eddy County–Lee County line.

The proposed storage facility would handle the radioactive wastes generated by the commercial nuclear power industry. Such wastes are in temporary holding facilities now, but their volume is expected to swell as nuclear plants come on line in greater numbers.

The latest snag is the second to disrupt or delay plans to build storage caverns in bedded salt layers deep underground. The search in New Mexico was launched after previous efforts to build the facility in an abandoned salt mine near Lyons, Kansas, were abruptly terminated because of unanticipated problems. Although that site had been under consideration for many years by the old Atomic Energy Commission (since absorbed into the new Energy Research and Development Administration), it was not until 1971 that the commission and its contractors discovered two major problems with it. One was a series of abandoned gas and oil drill holes in the area. Another was an adjacent salt mine's extensive use of water to dissolve out the salt—including a hydraulic fracturing technique which had resulted in the disappearance underground of some 175,000 gallons of water. Both discoveries cast doubt on the long-term safety and integrity of the proposed Lyons site, since it appeared possible that water might penetrate the area and allow radioactive wastes to escape.

Thus the Lyons site, which had become the focus of political controversy, was abandoned, and a search was launched for another suitable site—preferably in bedded salt, which has been deemed the most advantageous geologic formation for long-term disposal by committees of the National Academy of Sciences and is the preferred formation in some foreign countries as well. Salt's many virtues include the fact that it flows plastically, thus healing any fractures; it is a good radiation shield; it dissipates heat well; and it has almost always been geologically stable for millions of years.

A survey for possible sites conducted by the U.S. Geological Survey resulted in attention being focused next on the salt beds of southeastern New Mexico. The area under investigation has not had previous extensive drilling, so there is not apt to be a problem of drill holes penetrating the repository area, according to officials of the energy research agency.

But the immediate area under study, roughly three square miles in size, has developed an unexpected problem. The first two test holes, drilled while Oak Ridge National Laboratory was in charge of the project, encountered no insurmountable difficulties. But the third test hole—drilled after Sandia took over management in April—unexpectedly hit a big pocket of brine, containing toxic gases in solution, some 2710 feet deep, about 200 feet below the level of the proposed waste disposal facility. The brine pocket was found in fractures in a bed of anhydrite rock, an evaporative rock commonly found in layers alternating with salt layers. Dissolved in the brine were such gases as hydrogen sulfide, which is toxic, and methane, which is explosive.

The presence of the brine was disturbing for two reasons. One was that the gases could pose a safety hazard for workers building the facility or operating it. Although a 200-foot buffer between the facility and the brine would ordinarily be considered sufficient, according to Weart, geologic conditions make it difficult to be certain the buffer would always be that thick.

The second disturbing aspect is that the presence of the brine solution may indicate that fluids have been migrating underground, thereby threatening the integrity of the site. Although many experts believe the brine has probably been there since the formation was laid down hundreds of millions of years ago, Weart said, others warn that it might be connected to adjacent aquifers. Age-dating tests will be conducted in an effort to resolve the matter.

The geologic problems were caused by the unexpected presence of a "thumb" sticking out of the buried Capitan Reef, an ancient coral reef which is shaped somewhat like a horseshoe, with the proposed repository area inside its semicircle. Where the bedded salt and anhydrite rock abut the thumb, there are many fractures and the beds incline upward at a 75° angle, far more than the 1° or 2° angle for other beds nearby. The sharp incline in itself would make planning the proposed repository difficult.

William Armstrong, a nuclear waste management engineer with the energy agency's New Mexico office, describes the problems as much less severe than at Lyons. But he said that in these days of doubt over things nuclear, the energy agency is "looking for a super-safe place." He added: "If anything went wrong it would hit the headlines. If we hit a gas brine pocket and killed a few people, hell, it would be spread all over the front pages"—even though it would really be a mining accident, not a nuclear mishap, in his opinion.

The latest problems may delay the repository project for several months (depending on the level of funding allowed for catch-up work) and will unquestionably increase the costs somewhat. Sandia will propose a thorough geophysical survey to find a likely site for further test drilling.—PHILIP M. BOFFEY