New Books Received

All the books which are described below are available in the Library and may be borrowed by members in the United Kingdom. A postal loan service is available for those who are unable to call personally at the Library.

Sir William Preece, F.R.S.: Victorian Engineer Extraordinary.

E. C. BAKER. Hutchinson, London 1976. 23·4 × 15·6 cm. 377 pp. £6·50.

W. H. Preece (1834–1913) was best known as Electrician and later Engineer-in-Chief to the British Post Office, and was well-known as a consulting engineer for electric lighting and electricity generating projects. In his time he was extremely influential, being generally highly regarded and well liked. He was an able administrator and very industrious, managing to give the Post Office good service while at the same time having numerous and varied outside professional concerns. The range of this outside work was astounding: telephones, telegraphs, electric lighting and power, sanitation, science generally, ranging from a local society in Wimbledon to advisory, consulting, and design work on a national and imperial level. Preece seems to have been a man of warm, kindly personality and of high standards of social conduct. Mr. Baker's book concentrates on this laudable side of him.

The relatively small size of engineering organizations in his day enabled Preece to deal personally with matters which nowadays a man of his eminence would have to delegate. This meant that Preece was able to attend to scientific ideas, experimental work, design problems, details of technique and practice, etc. Because of this exposure to problems at the working level, and also because of his habit of recording, and usually publishing, his technical thoughts and results, we can now see that he was no more infallible than the rest of us; the records, published and unpublished, are bespattered with his errors. He completely failed to understand the principle of parallel operation of incandescent lamps which he declared in 1879 to be an *ignis fatuus*, although he was converted by the subsequent practical success of the system; he could or would not understand the teaching of Oliver Heaviside in the mid-1880s on the transmission of telephone signals over lines, and obstinately refused to accept that increase in inductance could improve transmission until the work of Pupin and Campbell in 1899–1900 left no room for doubt; his calculations for the first Cross-Channel telephone cable, laid in 1891, were seriously wrong by large factors in several respects, although fortunately some of the errors largely cancelled out and others were detected in time, so that the cable was, in the end, a great success. There were, too, some serious discrepancies between what was said in internal memoranda and what was published.

Contemporary criticism of Preece was confined mainly to the sarcastic remarks of Heaviside and some caustic American commentaries; his strengths were evidently considered greatly to outweigh his weaknesses. But it is this interplay of the different aspects of his character that make him really interesting to me. Mr. Baker hardly discusses it at all.

Perhaps it is only the scholar or the engineer who is likely to be interested in this side of Preece. Mr. Baker has clearly not written his book primarily for them, but rather for the general reader. He states in his Preface: 'Readers of this book will generally not wish to inquire into sources.' Consequently he has largely avoided the controversial matters of Preece's career; and in dealing with the matter of telephone transmission, which he has discussed in Chapter 21, he has dealt generously with Preece and rather harshly with Heaviside, thus taking issue with most engineering historians.

The book is undoubtedly interesting and original. It is presented quite charmingly as a sort of scrap-book of Victoriana, with little formal structure apart from a generally chronological base. There is not much technical discussion, and some of the material is perhaps of questionable importance. Yet I enjoyed reading it. Mr. Baker has a nice turn of phrase, and quotes extensively from the wide range of relevant private and public papers of which he has an unrivalled knowledge. It is an excellent book for the non-specialist reader at whom it is aimed, and will introduce much new material even to the specialist.

References to sources are not given in the published book, but have been added to readily-accessible reference copies in Britain and the USA.

D. G. TUCKER

Automatic Testing: Systems and Applications

ROY KNOWLES. McGraw-Hill, Maidenhead, Berkshire 1976. 23 × 16·5 cm. 246 pp. £6·30*.

CONTENTS: Philosophy. Systems. Hardware. Interfaces. Software. Liveware. Management.

The author has set out to provide one of the first books on the modern concepts in automatic testing. It is not an easy task to do this on a difficult subject within the confines required for publication. He is however well qualified to treat the subject in depth.

