occupied by the kth book is $\sum_{j=1}^{N} j\pi_j(k)$ and this quantity is not in general equal to k. What can be said is that $\pi(1,2,\ldots,N)$ is the largest value of all the $\pi(\mathbf{k})$ so that $(1,2,\ldots N)$ is the most likely arrangement.

Perhaps it should be borne in mind that there are 158 miles of books in the British Museum and each year they add another two miles. Moreover, nowadays there are computers for which the task of keeping track of the books in the random shuffling process is a triviality. Perhaps also, for the future, one should think of mechanical devices doing the chief task of recovering a book from the shelves, or, one stage further, of all the books being stored on magnetic tape and recovery being instantaneous through arrays of consoles in the "reading" room. But with all this it is difficult to see whether it would still be possible to browse among the books of your favourite subject.

POPULATION

Speeding up Censuses

from a Correspondent

WITH the approach of a new decade, preparations are already nearing completion in many countries for the holding and processing of the 1970 series of population censuses. According to United Nations recommendations, most countries try to hold their census in years ending in zero or, as in the case of Great Britain, in the first year of the decade, ending in one. Population censuses are among the largest statistical enterprises conducted by governments and recently there has been rapid growth not only in the number of countries holding censuses but also in the amount of information collected. This, combined with the general growth of population in most countries, with more people to be enumerated, has placed great pressure on national census offices and has led to a search for methods to reduce the workload. These methods were discussed last year at a United Nations conference, and proceedings have recently been made available. (Conference of European Statisticians, Statistical Standards and Studies, No. 12, *The Use of Electronic Computers for the Processing of Population Censuses*, United Nations, New York, 1968.)

Concern with the problems of population growth and the increasing use of census statistics in many aspects of government and local planning has led to a demand for results to be released before they become out of date, which occurs with increasing rapidity, and census offices have been under some pressure to meet this demand. For example, the General Report on the 1961 British Census was not published until last year, while the publication of some results from the 1966 10 per cent sample census is being delayed by the preparations for the 1971 census.

One method of reducing the workload and speeding processing is to hold sample censuses of between 5 per cent and 25 per cent of the population, instead of 100 per cent enumeration, as was done in Britain in 1966. This is fairly successful for national statistics but has the drawback that figures for small areas, which are playing an increasing part in the production of local and regional plans, are subject to such large sample error as often to be of little use.

One of the first applications of punched card equipment was to the processing of census results at the turn of the century, and again census offices are turning to novel methods of data read-in to handle the great bulk of information to be processed. The forthcoming US census, for example, involves the handling of 70 million questionnaires. To process so much data, the US Bureau of the Census is using direct optical read-in devices it has developed itself. Completed questionnaires are first microphotographed and then automatically converted to data on magnetic tape for use on computers. Not only does this speed up the input of data but it leads to a marked reduction in processing errors compared with the old methods of manual coding and card punching. The English General Register Office found that of almost 0·25 million errors traced in the 1966 census, 75 per cent were due to coding and other processing mistakes. Optical read-in is likely to be used soon in West Germany, USSR, Canada, Belgium and Switzerland, as well as the United States.

Parallel with this development in processing hardware has been the development of increasingly sophisticated software to deal with the other principal source of census errors—incompatible cell entries, for example the recording of a child aged one as married. At first programmes merely recognized such entries and left them for manual inspection, but now they correct inconsistencies automatically. They reject obvious errors and replace missing entries by drawing randomly on a data store, or by imputing corrections and omissions from similarities of certain entries with entries that have already been processed.

It is interesting, in the light of recent fears of the effect of computer usage on privacy, that automatic census processing and tabulation, which reduce human inspection to a minimum, is likely to reduce rather than increase the potential for breaches of confidentiality.

LATTICE STATISTICS

New Approximate Method

from a Correspondent

FOR any physical problem which can be modelled on a regular lattice structure there is a difficult combinatorial problem. Probably the best known of such problems concerns the Ising model which corresponds to many physical phenomena such as ferromagnetism, antiferromagnetism, regular solutions and lattice gases. Solution of the counting problem is essential for a full theoretical calculation of the properties of the model. The only exact solutions available are for one dimensional lattices and the Onsager solution (and variants) for a limited class of two dimensional problems. Most interest is centred on the more physical three dimensional problems, and so there has been considerable effort to produce efficient approximate or series expansion methods. Domb reviewed the approximate and exact methods well a few years ago (*Phil. Mag.*, Suppl., **9**; 1960).

A new and interesting approximate method has been proposed recently by G. W. Woodbury, jun. (*J. Chem. Phys.*, **50**, 2247; 1969). The method follows a common pattern of writing the partition function of the assembly in terms of data for very small sub-assemblies; for example, for a two dimensional $M \times N$ square lattice the partition function can be written in terms of a