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JULY 16th NUCLEAR EXPLOSION: RADIATION SURVEY OF TRINITY SITE FOUR WEEKS AFTER EXPLOSION

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ABSTRACT

A survey of the ionization level due to gamma rays was made between August 12 and 14, 1945. The results, expressed in roentgens per hour, are indicated upon aerial photographs of the region.

JULY 16th NUCLEAR EXPLOSION:
RADIATION SURVEY OF TRINITY SITE
FOUR WEEKS AFTER EXPLOSION

At the request of K. T. Bainbridge, a survey of the gamma-ray intensity at distances ranging up to 500 yards from the Trinity crater was made between August 12 and 14, 1945. The measurements were made with meters of the Watts type, embodying an ionization chamber, an 'acorn' tube amplifier and a microammeter, and were taken at a height of one meter above ground level.

The procedure was as follows: Two observers, wearing appropriate protective clothing, carried the meter, a light tripod on which to place it, and a number of short wooden stakes. At each point where a measurement was to be made, they drove a stake into the ground, set up the tripod and meter over this stake, took and recorded the reading of the meter and made a hand-signal or a light-signal to the operators of two theodolite stations that were set up on the roofs of the instrument shelters distant 800 yards from "0" near the north and west roads. These operators had meanwhile trained their instruments on the stakes.

The theodolite readings were transmitted by telephone to a plotting station, where the location of the stake was immediately plotted upon a previously-prepared map of the area, on which had been drawn appropriate systems of angular coordinates based upon the known positions of the theodolite stations. The field observers then moved to a new position and the process was repeated until these observers, who carried integrating dose-meters, considered it advisable to return to the plotting station, where the meter was recalibrated and given to a fresh pair of field observers, who, having seen the points already plotted and being able to see the stakes left by the previous pair, were able to continue the survey without overlapping or leaving large gaps.

The method described above could not be used within and near the crater, wher the field observers had to work very quickly and were frequently invisible from the theodolite stations; in this region the observers (de Hoffmann and Lobel) made use of the many local landmarks to identify their positions.

A further set of readings was made on a circle of radius 500 yards at points previously surveyed by the Post Engineer for purposes of fencing, while some additional closely spaced readings were taken in the neighborhood of one or two of the green "streamers" that radiate from the central green-glazed area. These streamers could be seen on the ground more clearly than in Figs. 1 and 2. These last measurements showed plainly that the radiation comes mainly from the green material.

The reliability of the ionization measurements, as judged by differences between the meter calibrations before and after each expedition, was not so good as could be desired, being sometimes only about ten per cent. We suspect this may be due to thermal effects, since some of the readings were made in very strong sunlight. One set of readings had to be repeated owing to a radical change in the calibration of the meter. The accuracy is believed to be sufficient for the purposes of the survey, particularly owing to the rather 'spotty' nature of the ionization distribution.

The results are shown in Figs. 1 and 2 superimposed upon aerial photographs of the region; contours are plotted on Fig. 1 at levels of 2, 1, 1/2 . . . . . 1/32 r/hr. Contours are not shown on the larger-scale photograph (Fig. 2) of the central region; instead, areas are indicated by hatching where the intensity was constant in order of magnitude. The highest readings (about 15 r/hr) were obtained not at the center of the crater but at a radius of about 30 yards, over an incomplete ring of greyish material. The distribution as a whole was notably unsymmetrical, the intensity being greater towards the north.

Samples of earth were taken at selected locations and depths and were submitted to H. L. Anderson's group for beta-ray observation; the results of this work ar being separately reported to K. T. Bainbridge, but it may be stated here that the surface samples were more active than those taken at a depth of about six inches by a factor that varied between limits of about unity to a hundred, depending apparently upon the amount of green material that happened to be present in the surface sample.