The book aims to provide engineers and managers, who are not familiar with the potential of automatic testing, with an introductory understanding of the subject. Automatic testing has been approached from a systems point of view in a logical manner which makes easy reading. Of necessity, the author has had to leave out much detail of automatic testers. However, good coverage has been given to the fundamental concepts of automatic testing which must be understood for the successful introduction of automatic testing into any application.

It is interesting to note that many of the basic principles which are discussed apply to the whole discipline of testing regardless of whether implementation is by automatic or manual methods. For this reason alone, this treatment of the subject is valuable since it is always useful to have a clear and concise presentation of the basic principles which are not always apparent when first contacting a subject as complex as automatic testing.

The book closes with interesting case histories of successful applications of automatic testing.

In summary, Roy Knowles has certainly achieved his intention of introducing the subject of automatic testing to engineers and managers who are not concerned with the detail design of hardware and software but who are concerned with making decisions on new applications for automatic testing.

A. HANN

(Brigadier R. Knowles, C.B.E. (Fellow 1962) was appointed Secretary of the Institute of Quality Assurance on retiring from the Army; he has chaired organizing committees for IERE conferences on automatic test equipment).

Introducing Root Locus

P. DRANSFIELD and D. F. HABER. Cambridge University Press, London 1973. 25·5 × 19·5 cm. 132 pp. £2·00.

CONTENTS: Defining root locus. Interpreting root locus. Sketching root loci for negative feedback systems. Using root locus to improve system performance.

This is a programmed instruction text intended for university students of engineering mathematics.

Professor Dransfield is at Monash University, and Professor Haber is at the University of Idaho.

Book Supply Service

As a service to members, the Institution can supply copies of most of the books reviewed in the *Journal* at list price, plus a uniform charge of 35p to cover postage and packing.

Orders for these books, which are denoted by an asterisk (*) after the price, should be sent to the Publications Department at Bedford Square and must be accompanied by the appropriate remittance.

The Newcomen Bulletin, No. 113, April 1979, p.9

The Swan Centenary I.E.E. Colloquium, 'Lamps and Lighting : Past Present and Future', held at the Institution, 1 March 1979.

As with other centenaries related to inventions rather than to births and deaths, the correct date to celebrate the centenary of the invention of the electric filament lamp is indeterminate. It does not even seem quite so clear now that Joseph Wilson Swan preceded Thomas Alva Edison! Nevertheless, 1 March 1979 was a reasonable choice for the I.E.E. celebration, and two or three hundred people attended the lectures and visited the exhibition. It was *about* 100 years ago that the filament lamp became practical. Its development was described by Dr. D. Davies, Chief Scientist at the Department of Industry, who opened the proceedings, as an example of a 'trigger technology'; it triggered off a demand for electricity, which then, once available, led to applications in heating, cooking, transport, industry, etc. By contrast, said Dr. Davies, nuclear power was not a trigger technology, although microelectronics was. It was important to recognise trigger technologies when they arise.

Dr. Brian Bowers (Member) of the Science Museum then gave a lecture, entitled 'Swan and his Contemporaries', and illustrated with several demonstrations, on the development of lighting, and particularly on the part played by Swan in the development of the carbon filament lamp and on the potential conflict with Edison so sensibly resolved by collaboration. The carbon filament lamp continued to be manufactured long after the expiry of the original patents in 1893, but metal filaments began to be used from 1899. Dr. R. Burgin of Osram (GEC) Ltd., in his lecture entitled 'Seventy years of the Tungsten Incandescent Lamp', took the story from the first introduction of tungsten filaments in about 1908 up to recent times. He explained some of the chemistry and physics of tungsten lamps, and showed why coiled filaments in a gas (originally nitrogen, now mainly argon) gave a better performance than the open filament in a vacuum; the coiled-coil filament was better still, but manufacturing difficulties delayed its widespread introduction until 1934. The introduction of a little halogen prevented deposition of tungsten on the glass, but tungsten-halogen lamps were still expensive.

