angles could not be determined with accuracy. The measurement of the Wheal Cock Zawn crystal was further complicated by impressions left by axinite crystals but the dominant form is the bipyramid {121} rounding to {243}, in combination with {010} (fig. 1).

The Halvosso quarry crystals are more complex and consist of incomplete modified bipyramids {243} rounding to, or separate from, {485}, and usually in divergent groups. Table II lists the forms and angles observed on three Halvosso crystals (BM 1975, 543–5). The calculated angles were used for the idealized drawing (fig. 2) and were obtained from the mean of the x and y coordinates of the faces in the forms {110}, {101}, {301}, {011}, and {111}. The axial ratio of 0·8092 : 1 : 0·3642 derived from the calculated angles is close to that of 0·8056 : 1 : 0·3627 calculated by Gay and Rickson (1960) from the cell dimensions obtained by an X-ray examination of the type specimen in the Museum of the Department of Mineralogy and Petrology, Cambridge.

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A new interactive computer program to process electron microprobe data

FOR many years now the MK2 version of the NPL–IC–BM electron microprobe data processing computer programs (Mason, Reed, and Frost, 1968; Beaman and Isasi, 1970) has been successfully used in many laboratories. This program is used for batch processing and is punched-card orientated. Nowadays, computer networks often offer terminals, interactive software, and flexible file-handling systems (sections of disc storage, allocated for private use). This note describes a program, named MK7, for processing data from electron microprobes, which takes advantage of these advances in computing. Only a brief summary of the main details are given here and full specifications, listings, and card decks may be obtained on request to the author. The program has been written in Fortran, specifically for a CDC

computer using the Kronos operating system, but the package could easily be used on other interactive computer systems. It is specifically designed for such computer systems and only when these are available is it intended to replace MK2. In many ways the MK7 version is the same as MK2 in that the correction methods are identical, the physical constants and standard factors are arranged in Initial Data Sets and Standard Factor Sets, and the procedure details (method of analysis, form of input, etc.) are input for each group of analyses or Analysis Set.

```
                    Key in    Ø for measured concs. RQ 1
                              1 for raw intensities
                              2 for ratios
                              3 for std. concs.
? Ø
  How many analyses and then how many elements analysed RQ
? 1 5
  Are data on another file Yes 1 No Ø
? Ø
  Key in each analysis in turn RQ 5
    A CRLF must follow each analysis
? . 15Ø75 . 18Ø73 . 21167 . ØØ145 . ØØØØ14
  Print your title—only 72 chars. long RQ 7
? ex. 2 analysis by difference
  Key 1 only if Last element oxygen by difference
                Fluor. corr. required
                No calibration
                No full print out
                KV is 15
  Key Ø otherwise RQ 8
? 1
  Key codes for 5 elements analysed RQ 14
? mglsilfelmnlcal
  Key std. names to match (7 on aline each 6ch.1ha)RQ 15
? olivinolivinpurefepuremnwoll2
  Formulae required then write 1 RQ 18
? 1
  No. atoms of which element RQ 19
   ? 8 6
/stop
```

FIG. 1. An example of the form of input for the first part of the MK7 package. For more details see text.

But MK7 uses files instead of card decks and the procedures are input interactively. To allow this, the rather large MK2 version has been divided up into three parts, all using less than 25K of store, with intermediate data stored on to scratch files. Because of this configuration, results may be obtained within seconds of request; a very considerable advantage over the much longer turn-round times usually encountered in batch-processing data.

The main features of the program are: Data may be input either in the form of measured concentrations, or as ratios of specimen to standard counts, or in the form of raw intensities; the format for raw intensity input is strict, as the program has been designed to accept data from the automated Geoscan at Imperial College, London (Frost *et al.*, 1976); however, the package of programs has been designed in such a way that the processing of data from raw intensities with other formats could easily be undertaken; measured concentrations or ratios are keyed in via a terminal or are accepted from a previously prepared file. Nine methods of analyses are offered, three specially orientated to the minerals olivine, pyroxene, and feldspar with the rest having a general application.

The package processes up to 30 analyses in a set with up to 14 elements in an analysis, and these elements can be analysed by up to three different characteristic radiations ($K\alpha$, $L\alpha$, and $M\alpha$); these parameters may be changed if the user wishes. To process data from another probe, one card needs be changed in the program.

The form of input is illustrated in fig. 1. The program defines each request for information by an RQ number, which refers to more detailed notes in the specification of the program. In this example measured concentrations from one analysis are input by the operator at the terminal. The method of calculation selected causes oxygen to be determined by difference. The five elements analysed, Mg, Si, Fe, Mn, and Ca, all determined by their K-radiations (code 1), have been measured with standards named OLIVIN, for both Si and Mg, PUREFE, PUREMN and WOLL2 respectively. The first part of MK7 organizes and then writes this information on to a scratch file. A second identifies the elements and lines used and extracts from another file all the physical constants (e.g. absorption coefficients, line energies, atomic weights, etc.) needed to make corrections with those elements present. The standard names are also recognized and the standard factors extracted. All these data are written on to a second scratch file. Finally the third part of the program reads the data from these scratch files and processes the measured concentrations. Results are output via the terminal in an abbreviated form and full details are written on to a scratch file to be queued to the line printer if so desired.

For the MK2 version each Initial Data Set is prepared by punching the appropriate physical constants on to cards and sorting these cards into the Initial Data Deck for subsequent use. This method was adopted to allow users more flexible selection of absorption coefficients than would be obtained if algorithms that computed coefficients from a particular set were built into the program. For MK7, a separate interactive program has been written, which either allows the user to key in absorption coefficients, or computes them for any element and characteristic radiation using the algorithms of K. Norrish (private comm.). These, together with the other relevant constants, are arranged automatically on the user's Initial Data file.

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Abundance of fluorine in stony meteorites

THE application of pyrohydrolysis to the separation of fluorine from silicate material (Clements and Sergeant, 1971; Berns and van der Zwaan, 1972) has led to consistent and reproducible values for the internationally recognized standard rocks. However, our preliminary results show that the application of this technique to ordinary chondrites results in a low recovery of fluorine.