

expression, and the high level and reliability of performance suggest that such a habit may be an especially favourable ESP vehicle. Research is needed to see whether other individuals would show similar performance.

This work was supported in part by the Parapsychology Foundation.

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Received June 17, 1968.

¹ Blom, J. G., and Pratt, J. G., *J. Amer. Soc. Psychological Res.*, **62**, 28 (1968).

The following is an extract from the report of one of two referees. The other referee recommended that the communication should not be published.

I consider that the facts with which this deals deserve to be brought before a wider scientific public than would be attainable if they were to appear only in a specialist journal.

The one point on which criticism could alight is that the subject himself handles the target-packets the content of which he is required to guess. Inevitably this gives rise to the suspicion that the effects may be due to certain subtle cues connected with the differential warping of the target-materials. It seems, however, that the effect has stood up under such a variety of conditions (see especially series 11, fourteenth paragraph) that such a possibility can be ruled out. I would have been still happier if the outer jackets had been made of rigid materials rather than the double-thickness manilla file folder card mentioned in the ninth paragraph, but I cannot fault the authors' claim to have effectively eliminated all normal counter-hypotheses. Accordingly, I see no way of avoiding the conclusion that, in the situation described, a particular verbal response was being elicited by a concealed stimulus-object even though this object could not have been recognized by the use of any known sensory mechanism. The general interest and importance of such a conclusion speaks for itself.

Investigations of the Inks used in Writing the Dead Sea Scrolls

FUNERAL texts written on stones found inside a grave in the cemetery at Qumran have recently been described¹. This discovery necessitated an investigation of the composition of the inks used by the Qumran community, chiefly because the ink on the stones had faded and could only be seen with the aid of ultraviolet fluorescent lamps, while photographs taken with ultraviolet lighting and infrared film were not satisfactory.

Brief reports on the inks used to write the Dead Sea Scrolls have been published^{2,3}, but most of the tests to determine the nature of these inks, carried out nearly 20 years ago, have not been published. I report here work carried out by Dr H. J. Plenderleith, formerly keeper of the Research Laboratory of the British Museum, on the Dead Sea Scrolls, and by Professor D. Vofsi, of the Weizmann Institute of Science, on the Qumran funeral texts.

Plenderleith's work confirms published reports that the inks had a carbon base; reference is also made to ink with an iron base. Professor Yigael Yadin has pointed out that a metal based ink was apparently used for writing the *Apocryphon of Genesis* scroll⁴. This was, however, acquired by Yadin and unrolled several years later so that it could not be the major scroll on which iron ink was found, as mentioned in the report by Plenderleith. We have been unable to ascertain who conducted these tests on the six scrolls then extant.

Wherever writing was found, the ink was quite black and showed no tendency to turn rust coloured. Twelve separate fragments bearing vestiges of script were collected and tested with potassium ferricyanide—a sensitive method of detecting the presence of iron—but results were all negative. Bleaching agents seemed to have no effect on the writing and, there being no loss of intensity, the conclusion was that all the writing was done with carbon ink. This has been taken by some archaeologists as a criterion for dating, but iron as well as carbon inks were available before the Christian era; iron had been used, at least sporadically, ever since the invention of tanning. Iron occurs universally, and has only to be present in solution with tannins for a writing ink to be formed, so that the fact that some of the main scrolls were written in iron ink is no indication of their age. It is also fair to claim, because the writing is legible, that it could not have been done when the skins were old and absorbent—there can be no doubt that the ink is as old as the skins.

While I accept that the presence of carbon or iron ink is no criterion for dating the Dead Sea Scrolls, it should be noted that the oldest known specimen of an iron-based ink dates from the seventh century AD (ref. 5). It is generally accepted that the Dead Sea Scrolls were written during the two centuries before the present era and in the first half of the first century AD, and so the presence of an iron based ink at that time, while not refuting the dating of the documents, could have a bearing on the work on Qumran texts.

In 1954 Plenderleith used a spectrograph to examine two samples from Qumran. The first was a mass of white crystals with a spectrum indicating a high content of calcium. Chemical analysis showed sulphate to be present in quantity and a heat test showed the presence of water crystallization. The sample was therefore a residue of gypsum and had no particular association with ink. The second sample also contained calcium, but in association with traces of copper, tin, lead, silver, iron and manganese. The chief constituent was carbon. The sample was the residue of a carbon ink, no doubt contaminated with the corrosion products of a metal (bronze) inkwell.

Three inkwells, one bronze and two clay, were found during excavations at Qumran by Pere Roland de Vaux of the Ecole Biblique, and another clay inkwell was found later during my own excavations in conjunction with the Department of Antiquities of the Government of Jordan. An analysis of the ink residue in this specimen is being prepared by Dr George Adler, of the Brookhaven National Laboratories, New York. A preliminary examination has shown that this ink does not contain an appreciable amount of iron, for it did not fluoresce when tested with a copper X-ray tube.

The results of these tests suggested that a carbon ink should be used in any subsequent experimental work. The stones used were collected in Qumran, in gloved