

# Protons for studying the Dead Sea Scrolls

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Researchers of the National Laboratories of the South (LNS) in Catania of the Istituto Nazionale di Fisica Nucleare (INFN, Italy's National Institute for Nuclear Physics) have shed light on the origin of one of the extraordinary Dead Sea Scrolls.

It is a collection of about 900 documents discovered half a century ago in various caves near the Dead Sea and constituting the oldest known biblical texts, dating back to the period from about 100-200 B.C. to several decades after the birth of Christ. This finding was made possible by the combined use of a new system of analysis known as "XPIXE", patented by the INFN National Laboratories of the South, and a [particle accelerator](#) located at the same facility.

The results of the analyses were presented yesterday, 1 July 2010, by Professor Giuseppe Pappalardo of the INFN, at the PIXE 2010 Conference in Surrey, Great Britain.

The analyses, which were conducted by INFN physicists in collaboration with researchers from IBAM-CNR, have revealed that one of the Dead Sea Scrolls, in particular, the Temple Scroll (which is not part of the biblical narration and instead describes the construction and life of a temple and dictates how laws are to be communicated to the people), may have been made near the Dead Sea, in the area of Qumran, where the scrolls were found. In other words, the scrolls may have been created locally.

The analyses were conducted on seven small samples of the scrolls

(average size of one square centimetre), following a request made by Dr. Ira Rabin of BAM (Bundesanstalt für Materialforschung) in Berlin. The scrolls belong to the Shrine of the Book of the Israel Museum and the Ronald Reed Collection of the John Rylands University Library.

At the LANDIS laboratory (one of the INFN laboratories in Catania), non-destructive analyses were performed to obtain results on the origin of the scrolls. To produce a scroll, which was the writing material used at the time, a great quantity of water is needed. By analysing water samples taken in the area where the scrolls were found, the presence of certain chemical elements was established, and the ratio of their concentrations was determined.

The ratio of chlorine to bromine in the fragments of the Temple Scroll was then analysed using proton beams of 1.3 MeV, produced by the Tandem particle accelerator at the INFN National Laboratories of the South.

According to this analysis, the ratio of chlorine to bromine in the scroll is consistent with the ratio in local water sources. In other words, this finding supports the hypothesis that the scroll was created in the area in which it was found. The next step in the research will be to analyse the ink used to write the scrolls.

Provided by INFN

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