of diffractometers. In a section on crystal physics, surely an attempt should be made to justify the indicatrix. Part two begins with an interesting account of crystallization processes and phase diagrams up to ternaries; it then leads on to hydrous systems. The sections on igneous and metamorphic petrology are much too condensed, but the account on the role of volatiles is quite the best to appear in an elementary text. There are further chapters on sedimentary rocks, metasomatism, the development of tectonites, and geochemistry.

The account seems to have lost little in translation, the diagrams are excellent and the paper, although still of two types, is of good quality. A bibliography is provided as well as author and subject indexes. The work throughout is written with authority and reaches a high standard, but one is left with the feeling that this vast field would have been covered much better by two books.

I. D. MUIR

OPTICS FOR UNDERGRADUATES

University Optics

Vol. 1. By D. W. Tenquist, R. M. Whittle and J. Yarwood. Pp. viii + 349. (Iliffe: London, October 1969.) 70*s*.

IN the preface the authors describe this text as "intended to cover the requirements in the subject of optics for the student preparing for Part 1 of an honours degree in physics, a general degree in science or ancillary physics to an honours degree in chemistry or other main discipline". Of the material covered in volume one, the first three chapters deal with geometrical optics and optical instruments. These chapters deal with these difficult subjects clearly and concisely. Refractometry and photometry take up nearly one-third of the volume and it is this extensive treatment of practical optics which distinguishes this book from the many other available texts. The velocity of light is given a chapter to itself, which seems a little excessive. The wave theory of light is followed by sections on interference, diffraction and resolving power.

There are worked examples throughout the text and questions from various university degree examinations are included at the end of each chapter, with answers to the numerical problems at the end of the book. The treatment throughout is traditional, in contrast with other recent undergraduate books in optics. While there is nothing particularly novel in either presentation or material, the writing is thorough and accurate. Special attention is paid to practical details, particularly in those sections dealing with optical measurements and instruments. There are plenty of clear, well-drawn diagrams which supplement the text, but it is a pity that the publisher did not choose a better quality of paper.

To sum up, this is a useful book which, while suitable for applied physics and ancillary physics courses, probably does not present sufficient challenge for a first year undergraduate intending to specialize in physics.

D. J. BRADLEY

Obituaries

Mrs M. J. Richards

MRS M. J. RICHARDS (Dr Maud Norris) will be remembered chiefly for her work as a locust entomologist, in which she had a world-wide reputation. It was Mrs Richards who discovered the maturation pheromone of the desert locust in 1954. Her association with locusts and the Anti-Locust Research Centre came about almost by accident and in spite of the fact that her early work had been on pests of stored products. When the Anti-Locust Research Centre became an independent research institute in 1945, the director at that time, Dr B. P. (now Sir Boris) Uvarov, was looking for a scientist to run the laboratory. Mrs Richards expressed interest, was given a research grant in 1946 and from then until December 1969 never gave up locust work.

Maud Richards was born in Plymouth in 1907, the daughter of a naval officer, and was educated at several schools including Cheltenham Ladies' College. At King's College, London, she obtained first class honours in zoology in 1928. She became a demonstrator at King's College and then held a DSIR grant in the Department of Zoology and Applied Entomology of Imperial College, where she obtained her PhD degree. It was also here that she met her husband, Professor O. W. Richards, who was then a lecturer in the department, and she was married in 1931. From 1932–34 she was a research assistant at Imperial College and took up what was to remain the major theme of all her work, the reproductive processes and associated behaviour of insects. Her three papers on the stored products moth *Ephestia*, published in 1932, 1933 and 1934 and still quoted today, typify her broad approach and include studies of the structure and functions of the reproductive organs, the effect of food and external factors, and physiology.

After 1934, when she stopped working full time, she did part time work in the British Museum (Natural History) on the *Zoological Record* as well as voluntary work at the Pest Infestation Laboratory in Slough. In 1937 she accompanied her husband to British Guiana, sharing his Leverhulme grant, to collaborate on the biology of social wasps; a notable joint paper resulted later. In 1946 Mrs Richards joined the ALRC as a research fellow, was then appointed an SSO and finally promoted to PSO, which she remained until her death this year. While there she published more than twenty-five important papers on locust biology and physiology, and built up an international reputation for her work on the effects of grouping and phases in locust biology. She made important observations on the effects of density, food and photoperiod on locust reproduction and maturation, but clearly something else more elusive was involved and in 1954 her patience and persistence were rewarded with the discovery of a chemical influence, the maturation pheromone. This was a finding of great importance and was one of the first demonstrations that this type of compound existed.

Mrs Richards's research stimulated further work in the ALRC and in many other laboratories in this field, resulting directly in the discovery of more pheromones. She herself found others connected with reproduction and, recently, a chemical functioning in gregarious oviposition behaviour of locusts. Indirectly her work generated interest in chemicals biologically active in locust reproduction, particularly plant chemicals that trigger maturation.

She was now well known internationally, and was awarded the DSc of the University of London in 1964. She was much in demand for international symposia, treating this recognition with characteristic modesty; she was also interested in field work overseas, enjoying these visits not only for the experience itself but because they provided her with insights for further laboratory work. During the 1960s she went abroad frequently. In probably the most interesting and arduous of her trips she and Professor Richards joined the Royal Society and Royal Geographical Society Expedition to the Mato Grosso in Brazil in 1968. She passed off the hardships of the life there with characteristic calmness and said that she was much more interested in the great variety of grasshoppers that she found in the forest than in the difficulties of camp life.

