PERSONAL FACTORS IN ACCIDENT PRONENESS*

STUDIES of accident proneness are usually either statistical or psychological. The statistical studies have inherited common aims and methods from the pioneer work of Greenwood and Woods[1]. The psychological studies have been diverse in aim, ranging from attempts to predict the accident prone by æstheto-kinetic skill test performance, through other investigations of a laboratory type seeking to define the behaviour inadequacies responsible for accidents, to clinical assessment of various aspects of the personality of multiple accident-prone individuals. Dr. J. A. Smiley's work belongs to the last-named class, although he gives due place to earlier work along the other approaches. He has made full use of his position as medical adviser to an aircraft-manufacturing company to study the accident histories of 6,450 men, and to examine in detail eighty-seven men classified as accident prone, and a random control group of a hundred normal men.

His thesis may briefly be stated—accident-prone individuals are usually emotionally disturbed, with associated hypothalamic misfunction which, it is tentatively suggested, produces minor imbalance of adrenalin and acetylcholine with concomitant behaviour disturbance. This thesis needs to be examined both in the light of the evidence he presents, and in respect of other studies.

There can be no doubt that a large proportion of his eighty-seven cases were emotionally disturbed. The evidence, presented soberly and cautiously, may almost be described as overwhelming. The case-histories are illuminating; classification on Culpin's scale (with a high degree of care exercised against possible observer bias) shows that 72 per cent of the accident group exhibit emotional disturbance of a marked degree, against 8 per cent of the normals. The accident-prone individuals also show 'anxiety' sweating in interview, albumin in the urine specimens collected during medical examination, a seven-fold increase in peptic ulcer incidence, and a more than four-fold increase in incidence of other medical symptoms. There can be little doubt as to the accuracy of the psychiatric diagnoses of these men.

The problem remains, however, whether these men may adequately be described as accident prone. Dr. Smiley is cautious in pointing out that his conclusions may only apply to men engaged on similar work and (as he specifically states) would not apply to road accidents. His introductory statistical observations (which are, unfortunately, marred by errors—his tabulations of observed accident frequency give a total incidence of 13,584, against a quoted 14,498, the latter figure being used for the theoretical distributions) do not completely comply with the canons of statistical investigation. Although the men all work in shops of roughly equivalent risk per hundred thousand man-hours, no check has been made of each individual's actual exposure, which, of necessity, will vary with the total number of hours worked. It is also very likely that there are large differences in actual risk due to differences in work done within the larger occupation groups. The eighty-seven cases picked out are, however, so removed from their fellows that these points are probably of minor importance. A more serious objection is that only minor injuries are considered. To some extent this must have been inevitable, as apparently only 1 per cent of injuries reported involved absence of more than one day. Greenwood and Woods's dictum that the law of a distribution will not in general be affected by the consequences of the result is quoted in extension of this use. But the correlation between minor and major accidents, though positive, is not usually very large, and accident proneness, as an important problem, concerns those incidents with more severe medical, human and economic sequelæ. Dr. Smiley's accident group attended the medical room for accident injury treatment approximately six times as often as average. They also attended for other medical purposes approximately two and a half times more than normal. Taken in consideration with the sweating, albuminuria and peptic ulcer incidence, the main conclusion to be drawn is that proneness to report minor injury can be added to the list of other known clinical signs of emotional disturbance. This is valuable; but when Davis[2] has reported that a group of accident-prone coalminers (who had sustained many 'disabling' accidents) showed no similar symptoms, it would suggest that accident proneness, as distinct from proneness to attend the surgery whatever the reason, has still to be described in psychological or psychiatric terms.

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* Substance of the Milroy Lectures of the Royal College of Physicians of London, given by Dr. James A. Smiley on Feb. 8 and 10, 1955.

[1] Greenwood, M., and Woods, H. M., "The Incidence of Industrial Accidents, with Special Reference to Multiple Accidents". (Medical Research Committee, Industrial Fatigue Research Board Report No. 4.) (London: H.M.S.O., 1919.)

[2] Davis, D. R., *Quart. J. Exp. Psychol.*, 1, 136 (1949).

SECONDARY ELECTRON EMISSION

A COLLOQUIUM on "Secondary Electron Emission", sponsored jointly by the Institute of Physics and the Physical Society as one of a series of meetings on electron physics, was held in the lecture theatre of the Institute on March 1, when eight papers were read and discussed. This report summarizes first the papers on secondary emission yield, on energy losses and on depth of penetration of electrons, and is followed by a résumé of the talk by Prof. H. Fröhlich (University of Liverpool), who spoke on the quantum theories of secondary emission. The succeeding papers deal with phenomena exhibited by specific targets.

S. Rodda (Edison Swan Electric Co., Ltd., Enfield) spoke briefly on universal curves for secondary emission yield, a subject in which we are greatly indebted to Bruining and Jonker. The formulæ proposed assumed δ to be of the form

$$\delta = \frac{aV^n}{1 + bV^m}$$

in which the relative yield curve would be

$$\Delta = \frac{\frac{m}{m-n} W^n}{1 + \frac{n}{m-n} W^m}$$

with $\Delta = \delta/\delta_m$, $W = V/V_m$.