types of spectra are obtained for all separated mixture components. Therefore an arrangement that maximizes the amount of sample provided to the less sensitive infrared spectrometer is best.

Instrumentation for GC/IR/MS

One question that legitimately can be asked about complex analysis systems such as GC/IR/MS is whether their cost and complexity can be justified by the increased analytical capabilities they provide. If expensive high-performance IR and mass spectrometers are required for success, it is not likely that the method will be widely adopted for routine mixture analysis. For example, a review that appeared late in 1982 (*20*) discussed GC/IR/MS analysis studies using very expensive high-performance double focusing (*12*) and Fourier transform mass spectrometers (*19*) in combination with top-of-the-line FT–IR spectrometers. Such systems involved use of close to half a million dollars' worth of equipment. Clearly they would not be practical for widespread use unless they were highly reliable and provided unique analytical power. There had been the Hirschfeld report of a system using a quadrupole mass spectrometer (*18*), but the only examples of relatively complex mixture analyses (peppermint oil and lacquer thinner) had relied on high-performance instruments.

Fortunately, it was at precisely that time (1983) that low-cost mass spectrometers, such as the Hewlett-Packard mass selective detector (MSD) and the Finnigan ion trap instrument (ITD), became available, and unprecedented competition in the FT–IR field resulted in the introduction of numerous moderately high-performance instruments at relatively low prices. These developments, occurring just as feasibility of GC/IR/MS had been convincingly demonstrated, laid the groundwork for the next stage of GC/IR/MS research, which would concentrate on the dual questions of data interpretation algorithms and evaluation of lower cost alternatives to the expensive prototype research systems of the preceding three years.

Complementary information from GC/IR/MS

Following the demonstrations of functional GC/IR/MS systems discussed above, there was renewed interest in evaluation of the use of complementary IR and mass spectral information for organic analysis. In our laboratory (*12*, *19*), searches of computer-readable mass spectral and gas-phase IR spectral libraries were used for identification of mixture components. To accomplish specific identification, the same component was required to appear