The Sciences and the Analysis of the Ancient Scrolls: Possibilities and Impossibilities

The study of the Qumran scrolls is the study of fragments and sheets rather than that of complete scrolls. For example, 4QJer consists of fifty fragments covering parts, sometimes very minute, of sixteen chapters. 4Q509 consists of 313 fragments, and 4QSama has 346 fragments covering parts of fifty chapters. I have no idea how many fragments altogether have been found in the Qumran caves, but it must be a large number. Some scholars speak of 15,000 fragments for cave 4 alone,1 while others estimate the total number of fragments as 10,0002 or as many as 100,000.3 If we set the average number of fragments per scroll randomly at forty, we are dealing with 37,000 fragments covering 930 fragmentary scrolls. The actual number will remain unknown unless one dedicates many weeks to counting.

When dealing with a topic like the sciences and the ancient scrolls, scientists often forget that these fragments are parts, however minute, of once complete sheets, and that each medium-sized scroll consisted of a number of sheets. Each fragment constitutes an independent unit for a material investigation, to be supplemented by information included in other fragments deriving from the same sheet. Each sheet likewise forms an independent unit, not necessarily of the same nature as the sheet that is now stitched to it. Therefore, in the material analysis of the fragments it is necessary to know more about each sheet or the scroll as a whole. The scroll is the overriding unit, but since many scrolls are composed of different sheets, we have to base our remarks on these sheets. Single-column sheets like 4QTest (4Q175) and single-sheet scrolls are rare in Qumran. Most scrolls are composed of a number of sheets, seventeen in the case of the large Isaiah scroll.

Over the past five decades, the sciences have come to our aid in examining several material aspects of scroll fragments, their coverings, stitching material,

1 R. de Vaux, quoted by P. Benoit in DJD vi, v.
3 J.T. Milik, oral communication.
etc. The first such study was that included in DJD 1 (1955), viz., examinations by Crowfoot of the linen textiles, some of which must have covered scrolls. The tests themselves were carried out under the direction of W.F. Libby at the University of Chicago in 1950.

Further, according to investigations made in 1958 and the early 1960s by Ryder on the one hand and Poole and Reed on the other, the leather scrolls found at Qumran were made mainly from skins of sheep and goats. A more detailed study of the scroll material mentioned the following four species: calf, fine-wooled sheep, medium-wooled sheep, and a hairy animal that was either a sheep or a goat.

There are many ways in which the sciences helped or could help us to gain a better understanding of the scroll fragments and aid us in their reconstruction. The main areas are: (1) determining the date of the scrolls (based on the age of the skin and ink), (2) determining whether fragments derive from the same sheet (Carbon-14, DNA research, the chemical composition of the skin and ink; follicle patterns in skins, and fibers in papyrus), (3) retrieving previously unreadable letters with the aid of advanced photographic techniques, (4) identifying fragments and determining the relation between fragments with the aid of computer-assisted research. At the same time, we should also be able to determine where these sciences are unable to help us.

This study refers solely to the scientific examination of the fragments, and not to the identification and reconstruction on the basis of content. Further, it refers only to scientific aid in the reconstruction and understanding of the scrolls, and not to the contribution of these examinations to the archeology of Qumran or the understanding of life at Qumran. Thus, we do not deal with

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4 G.M. Crowfoot in DJD 1 (1955), 18–38. The tests themselves were carried out under the direction of W.F. Libby at the University of Chicago in 1950.


6 Ibid., "Part 1, Physical Examination," 1–13 (8).


8 For an earlier survey, see M. Broshi, "The Dead Sea Scrolls, the Sciences and New Technologies," DSD 11 (2004): 133–142.