

Letters

More on Computer Applications

As the first known practitioner of strategic geology (a misprint of "stratigraphic" in the title of my original article, *Geoscience Canada*, v. 2, p. 193) I would like to reply to some of the points made by Burk and Wynne-Edwards in their discussions.

Burk states that far from being overdone, computer applications in the geosciences are only just beginning, and he makes the point that only a few per cent of geological data are currently available in computer-processable form. He cites a recent study showing that the Department of Energy, Mines and Resources had, in 1974, only 11 fully operational data files. The key here is the word "operational". I personally am aware of several files being built at great expenditure of effort, for which there does not appear to be any clear purpose and for which no retrieval programs are yet contemplated. This is unfortunate, for a file obviously should be designed with retrieval in mind. I agree with Burk that computer applications are only just beginning, but my original warning as to the mindless creation of unuseable data files still stands. There is a lot to be said for Wynne-Edwards' point that any large mass of pre-existing data (such as well records) is worth computerizing if only because of the advantages of flexibility and compactness that the computer offers, but, to borrow an Ann Landers phrase, be sure to get professional help before proceeding.

Many geoscientists would, I am sure, disagree with Burk's comment that "some practitioners choose to live in a world without reproducible data - the resulting work thus falls outside the realm of science". It reminds me of a comment by the great British physicist Lord Rutherford when asked to define

science: "well, there's physics; then there's chemistry, which is a sort of physics; and then there's stamp collecting". To quibble about what is or is not science is fruitless. The essential fact is that much guesswork, intuition, interpolation and extrapolation takes place in geology, and yet our profession certainly continues to flourish and evolve at a great rate.

Burk objects to my derogatory remarks regarding computer-processable bibliographic files. It may indeed, as he states, be "inconceivably naive" to suppose that geologists can carry out manually a complete literature search on all the hundreds of thousands available geological publications. The simple fact which eludes Burk is that nobody would want to. The vast majority of those publications will be in specialties of no interest to the given individual, or will describe areas of only local importance. I still maintain that the number of papers critical to a geologist's progress and development will be, relatively speaking, extremely small, and that the majority of these will be in journals with which he or she will already be familiar. For most geologists there simply is not the time to wade through either a conventional literature search or a computer-produced bibliographic printout to find those rare, elusive papers that they missed, and for which there is no guarantee of relevance anyway.

In conversation with our librarians at the GSC in Calgary I learned that in spite of an office-wide indoctrination, only five of the more than fifty scientists on staff subscribe to the regular monthly selective printouts by GEO-REF. All five are paleontologists and are interested mainly in taxonomic descriptions. The 1975 GSC annual report states (p. 73) that in all of Canada there are only 158 regular subscribers. Several of us at ISPG subscribed to the current awareness service for a few months, using a personally designed interest

profile, but all gave up after being confronted with a half-inch thick printout each month. My own experience was that those references I was interested in I already knew about, and those which I did not know about already were no use to me. The three to six month delay between initial publication and tape storage (as quoted in GEO-REF advertising material) simply is not good enough for many geologists working in an active branch of the science.

Nobody in our office uses the Canadian Index to Geoscience Data. According to Burk (pers. commun., 1976) approximately 130 requests for selective printouts from the Index have been made since 1971. At an average of about 22 per year (or less than one every two weeks) it would not seem that the Index has been meeting an overwhelming need. According to the list supplied by Burk the rate of requests appears actually to have *decreased* since the Index was first started.

Some special functions may be fulfilled by the Index; for example I am told that mining companies in Vancouver find it quite useful in searching for unpublished descriptions of mining properties. But, of course, the output is only as good as the input. Thus, a listing of publications on coal in western and northern Canada was prepared for this office, but it was found that several of the important and widely-known papers on the topic were missing. In other cases the Index, like our old friend Information Canada, appears to duplicate services readily available elsewhere. Some of these 130 requests made to the Index include such items as listings of GSC publications and open files, and the publications of the Saskatchewan and Alberta Research Councils.

I simply do not accept that those of us who do not use these services are old-fashioned fuddy-duddies who are

refusing to enter the golden age. We are doing what works for ourselves the best. Perhaps the paleontologists and mining companies could use more limited services, tailor made to their specific needs. These already are being developed for micropaleontologists. Note that this narrowly-defined type of computer application would accord rather well with the three criteria of good computer use, as set out in my original article.

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Miall will get no argument from me on the undesirability of building "unuseable data files"! However, criticism for such wasteful activity must be directed at people and management, not at computer technology or at the concept of data management. Even so, it is difficult to discuss the utility or value of computer-based data files on a generalized basis. One must ask with respect to a particular file: unuseable to whom? and: unuseable in what context? Having satisfied the immediate and narrow need, too many geologists effectively discard their expensively acquired data on the arrogant assumption that no other geologists - much less non-geologists - could understand or use them.

My comments on the general lack of objective data in geology and on the attitude of many (most?) geologists that only their "own" data are trustworthy (i.e., the data are not considered reproducible) do not represent quibbling on the definition of "science". This is a serious indictment, and I'm not reassured by Miall's failure to recognize it as such or by his evident faith in scientific progress through "... guesswork, intuition, interpolation and extrapolation ...".

Miall's attitude on geological data carries over to the literature where he considers only papers known to him through an informal personal network to be worthy of consideration. Data and ideas generated outside this network are evidently not relevant simply because they are outside. He contradicts himself on his contention that "nobody" wants to

search the literature systematically, since elsewhere he acknowledges that 10 per cent of scientists at his institution use the CAN/SDI service offered by the Canada Institute for Scientific and Technical Information (CISTI). Complaints about "half-inch thick printouts", "guarantees of relevance", six-month turnaround times for GEO-REF citations, etc., may or may not be resolvable, but the main question is: What is the alternative? For most, it's an intellectual ghetto.

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Mission-Oriented Research

I am writing to suggest that the geoscientific community (that means you) should establish a central organization to coordinate and fund mission-oriented research.

A few years ago, mission-oriented research was a dirty word among many academics but two series of events of the early seventies should make us change our minds. One has been the progressive drying up of research funds, accompanied by the apparent inability of federal ministers to understand the potential of pure research, and by the refusal of the federal government to give any priority to science programmes. The other has been the demonstration that political decisions are continuously being taken on the basis of inadequate and incomplete scientific data because the necessary (mission-oriented) research has not been done on time. Variations of estimates of the oil potential of the Arctic are only one case in point.

If academics are hard-pressed for research support and if the government badly needs specific work to be done, surely the two should meet.

I would envisage a three-tiered structure, with a policy-making body, a coordination office and potential grantees.

Policy-making should be handled by a small joint committee of universities, governments and industries. Its members would be respected experts who would consult others formally and informally and would establish a priority list of problems that need to be solved. They would not deal with details but identify specific questions that must be answered. Their fundamental criterion should be to promote what will be most beneficial to the country as a whole.

Once the goals are set, a coordination office is necessary, that would receive proposals, act in effect as a granting agency, and distribute funds according to policies and guidelines established by the joint committee discussed above. Mission-oriented research is evidently funded by those who want it done. Such funds would be put at the disposal of the coordination office by various government agencies or departments, and oil or mining companies for instance. The office should presumably be integrated to the Geoscience Council.