A lively discussion followed these contributions. This was really the end of the historical section. The remainder of the meeting was devoted basically to modern lighting, with six short lectures and more discussion.

The largest part of the accompanying exhibition was mounted by the Science Museum, and illustrated lighting through the ages—but mostly in the electric era. Much credit is due to our member, Dr. Bowers, for the arrangements.

D. G. Tucker.

From Newcomen Bulletin, No.116, April 1980

Historic Industrial Scenes : *Wales* by D. Morgan Rees (late Member of Council), Moorland Publishing Co. Ltd., Ashbourne, Derbys. No date, 98pp, 141 illustrations. £5.50.

This is basically a picture book, but not one of those which panders to mere nostalgia like so many flooding the market at present. This is a serious contribution to industrial history, and the collection and selection of pictures have been made with great care and judgment. The vast majority are views of the various works in their period of activity, and with the brief descriptions in the captions, help those of us who merely know the sites at the present day to understand what the remains represent and how the works functioned. While therefore it is not a book on industrial archaeology, it is likely to be the industrial archaeologist who will obtain most benefit from it.

The pictures are arranged in groups according to subject : Ironmaking; Coalmining; Iron, steel and tinplate; Transport; Ports; Quarries; Metal mines and smelting; Other industries; and People in industry. An adequate index is provided, three pages of introduction, and about 100 words of caption to each picture.

Morgan Rees's strength was his grasp of the historical industrial scene of Wales as a whole. This shows up well in his careful balance of material. All of the new Welsh counties are represented, and almost all of the old ones. It is perhaps inevitable that the works illustrated are the larger ones, for these were probably the only ones photographed or sketched, but this does make the book less representative than one would wish. For every huge and successful lead mine like Van there were dozens of small and often unsuccessful ones. Morgan had a good knowledge of these smaller sites and a great interest in them, so one can only suppose that no suitable pictures were available. A surprising omission is any reference to the mining of iron ore, although this was such a vital factor in the industrial development of Wales.

It is sad that Morgan Rees died a few months ago, but this book is not a bad memorial to him. The production is good, with hard covers. It is deplorable, however, that the publishers do not always date their books. This may make nonsense of such statements as 'they remain as listed buildings' (picture 91) for readers of the future.

D. G. Tucker.

Peakland Lead Mines and Miners by H. M. Parker and L. Willies. Moorland Publishing Co. Ltd., Ashbourne, Derbys. 1979. 64pp, 87 illustrations. £1.95.

This is a really fascinating and useful little book. Confined in its scope to a limited geographical area and a single subject, it yet manages to present 87 quite different pictures which are all interesting. The majority, photographs taken by Mr. Parker and of very high quality, are of the present-day scene, i.e. industrial archaeology, above and below ground. But they all illustrate important aspects of Peakland lead mining, like the long drainage soughs and underground engines, and they cover mines of considerable age as well as the 20th-century success, Millclose Mine. The text, by Mr. Willies, is well co-ordinated with the pictures, occupies about half the space in the book, and is well-written. Those who know Mr. Willies's work, both in detailed documentary research and in field work of the most active kind, will need no reassurance as to the reliability of the information given. It must be said, however, that this book presents little historical information not previously published; but a good example of the clarification effected by the new presentation is the view and sketch of the Alport smelter (picture 74).

D. G. Tucker.

BOOK REVIEWS

The Siemens Company: its Historical Role in the Progress of Electrical Engineering, by Sigfrid von Weiher (Member) and Herbert Goetzeler, 183 pp including numerous plates and diagrams; Siemens AG, Berlin and Munich, 1977. No price quoted.