Each stake used in the survey was numbered and, in the event of any future surv y, may be located from a plan of the area that is available in Bainbridge's office

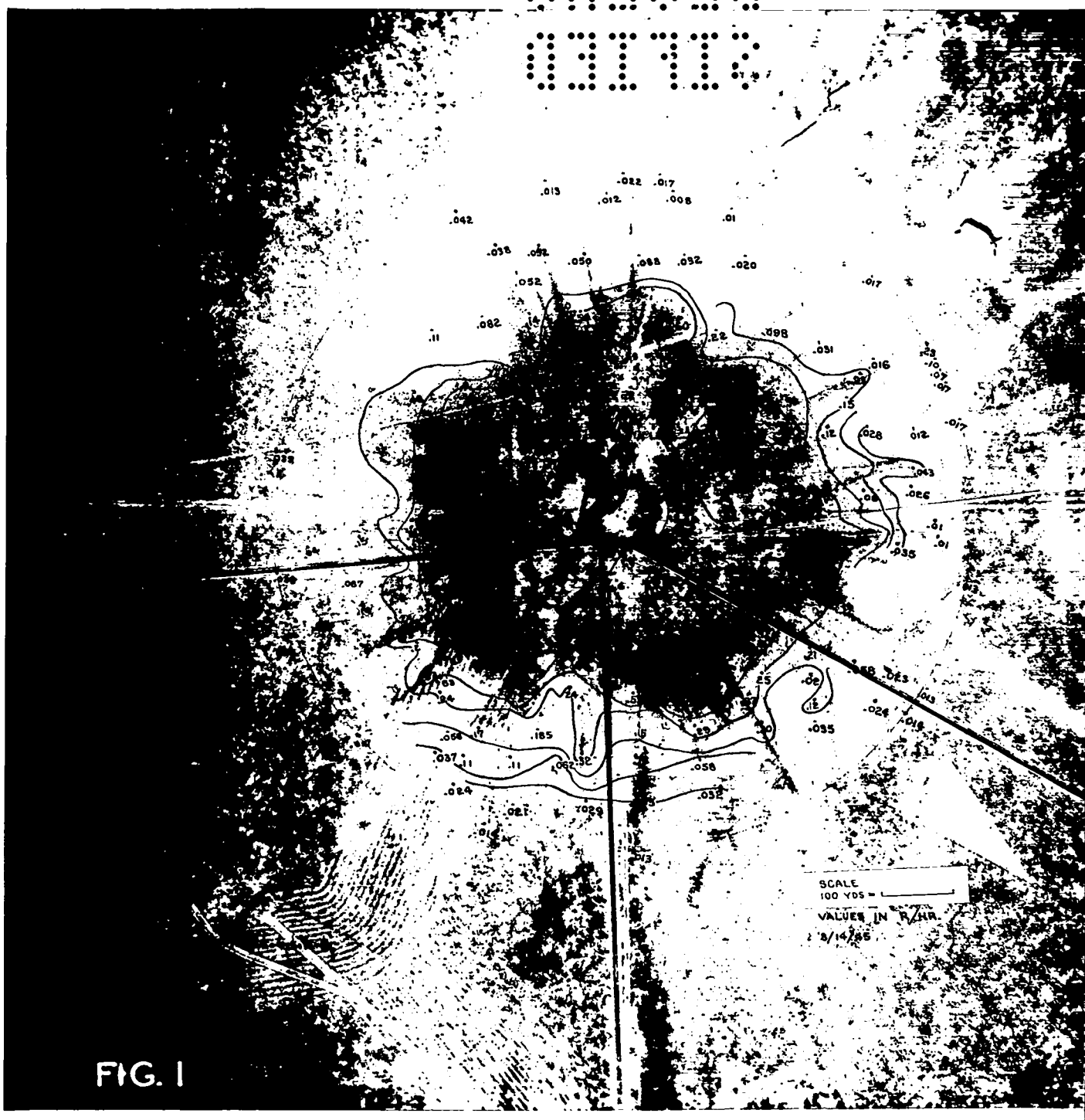

FIG. 1

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FIG. 2