Flying Saucers

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The UCCA method of assessing the A-level performance is to award points for A-level grades, 5, 4, 3, 2, 1 representing A, B, C, D, E, respectively. By considering the best performance in three subjects each candidate is put on a scale which runs from 15 (AAA) to 2 (EE). Consequently, those considered by Prof. Thompson scored 9 or more points, while the other 274 scored from 2 (EE) to 8 (CCD), (BCE) etc. The UCCA report shows that about 56%, or 153, of these poorer candidates were successfully placed and, although no doubt some of the remaining 121 continued with their education in other institutions, it is likely that many were discouraged from continuing with their ambition to achieve a physics degree. With the shortage of graduate physicists, both nationally and internationally, this is unfortunate for if the results obtained in my own department are considered it is likely that many of these candidates had the latent potential to succeed.

In 1965, 23 students enrolled for the BSc Special Physics External London, and none of these scored more than 7 on the UCCA scale. This year 19 of these graduated, two with first class honours, two with upper seconds, eleven with lower seconds and four with thirds. Of the four who fell by the way, three have since passed Part 1 of the examination and are expected to graduate next year. The two first class graduates had UCCA scores of 7 and 6, the upper seconds 7 and 4, while those of the lower seconds ranged from 7 to 2.

This is not an isolated case for in 1967 of 12 candidates entered five obtained upper seconds, five lower seconds and two thirds, while in 1966 again 12 entered for the examination, two obtaining first class honours, one an upper second, seven lower seconds, one third and one pass. All these young people who were originally very despondent after their A-level performance are now able to hold their heads high for they have more than justified themselves, and the example of what they have accomplished should be an inspiration to those who find themselves in the same position this year.

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Interpretation of electron diffraction patterns

In the extremely interesting Jubilee article 'Electrons in metals and alloys' by Prof. H. Jones in the June 1968 issue of *Physics Bulletin*, I was disappointed to see that the electron diffraction patterns of CuAu alloys were described as 'Laue photographs', and that both were stated to be projections of the reciprocal lattice. In addition, possibly as a result, the patterns were incorrectly indexed. As misconceptions about the nature of electron diffraction patterns seem to be widespread, the following clarification of the differences between these two types of diffraction pattern might be helpful.

A Laue photograph is recorded by the action of 'white' X-rays on a stationary crystal, usually along a principal axis. The radiation covers a wide band of wavelengths. Although the crystal planes lie at many different angles θ to the X-ray beam, and their d-spacings vary, almost all sets of planes give diffracted beams, because one of the available wavelengths λ can satisfy the Bragg equation $n\lambda = 2d\sin\theta$. The position of a spot on the photographic plate depends entirely on θ, not d. Laue photographs cannot therefore be regarded as "projections of the reciprocal lattice" as stated, because for example, the 312 reflexion would coincide with 624, 936, etc., corresponding to values for n of 1, 2, 3 . . . . If a monochromatic X-ray beam were used very few, if any, beams would be diffracted, as only certain specific values of both d and θ would satisfy the Bragg equation for a fixed value of λ.

In an electron diffraction camera, or an electron microscope adjusted for selected area diffraction, the electron beam is nearly monochromatic, with a much shorter wavelength (about 0·04 Å) than that of X-rays (e.g. Cu Kα: λ = 1·54 Å). The Ewald sphere of reflexion has such a large radius that it cuts an almost planar section of the reciprocal lattice, which is undistorted because of the small angles involved. This *section* is not a *projection*, as stated in the article; a CuAu crystal with [001] parallel to the electron beam would not give 111 spots, as stated, because these reciprocal lattice points are not in the plane cut by the Ewald sphere. The reflexions from disordered CuAu shown in figure 1*a* should therefore be indexed 200 and 220, not 111 and 200. The additional spots in figure 1*b*, from ordered CuAuI, were correctly indexed 110 (on the 'cubic' unit cell axes), because they lie half way between the direct beam spot and the 220 spots. A fuller analysis of the origins of these extra reflexions and other satellite spots, and the splitting of spots in CuAuII patterns has been given by Glossop and Pashley (1959).

Interpretation of the causes of splitting of the 110 spots from the various CuAuII alloys with other metals was not affected in this case by the confusion between electron diffraction patterns and Laue photographs, but errors have undoubtedly arisen in the past for this reason and can only be avoided in the future with a clear understanding of the mechanism involved in the particular type of diffraction under discussion.

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Reference

GLOSSOP, A. B., and PASHLEY, D. W., 1959, *Proc. R. Soc.*, **A, 250,** 132.

I am grateful to Dr J. A. Gard for pointing out the incorrect terminology used in the last section of my article. He is quite right when he says that the photographs shown in this should not be referred to as Laue photographs in spite of superficial similarities, and that in figure 1*a* the indexing should be 220 and not 111 as stated.

In the last paragraph of his letter Dr Gard points out that these terminological errors do not affect the interpretation of the causes of 110 splitting in CuAuII. With this statement I also wholly agree.

H. JONES

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Flying Saucers

Apropos of Prof. R. V. Jones' article on flying saucers (*Physics Bulletin*, July 1968, p. 225), if any couple, married or otherwise, have ever been able to sit up watching Venus all night, I shall start believing in flying saucers — or maybe they were Eskimos.

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Additional letters on the subject of Prof. Jones' article have been received from Mr P. C. W. Davies, Physics Department, University College London, and Mr R. C. L. O'Neil, North End, Portsmouth, both contesting to some extent Prof. Jones' belief that the evidence for flying saucers remains inconclusive. It is regretted that due to lack of space it is not possible to publish these. ED.