This book is an English translation of the book originally published in German in 1972 under the title 'Weg und Wirken der Siemens-Werke im Fortschritt der Electrotechnik 1847-1972'. It is indeed a sufficiently literal translation to show signs, here and there, of the German forms of expression of the original; nevertheless the English is very good and easy to read, and the reader is given confidence that the translator has not departed from the authors' meaning. Fortunately, I have a copy of the German book, and have been able to check a few matters of doubt. I do not think much blame can be attached to the translator for implying on the first page of text (p. 9) that Werner Siemens was a pioneer of the Industrial Revolution (he was a century too late for that!); the rather ambiguous wording of the German sentence leads directly to this translation. Again, on p. 18, we read in connection with the England to India telegraph line of 1870 that 'interconnection' was necessary only in Teheran. Now when Dr von Weiher was in England some years ago, he used the word 'repeater' in describing (in discussion with me) what was installed at Teheran. The German is 'ein Umsprechen', and I think 'repeater' is the correct meaning—technically very different from 'interconnection'. On p. 42 Edison is cited as the sole inventor of the incandescent electric lamp, when every Briton knows that Joseph Swan anticipated him. And generally one may say that the book concentrates on German invention and development, giving scant credit to British, or even American, ideas and advances. However, as British and American books habitually ignore most of the German ideas, this merely helps to redress the balance. It is indeed very valuable for us to read this book and learn what an immense contribution Germany made to the development of electrical engineering and its industry.

The book, whose merits greatly outweigh the minor criticisms made above, is a fascinating history of German electrical engineering seen from the point of view of the firm of Siemens. This great firm, started in 1847 as the 'Telegraphen-Bau-Anstalt von Siemens & Halske' by Werner Siemens, then only 31 and an officer in the Prussian army, in association with Johann G. Halske, spread its influence throughout Europe and many other parts of the world, setting up many subsidiaries, such as Siemens Brothers in England. Although the parent firm became a limited company before the end of the 19th century, it has retained its connection with the Siemens family—indeed, has had a member of the family as its head—right up to the present. It has a quarter-of-a-million employees, and is still concerned with nearly every topic in electrical engineering from its traditional communications through railways and power stations to nuclear power and computers. Its history is fascinating, full of enormous projects and great risks, and is very well and clearly told in this book by two people who devote their professional lives to the subject.

The production and appearance of the book is near-perfect and it is a pleasure to handle it.

Gordon Tucker

From Technology and Culture, 21, 1980, pp.254-7

Electricity before Nationalisation: A Study of the Development of the Electricity Supply Industry in Britain to 1948. By Leslie Hannah. London: Macmillan Co., 1979. Pp. xiii+467. £15.

The history of electricity supply in Britain has received little attention hitherto. Works such as R. H. Parson's *The Early Days of the Power Station Industry* (Cambridge, 1939) and R. A. S. Hennessey's *The Electric Revolution* (Newcastle-upon-Tyne, Northumberland, 1972), although excellent in quality, make no pretense of being comprehensive and only sample their subjects, while the only major work on the early period (I. C. R. Byatt's "The British Electrical Industry, 1875–1914") was a 1962 Oxford doctoral thesis which remains unpublished although much used and quoted. Thus Hannah's book was badly needed. It is a massive and scholarly work based on the researches of a sizable research team financed by the Electricity Council. The presentation is excellent, with a leisurely discussion which makes the large content of fact very easily digestible; the price paid for this is a certain amount of repetition. Not only facts, but the people involved in the industry are also discussed at some length—they emerge as real persons—and the result is an eminently readable book. The discussion is supported by no less than sixty-four closely printed pages of notes and references. One possible general criticism might be that there is very little comparison of the British electrical scene with that of other countries.

