but the data base was very restricted (3 events of each type). However, the events ranged in magnitude from m4.2 to m4.6 with the smallest of the events having a sufficiently high signal-to-noise ratio to make the spectral ratio application meaningful. It appears, therefore, that the 90 per cent I.P. threshold of application (which will not necessarily be the threshold at which the criterion is a successful discriminant) may be significantly below m4.9 ; this process is being tested with a large suite of NTS explosions and United States earthquakes at the time of writing.

Weichert (1970) in a comprehensive examination of the spectral ratio method applied to Asian events cannot completely separate earthquakes and explosions using YKA data. His data sample goes down to magnitude m4.5 for earthquakes and m4.8 for explosions. The best process Weichert has found, average third moments of the P wave spectra, results in about 80 per cent of the shallow earthquakes overlapping 20 per cent of the explosions, with the data regionalized. Thus, as neither the Asian P wave spectral ratio data of Weichert nor the preliminary NTS spectral ratio data (E.B. Manchee, personal communication) using YKA records result in a threshold magnitude above which the criterion can be described as a "positive identifier", the Canadian P wave spectral ratio method is simply a "diagnostic aid" with overlapping population at all magnitudes.

The threshold of application of the P wave spectral ratio method (whether at that threshold it is a positive identifier or a diagnostic aid) is much lower than the threshold of application, particularly for explosions, of the two criteria requiring measurement of Rayleigh waves (see sections 8.3 and 8.4). The method, therefore, retains considerable value for the application, in the absence of positive identification, of a multivariate analysis (the combined application of all available imperfect criteria to the problem of discrimination). This multivariate analysis can include, in addition to spectral ratio data, correlogram complexity data such as that described by Whitham et al. (1968), any depth of focus information, "negative" Rayleigh wave criteria (see section 8.5), etc.

8.3 Relative Excitation of P and Rayleigh Waves

The spectral ratio described in the previous section is confined to a narrow frequency band within the P wave signal. Similar differences between earthquakes and explosions at longer periods of the total spectrum are usually described by a measure of the relative excitation of the long period surface waves (Rayleigh) and the short period body waves (P), or as a ratio of two bands of energy within the long period waves (see section 8.4).

The simplest method of defining the relative excitation of P and Rayleigh waves is to use the straightforward phase amplitude measurements required for calculation of magnitudes from the two types of waves, i.e., by comparing earthquakes and explosions by their M versus m relationships. It is for this discrimination criterion that the greatest body of results are available; SIPRI (1968) contains all significant