

ELECTRON BACKGROUND IN NUCLEAR EMULSIONS*

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Since 1951 supplies of Ilford G5 electron sensitive nuclear emulsions have been flown by air to Australia. In 1954 it was observed that some batches, when developed soon after arrival, showed an excess electron background which made them unsuitable for the cosmic ray work for which they were imported.

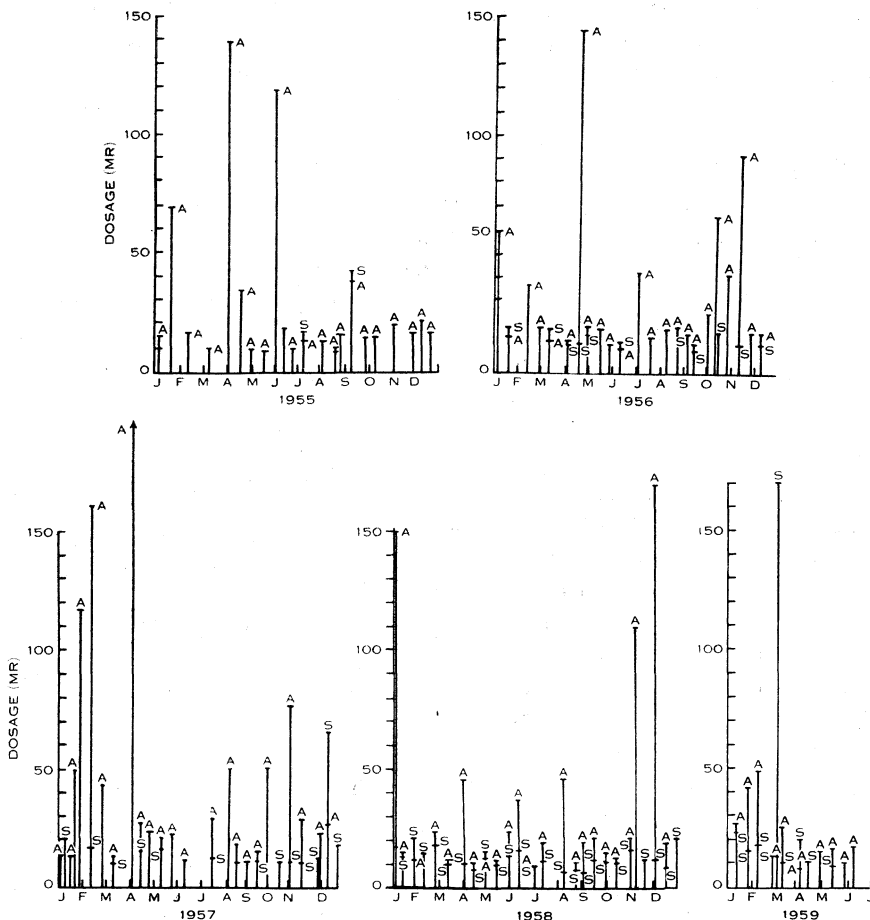


Fig. 1.—Dosage in milliröntgens received by electron sensitive emulsions arriving by air from England (A), and arriving by ship (S) over the period 1955 to 1959 (June).

It was then decided that a test development was required for all emulsions before they could be safely used in the high altitude studies. It was also considered necessary to import samples by ship to determine whether emulsions would be more suitable if imported by this means.

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Results of the dosage received by samples arriving throughout the period January 1955–June 1959 are given in Figure 1, where plates sent by air are marked A and those by sea S. The electron background dosage in milliröntgens calibrated as described earlier† is plotted against the approximate date of manufacture. Correlation of the heavy dosage samples with radioactive rainfall in France was noted earlier.*

The emulsions consisted of 600 micron thick Ilford G5 emulsion on glass backing. The size of the plates was 3 by 2 in., and these were packed in cardboard packets holding 6 or 12 plates. The packets were in turn protected with a layer of wood shavings placed inside wooden boxes. These boxes were labelled photographic material and the label specified that the packet should be kept 10 ft from any radioactive material. Comments regarding radiation due to instrument panels etc. are made in the previous communication on this subject. The same method of packing has been made throughout the duration of this test.

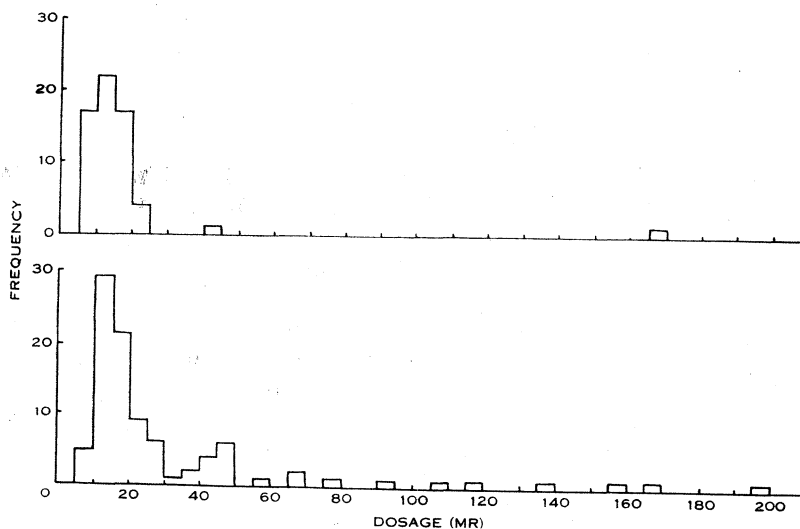


Fig. 2.—Histogram showing the frequency of dosage: (above) plates arriving by ship, (below) plates arriving by air.

It has been the standard practice of Ilford Ltd. to dispatch plates within about 3 days of manufacture and to mark the manufacture date on the box carrying the plates.

Figure 2 shows the histograms for plates arriving by sea and by air and clearly shows that air-flown samples are more prone to excess radiation damage than those arriving by sea. (The mean air transport time was 38 hr at 10,000–20,000 ft, climbing and descending time about 8 hr.)

Only two samples out of 60 of those arriving by sea showed an exposure exceeding 25 mr. One sample was manufactured in September 1955 and the corresponding sample which arrived by air also showed excessive exposure.

* HOPPER, V. D., and LABY, JEAN E. (1955).—*Aust. J. Phys.* 8: 557.

The other sample, manufactured on March 2, 1959, showed a very high exposure (170 mr), whereas the corresponding sample arriving by air showed low exposure (13 mr). The reason for this difference has not been determined.

Results show that it is advisable to import nuclear emulsion plates by sea rather than by air, although there is still some chance of excessive exposure. The use of the electron sensitive emulsions in radiation measurements is also shown to be useful for determination of low dosages, particularly as the electron tracks can be distinguished from darkening produced by other means such as exposure to light and chemical fogging due to excess temperatures. Further tests are being carried out with the method on aircraft travelling on different routes in the southern and northern hemispheres.