It can be debated when and where the British public electricity supply industry started, but Hannah takes the conventional view that it was at Godalming in 1881, where Calder and Barrett (not Siemens, as Hannah says—they came there later) installed a water-powered system including public lighting by Swan incandescent lamps. The first steam-powered system was at Holborn Viaduct, London, in January 1882, followed closely by a few others. They were sufficiently successful to lead Parliament to pass the Electricity Act of 1882, designed to prevent commercial monopoly by providing for the compulsory purchase of electricity supply undertakings by local authorities after twenty-one years at written-down values. The conventional view is that the act was a disaster, inhibiting investment in the embryo industry. T. P. Hughes (*Technology and Culture* 3 [1962]: 27–44) examined this question thoroughly and concluded that the 1882 act *had* seriously hampered development. Hannah states his own heresy: that the 1882 act did *not* deter investors, the twenty-one-years clause was no bar whatever to capitalists, and the only difficulty was to persuade potential consumers that electric light was worthwhile and reliable. Be that as it may, the government felt it necessary to pass an amending act in 1888, extending the twenty-one years to forty-two and making the purchase price that of the undertaking as a going concern—and public electricity supply did expand rapidly after that.

The discussion of the introduction of steam turbines rather misses the point; their speed, as such, was surely not their important feature, but rather the consequent increase in horsepower per cubic foot as compared to reciprocating engines, and the ever-increasing capacity achievable with turbines which enabled real economy of scale to be realized.

The complexity of the industry is well brought out—initially the developments were all by companies, but as electricity supply began to appear profitable, municipalities (which had the power to prevent company activities in their area) set up their own electricity undertakings. All franchises gave a local monopoly in a small defined area, and no connections were allowed outside this area. By 1895 the municipal undertakings represented two-thirds of the invested capital. From around 1900, "power companies" were established to exploit the economies of scale by selling electricity in bulk over a large area, but they were additional to, and did not replace, the existing pattern of local company and municipal undertakings. A notably successful development at this time was the Newcastle-upon-Tyne Electric Supply Co. (NES Co), which under the guidance of Charles Merz grew into a highly efficient large-area undertaking, leading the country technically and economically. In spite of this, some 224 new electrical undertakings were started between 1900 and 1913, and the total number eventually grew to about 600. There were all conceivable variations of system: d.c. and a.c., the latter with no fewer than seventeen different frequencies even in 1924; numerous different voltages; two-wire, three-wire, and four-wire distribution; etc. Most of the small generating stations were grossly inefficient. Merz and others worked for rationalization, but it came very slowly.

World War I highlighted the need for more efficient operation. Government control during this period, first under William McLel-

lan, then Arnold Gridley, led to some rationalization, the general principle of bulk generation of a.c. was established, and some linking up of systems was developed. After the war, this impetus was to some extent maintained. An act of 1919 set up the Electricity Commissioners, of whom Sir John Snell became chairman. They had quite wide powers, concerned with tariffs, loans, development, general regulation, and policy. Improved efficiency was obtained by encouraging the building of larger stations and interconnections, with overhead transmission lines (hitherto not much used in Britain).

This rationalization was, however, too limited; Britain was falling even further behind Germany and the United States. The real turning point was the establishment in January 1925 of Lord Weir's committee to investigate the national problem of electrical energy. Its report was political dynamite. In spite of great opposition from all vested interests, the Conservative government, with the support of the Labour party but the opposition of many of its own backbenchers, managed to get a bill approved by December 1926 which set up the Central Electricity Board to establish a National Grid of transmission lines with extensive power to control generation. Sir Andrew Duncan was appointed chairman, and he made the board a very autonomous body, running on commercial lines with freedom from ministerial control. It was highly successful. The grid was constructed during the Great Depression, providing perhaps 120,000 jobs; its primary network was completed in 1933, working at 132 kV, 50 Hz. "The Board became responsible for both the security of supply and the economic generation of almost all the electricity sold by public supply undertakings in Britain" (p. 122).

The twenty-two-year period from the act of 1926 to the total nationalization of electricity supply in Britain, which became effective in 1948, is particularly closely analyzed, from domestic and rural electrification to industrial relations. One is full of admiration for the masterly way in which Dr. Hannah has reduced such a mass of material to a lucid, absorbingly interesting, and informative account, of such quality and authority that it is likely to remain in perpetuity as the definitive work on the central aspects of British electricity in the period concerned. It is perhaps ungracious, but necessary, to point out that his viewpoint is entirely that of the central authorities; he regards the opposition of the local undertakings in terms of their desire to retain their jobs and independence. My own researches into local undertakings show a very different picture: a morass of government and quasi-government bodies, procedures, and red tape that hampered and blocked the efforts of the undertakings to meet the need for expansion. Things look very different from the other side of the fence; and although the end (i.e., rationalization) may justify the means, the means were often very heavy-handed.