Mrs Richards was one of the longest-serving members of the Anti-Locust Research Centre; she had a quiet, friendly, unassuming manner and never sought the limelight. But she could be roused when scientists, be they

colleagues or not, drew unwarranted conclusions from insufficient data, and then she gently but firmly drew attention to the lapse. Her help and counsel were much in demand by her colleagues at home and overseas, and she was always ready to assist them. She will be sadly missed not only in the centre but by locust scientists all over the world.

Correspondence

A-levels and University Performance

SIR,—I would like to comment on D. G. Bagg's interesting article on A-levels and university performance (*Nature*, **225**, 1105; 1970), and to take a different view of the predictive value of examinations based upon a less literal interpretation of the results of analysis and consequently reaching more conventional conclusions.

I have made an investigation of the predictive validity of examinations from university entry qualifications to final degree for all candidates for the honours degree in mechanical engineering of the University of Salford from 1959 to 1964. This study is continuing; there is, however, a time delay of five years to allow for students who require five years to complete the normal four-year course. As in Bagg's work, the study is longitudinal, but attempts to predict only from one sessional examination to the following sessional or final examination taken one year later. The predictive criterion used is the average mark per script obtained by each candidate in each of the successive examinations. This criterion was selected because it gave significantly better correlation from year to year than the mark in any individual subject and also because the frequency distribution of average mark per script was found to be very close to a normal distribution for sessional and final examinations, thus satisfying an important condition for a linear regression model.

Table 1

Entry qualification	No. of candidates	Average mark per script	Correlation coefficient
GCE Advanced level in three or more subjects, including maths and physics	243	56·7	0·286
GCE Advanced level in maths and physics only	187	53·1	0·292
Ordinary National Diploma	40	58·0	0·461
Ordinary National Certificate (internally examined)	155	55·3	0·285
Ordinary National Certificate (externally examined, with four subjects)	121	54·8	0·422
Ordinary National Certificate (externally examined, with three subjects)	65	53·1	0·213

The condition of normal frequency distribution was not satisfied by the marks obtained in the entry qualifying examinations, these marks tending to be biased towards the minimum acceptable standards for the course. For this reason and because of the variety of entry qualifications offered by students, which in turn led to relatively few students in some of the categories of entry group, linear regression equations were not calculated to predict first-year sessional examination performance from entry qualification performance. However, product-moment correlation coefficients between entry qualification performance (divided into six categories of qualification) and average mark per script obtained in the first-year sessional examination were calculated and provide an indication of the degree of relationship between these variables. The average mark per script obtained in the first-year sessional examinations for all candidates in each of the six entry qualification categories was also calculated and is shown, with the correlation coefficients, in Table 1.

The regression equations and correlation coefficients for performance in sessional and final examinations of candidates in successive years of the course are shown in Table 2, in which $x_{1,2,3,4}$ denotes the average mark per script obtained by a candidate in the first, second and third year sessional examinations and the final examinations respectively.

Table 2

Sessional examination	No. of candidates	Correlation coefficient	Predicted mark
First to second	265	0·660	$x_2 = 11{\cdot}82 + 0{\cdot}745\ x_1$
Second to third	232	0·723	$x_3 = 6{\cdot}58 + 0{\cdot}916\ x_2$
Third to final	233	0·736	$x_4 = 4{\cdot}63 + 0{\cdot}887\ x_3$

The correlation coefficients shown in Tables 1 and 2 indicate that performances in successive university examinations are more closely related than performance in GCE Advanced level or other entry qualifying examinations with subsequent performance in university examinations. It would be surprising if this were not so, in view of the relative homogeneity of the university situation compared with the variety of examining boards, schools and social backgrounds of the candidates before university entrance.

This factor, in conjunction with the reasonable surmise that undergraduates are, by the time they begin university courses, already highly selected from the general population as far as examination performance is concerned, leads me to conclude that final degree performance cannot be expected to bear marked relationship to performance in A-level examinations as a whole. This relationship can be expected to weaken with performance in a single A-level subject and to become negligible if factors affecting performance which are common to two or more subjects are removed in the regression analysis. This effect is clear in the multiple regression equations presented in Bagg's analysis. This is not to argue that A-level grades are unreliable and possibly hazardous predictors of future academic performance but that to expect more than a general indication of academic ability is to expect too much. That A-level performance does provide such an indication has been demonstrated by Petch[1], who states that of a sample of 3,523 students who entered a university in October 1956, after being examined by the Joint Matriculation Board, nine out of ten justified their selection by subsequently completing degree courses and that incidence of premature termination of courses was higher for less well qualified groups of students than for groups which obtained better results at Advanced level. An additional inference which may be drawn from Table 1 is that A-level performance is not the only indicator of the potential ability of undergraduates, and I suspect that this conclusion is as valid for other disciplines as it is for engineering.

Yours faithfully,

R. R. PLATT

Department of Mechanical Engineering,
University of Salford.

[1] Petch, J. A., *GCE and Degree, Part I. Joint Matriculation Board* (Manchester, April 1961).

University News

Geoffrey V. Ball, head of the Department of Ophthalmic Optics, has been appointed professor of ophthalmic optics in the **University of Aston in Birmingham**, and **Dr Michael R. W. Brown**, Bath University of Technology, has been appointed professor and head of the Department of Pharmacy, also in the **University of Aston in Birmingham.**