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Unidentified Seismic Events

Last summer a group of experts from East and West assembled at Geneva to determine what would have to be done to set up a system for detecting explosions of nuclear weapons. Two kinds of explosions offered special difficulties: those set off underground and those set off in space. For the detection of underground detonations, to which we shall confine our attention, the question to be answered is: are there detectable differences between artificial and naturally occurring earthquakes?

As it now turns out (see p. 259), the data available last summer—obtained from a single nuclear explosion and several TNT explosions—have proved to be inadequate. Ordinary earthquakes send out compression waves in some directions and waves of rarefaction in others. Consequently, some seismographs will pick up, as the first detectable motion, waves of one or the other types. An earthquake initiated by an underground explosion, on the other hand, sends out, as the first motion, compression waves only. All seismographs within range pick up the first motion as a compression wave. It is this characteristic difference that permits the identification of a shock as of artificial origin.

The results of the three test explosions carried out in late October, 1958, showed that the earlier tests had led to an overestimation of the energy of the waves generated by explosions. Hence, at more distant stations the possibility that the first identifying compression wave will be swamped by background tremors ("noise") is greater than was thought last summer. Thus the number of unidentified seismic events that might or might not be of human causation is severalfold more than had been estimated.

These new estimates do not mean that a control system is out of the question, but only that the system proposed last summer—a network of 180 seismic stations and a system of on-site inspection of suspicious events—may need modification. One important first step would be to augment the data. Perhaps the best way to do this would be, as Senator Pastore has recently suggested, to carry out additional tests under international sponsorship, a procedure which would give the participating nations confidence in the results.

Such an undertaking would not exhaust the possibilities. The seismic stations could be more closely spaced; inspections could be made of a larger number of unidentified seismic events; better instruments could be developed.

After the scientific questions are answered, the political questions will remain. When the probability of detection can be more closely estimated, the political negotiators will still have to decide whether that probability is sufficiently high to deter a potential violator. Absolute assurance that all explosions of small devices can be detected cannot, at least at present, be given. What can be given is an estimate that a certain percentage of all shots will be detected by a system of defined characteristics. Where that percentage may be safely set is a political decision of great difficulty and great importance. But it is a decision that can be reached if both sides sincerely want to reach it.—G.DuS.