For a second edition, Hannah would do well to check his references; in two dozen I checked in detail, I found four errors. The inadvertent

omission of the key in figure 7.1 seriously reduces the value of the map.

D. GORDON TUCKER*

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SOME RECENT BOOKS

TECHNICS AND PURPOSE

ALAN RICHARDSON: VOL. I—SCIENCE AND EXISTENCE. 30 PP.

EDWIN BARKER: VOL. II—SCIENTIFIC AND TECHNOLOGICAL EDUCATION. 37 PP.

H. A. WARREN: VOL. III—TECHNICAL EDUCATION: AN APPRAISAL. 37 PP.

MONICA WINGATE: VOL. IV—PURPOSE IN TEACHER TRAINING. 38 PP.

S.C.M. PRESS. 1957. 2S. 6D. EACH.

These four booklets are the first to be issued in a series sponsored by a working party convened by the Education Department of the British Council of Churches. They are important in showing how Christians are reacting to the challenge of science and of an expanding educational programme; and they are of particular potential importance to engineers, who are so largely responsible for creating the present need for more education. Professor Richardson's booklet, though beautifully written, is, however, rather abstruse; and while it is, no doubt, quite intelligible to the philosopher and theologian and will probably appeal to the pure scientist, it is not, in the reviewer's opinion, likely to prove valuable to most engineers.

The second booklet, by Mr. Barker, is of more direct interest. The author is Assistant General Secretary of the National Council of Y.M.C.A.s, and he finishes with an account of the way in which the Y.M.C.A. is prepared, partly through several suitable colleges of its own, to act as 'third partner' in the education of scientists and technologists, the other two partners being the universities and technical colleges on the one hand, and industry on the other. The main part of the book is rather verbose, but it does emphasize two important ideas. The first is that science and religion are each based on an act of faith, the former being based on a belief in rationality; thereafter both science and religion are subjective. The second is that education in science and technology should at first concentrate on mastery of science and technology, and only afterwards turn to the broader issues of life; it is argued that the students' interest in these will be aroused naturally. This is not a widely held view.

Mr. Warren's booklet gives, in the first half, a summary of the facts and organization of technical education, and although these will be familiar to many professional engineers the conciseness of the presentation makes the booklet valuable to those who want a quick general survey. The second half considers the social and cultural effects and problems of technical education. It discusses critically the themes that 'technics has already developed in a way which makes its meaningful integration with human life seem, at the present time, impossible', and that of 'fitness-for-purpose'; the latter leads into a discussion of 'ends and means', in which the Christian gospel appears as the only view of life providing realizable means and ends simultaneously. While the reviewer believes this himself, he does not find the author convincing. However, the author does himself admit that he is posing questions rather than answering them.

Monica Wingate's booklet is extraordinarily lucid and free from the abstruseness which spoils, to a greater or lesser extent, the first three in the series. Although few engineers are concerned with the training of teachers, yet almost all should find the booklet worth reading for its clear exposition of the purpose, not only of teacher-training, but of all education and, indeed, of life itself in a basically Christian, educated community.

[by D. G. Tucker.
J. Inst. Elect. Engrs.,
4, 1958, p. 273

Telecom Revival

By Professor D. G. Tucker

Telecommunications. By J. BROWN and E. V. D. GLAZIER. Volume 1. *Chapman and Hall.* (45*s*)

The new book, *Telecommunications I*, by J. Brown and E. V. D. Glazier, is stated to be the first of a new series on telecommunications under the general editorship of Professor H. M. Barlow. I am very impressed by this first volume, and feel that the authors of subsequent volumes will find it very hard to maintain the standard set by it. There can be little doubt that the combination of authors in this first book, one a university professor and the other a very experienced development engineer, is ideal and may account for the excellent balance of the work.

