SOME FURTHER DEVELOPMENTS OF THE STRATA SYSTEM

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The computer program STRATA is designed to assist in the analysis of archaeological stratigraphy, and is essentially an implementation of the Harris algorithm for the construction of the stratigraphical matrix (Harris, 1979). In its original form, STRATA was developed as a FORTRAN program to run on a mainframe computer (Wilcock, 1975; Bishop and Wilcock, 1976). Subsequently, a new version of the program was developed, written in BASIC and intended to run on a microcomputer (Wilcock, 1981).

Unfortunately, programs written in interpreted BASIC are inherently very slow; it was found that any attempt to apply the new program to realistically extensive data resulted in prohibitively long run-times. A decision was made to produce a third version of STRATA, again intended for a microcomputer, but written in a compiled language. The language chosen was Microsoft FORTRAN 80, which is a dialect of FORTRAN IV.

The new version omits one feature which had been incorporated, at the request of archaeologists, into the earlier versions. This is the facility whereby a note may be taken of contexts which are believed to be of the same date, so that they appear at the same level in the final stratification. While such a "same date" facility may sometimes be useful, it is not an essential part of the Harris scheme, and it is very difficult to implement, since it may link otherwise independent sections of the matrix. The other two relationships - "overlies" and "is equivalent to" - are retained in the new program. In many instances, the concept of equivalence may be employed in place of that of same date.

Otherwise two distinctive new features have been incorporated into the FORTRAN version. First, there is a continual check for any cyclic sets of relationships, which are forbidden under the strict Harris scheme. The program does not halt on discovering a cycle, but informs the user of its presence, before abandoning the current chain and searching for the next branch; by this means some automatic validation of the data is incorporated into the program. Secondly, the program is now capable of stratifying from the lowest context upwards as well as from the uppermost downwards. By comparing the results of these two methods, it is possible to specify upper and lower limits for any 'floating' chains.

The main advantage of the latest version of STRATA is the greatly increased speed. This has been achieved because compiled FORTRAN is inherently many times faster than interpreted BASIC, because the BASIC version had to use slow real arithmetic to solve a problem in integer arithmetic, and because all the routines for searching and sorting the data have been made more efficient in the new version.

The run-time is now roughly proportional to the number of relationships raised to the power 1.5, a very efficient proportionality for a caculation of this type. Running on a Research Machines 380 Z microcomputer, a stratification involving 100 relationships among 50 contexts takes some four minutes to complete, while one involving 450 relationships among 300 contexts takes some twenty-five minutes. In both cases, about 90% of the run-time is occupied in organising and printing the output rather than in the logic of the main calculation.

Horizontial stratigraphy play no part in the Harris scheme, and this is often reflected in the computer producing results with an inconveniently broad horizontal spread. Developments are currently being considered so that the user may introduce his own concepts of the horizontial stratigraphy, and thereby divide the overall matrix to convenient sections. Even without such developments, the current version of STRATA has already proved its worth in assisting archaelolgists with stratigraphical problems, and in providing an effective use of microcomputers in archaeology.

References

Bishop, S. and Wilcock, J.D. 1976 — Archaeological context sorting by computer; the STRATA program, SCIENCE AND ARCHAEOLOGY, 17, 3-12

Harris, E.C. 1979 — Principles of ARCHAELOGICAL STRATIGRAPHY, London: Academic Press USBN 01-2-326650-5

Wilcock, J.D. 1975 — Archaeological context sorting by computer, COMPUTER APPLICATIONS IN ARCHAEOLOGY 1975, 93-97, University of Birmingham

Wilcock J.D. 1981 — STRATA - the microcomputer version, COMPUTER APPLICATIONS IN ARCHAEOLOGY 1981, Institute of Archaeology, London