THE DEVELOPMENT OF MICROCOMPUTER PROGRAMS FOR USE BY GEOSCIENTISTS IN THE MINERAL DEVELOPMENT DIVISION

by

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The Mineral Development Division is responsible for collecting, archiving and processing large quantities of geological, geochemical, mineral deposit, and surficial geological data for evaluation of the mineral resource potential of Newfoundland and Labrador. Because of the increase in volume and complexity of these data, sophisticated computer programs are being used in their analysis. All these programs (and data) are presently residing on the AMDAHL V/7 mainframe computer of the Newfoundland and Labrador Computer Services (NLCS). To use the programs, one has to be familiar with operating system procedures of the AMDAHL computer, which in themselves are complex. Hence, as a result, very few geoscientists are able to use these programs to analyze their data themselves.

To overcome this shortcoming, the Computer Unit has decided to shift the emphasis towards development of 'user-friendly' programs on in-house micro-computers. The objective is to give research geoscientists the tools to store, analyze and retrieve their own data without having to become proficient in computer systems or computer languages. The Computer Unit has two microcomputers:

(1) Tektronix 4054 Graphic System with a plotter.

(2) Texas Instrument Professional Computer with a 132 column printer.

Development Work on the Tektronix Graphic System

The Tektronix Graphic System consists of:

a) 19" high resolution Graphics Screen;

b) 64K (RAM) memory;

c) a 300K tape drive cartridge system for storing programs and data;

d) a hard copy unit for photocopying the screen (11" x 8");

e) a 2-pen color plotter (22" x 17") for plotting camera-ready diagrams on mylar.

The Tektronix system uses the BASIC language so only programs written in BASIC can be used on it, which is a drawback. It is connected to the AMDAHL computer at NLCS, enabling the transfer of data between the two systems.

The most widely used program on the TEKTRONIX 4054 is MICRO-GRASP(*). This program provides for the storage, transformation, selection and display of data in tabular form. The user controls the execution of MICRO-GRASP by entering a series of "commands". There are 12 commands which can be used. These commands allow users to enter new data records, establish selection criteria, calculate summary statistics, display selected data values, perform arithmetic operations, review the status of the system, and terminate the session. In addition, the user can do graphics work such as plotting Harker variation diagrams and ternary diagrams. These can be either drawn on the screen or plotted on the plotter.

Proposed Development Work on the Texas Instrument Professional Computer

The Computer Unit has recently acquired a 16-bit Texas Instrument Professional Computer System. The system consists of:

a) a 13" color graphics screen;

b) 320K RAM memory;

c) a 320K disk drive for storing programs and data;

d) a 5 megabyte Winchester drive for storing programs and data;

e) an operating system which allows the user to run programs written in FORTRAN and BASIC languages;

f) a 132 column printer.

This computer is also connected to the AMDAHL for the purpose of data transfer. Work is underway to implement MICRO-GRASP on this system, too. In addition, the following programs are being evaluated for implementation:

(a) CIPW(*)

This program computes the CIPW norm, which expresses the chemical composition of a rock in terms of standard mineral mole-

cules. In addition to CIPW norm, the Thornton & Tuttle Differentiation Index, Barth's cations,and Niggli values are computed.

(b) MINRL NORM(*)

This program is used for deriving formulas from chemical analyses of minerals using the anion-based, hydrogen-equivalent method. Input data consist of weight percentage of oxides or halogens and, if desired, the density and cell volume of the mineral. From these data, the computer calculates the number of ions per molecular formula, normalized values of ions, grain-formula weight, calculated density, and/or calculated cell volume. The program is designed to provide a maximum flexibility of output with a minimum of input data. It provides a standardized basis of comparison of mineral norms, and permits systematic searches for integral anions per formula or formulas per unit cell, if these parameters are unknown.

(c) MICROSTAT

Microstat is a commercial statistical program developed by ECOSOFT. It is a library of statistical programs that perform the most common statistical tests and procedures. It was developed for "real life" applications using fairly large data sets. Computation algorithms were selected for accuracy and speed.

More programs will be added to the system depending on the users' needs.

Conclusions

The MICRO-GRASP system on the Tektronix has been used by some geologists for manipulating and analyzing data. Experience has shown that, after a training period of about one hour, a geologist can start using the system to obtain the required information from the data base.

The development of user-friendly programs on the microcomputer will provide another tool for the geologists in their scientific work. A geologist will be able to command a computer system to work for and with him, doing the tedious parts of the work and presenting him with condensed views of his data, allowing him to visualize the information in different ways and encourage a dialog between the thinking scientist and the functional machine.

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(*) These programs were developed by: Roger Bowen of the United States Geological Survey