Telecommunications engineering as an academic subject has been rather in the doldrums in the last decade or two. There are still electrical and electronic engineering departments in the universities in this country which do not include it in any degree courses, and the syllabuses of professional institutions which include the subject have tended to be very conservative. There has been no good up-to-date general undergraduate textbook available either. Seen through the eyes of the younger generation, communications engineering has undoubtedly lacked the glamour of subjects such as electronics and automatic control in spite of achievements of such magnitude as the transatlantic telephone cable.

There are now, however, some very welcome indications that the position of communications engineering is improving. Satellite communications and parametric amplifiers have added glamour and novelty to the subject. The production of this textbook will help this resurgence of interest very greatly. It has a most refreshing approach to the subject, setting out to deal with the fundamental principles of telecommunications in general in as broad and comprehensive a manner as possible.

The introduction during the last two decades of information theory and a basic theory of communication systems, based on the concept of a quantitative measure of information and of the statistical analysis necessitated by the role of random noise, has now begun to have a very marked influence on the development of communication systems. At first it was said that the new theory only confirmed what every communications engineer knew already from experience. But modern communication systems, such as high-speed data-transmission and some radar and sonar systems, depend on information theory for their design and are sometimes even conceived in terms of it. It is thus very pleasing to find that the simpler ideas of this theory and of the effects of noise are given proper prominence in the book. It is also pleasing to find that the topic of position fixing, including radar, is regarded by the authors as part of telecommunications.

The book is written with the needs of undergraduate students particularly in mind, and it meets these needs admirably. It is academic in the best sense of the word, being reasonably rigorous; but it is also practical in the sense of being realistic and giving a proper perspective of the whole field. Being very well written and with generally quite full explanations and discussions, it will also be read with pleasure and interest by many practising engineers. The mathematical level is that of a first or second-year undergraduate except possibly in the long appendix on Fourier Integrals and Transforms. There is an almost complete concentration on systems as opposed to circuits.

It is perhaps inevitable that even in a good book a reviewer can find faults and peculiarities. In a book of such broad coverage one would have expected to find a full bibliography of more specialized books and of other works which must be referred to for explanations of matters merely quoted in the book. But the lists of references appended to each chapter are sketchy in the extreme. The hybrid coil naturally has to

be introduced (in Chapter 8), but no explanation or analysis of its operation is given, perhaps strictly in accordance with the principle of "systems not circuits"; one would, however, have expected some reference to where an analysis can be found, but there is none. In discussing ideal systems in Chapter 4 in an otherwise very clear way, the statement is suddenly thrown in that "filters of infinitely sharp cut-off and linear phase characteristic have an infinite group delay (infinite lag filters)". This is not only not obvious, and should therefore either be explained or have a reference to a suitable book or paper, but is, I believe, quite incorrect. Such filters surely have a finite group delay of $d\theta/d\omega$, but are unrealizable because in general they require some part of the output (albeit small) to appear before the input is applied.

In discussing frequency-division-multiplex (FDM) systems the authors say "the receiving filters are essential to separate the wanted channels from all others." This I believe to be at least misleading, as in an ideal system it is only the one channel which lies in the suppressed-sideband frequency range adjacent to the wanted channel which can give an audio output from the demodulator, and therefore it is only this one channel which needs to be rejected.

The question of whether cosine (or sine) notation should be retained throughout when dealing with simple-harmonic excitation, or whether the use of exponentials has advantages is always a vexed one. It is discussed very sensibly in the appendix, but one dangerous statement has crept in: "The problem is then solved for the complex waveform $\exp(j\omega t)$ and the required answer is the real part of the complex solution obtained." This is, of course, valid only for linear systems, and as the book is not restricted to linear systems, it is extremely unwise to give the student such a statement without qualification.

I have noticed no misprints. The production is good.

Reader Card: enter Q 512