interpreted to reveal certain patterns of borrowing which have proved to be compatible with the results of previous similar surveys carried out at Birmingham and Leeds. The extent of "off-subject" or non-curricular borrowing is of particular interest; however, the provision of departmental libraries for some subjects, physically separate from the main library, is shown to have an inhibiting effect on undergraduate borrowing outside their own departments.

"A critical review of the surveys of scientists' use of libraries" by Mrs A. Stephanie Barber shows the same careful examination of her subject which occurs in all the studies in this volume. She states "... it is a pity that the data amassed ... do not correlate well and therefore form no sound basis to a theory for increasing the scientist's effective use of published information". Recently a committee of the Library Association has been investigating scientific library services in this country. It has studied existing surveys and where no reports have been available has had to investigate requirements itself. It will be of particular interest in view of Mrs Barber's conclusions to see what assessment of existing and required services the committee will produce.

The last study is an evaluation of *Referativnyi zhurnal: nauchnaya i tekhnicheskaya informatsiya*, the Russian abstracting journal, by Mr H. Schur, a lecturer at the postgraduate school. There is an obvious need to examine this publication, and its coverage in various fields, in much greater detail than has been possible in this interesting but short report.

The value of this book lies in the quality of the individual contributions, and it deserves a place on library shelves for this reason alone. I hope we may see further collections of studies from the Sheffield School, but that they will have a closer relationship with each other to provide a treatment in depth of aspects of library and documentation services.

DEREK JONES

* Clements, D. W. G., *J. Documentation*, **23**, 131 (1967).

OBITUARIES

Professor Frank Ernest Hoare

THE death of F. E. Hoare on May 25, 1967, after a short period in hospital, came as a great shock to all who knew him. The basic illness which had gradually developed had been completely unsuspected, and there had been no premonition in any decrease in his energy and cheerful enthusiasm.

He was born on June 22, 1907, at Brighton, where he attended the Municipal Secondary School. He gained scholarships to Imperial College, London, and studied under H. L. Callendar, who roused in him what was to prove a lifelong interest in heat and thermodynamics.

He joined the department of physics at University College, Exeter, in 1928, and remained there, first as assistant lecturer, and then as lecturer, until he was seconded to the Admiralty Scientific Service in 1940. His relations with Professor F. H. Newman were happy, and he enjoyed all aspects of university life and work. As in so many physics departments at that time, however, the teaching duties were onerous, and the general facilities and the financial backing for research were extremely meagre. It was then that Hoare developed his skill in designing and constructing apparatus, and acquired the do it yourself philosophy which coloured so much of his later work.

Hoare's early research at Exeter was mainly concerned with the determination of the Stefan-Boltzmann constant, using the Callendar radio-balance. With the improved techniques which he developed he finally obtained what was long accepted as the "best" of the directly deter-

mined values. In 1931 Hoare published *A Textbook of Thermodynamics* which, clear and unpretentious, and with a fuller than usual treatment of applications, was widely appreciated. His subsequent work was in the accurate measurement of the susceptibilities of diamagnetic salts. The analysis of the results, partly in collaboration with G. W. Brindley, at Leeds, led to comprehensive and reliable sets of values for the susceptibilities of ions with inert gas configurations in diverse surroundings. These have been widely used in testing theoretical calculations of space charge distributions in atoms and ions, and in correcting for diamagnetism in determining the magnetic moments of ions in paramagnetic salts.

In the course of his war service with the Admiralty, Hoare planned and conducted two research expeditions to Iceland, and later became deputy leader of more than a hundred naval and civilian personnel concerned with the testing and trials of newly developed weapons. His scientific and practical approach was invaluable.

In 1946, Hoare joined the department of physics at Leeds, where he was to become reader (1954) and later professor (1964). Much of the theoretical work at Leeds in the past thirty years was concerned with the interpretation of magnetic and related properties of metals and alloys on a collective electron basis. This led to an early appreciation of the need for much more extensive measurements in the low temperature range. Hoare was anxious to embark on experimental work in this field. This was the beginning of the building up at Leeds of the low temperature laboratories which were to provide basic facilities for a very wide range of research in solid state physics. The undertaking was a formidable one, for very little assistance by grants was obtainable for work in this field. A hydrogen liquefier was designed and built in the department, and later a helium liquefier-cryostat. It then became possible, through the efforts of a small group of which Hoare was a member, to buy liquid helium from a central source of supply; but it was not until 1963 that a modern hydrogen-helium liquefier could be installed in the department through grants which had at last been obtained.

Hoare took a helpful interest in all the low temperature work, but his more personal research, with a succession of colleagues and research students, was mainly on the determination of the low temperature specific heats of metals and alloys. The lattice and electronic contributions can be sorted out, and by measurements on, for example, palladium and its alloys with the neighbouring elements rhodium and silver, with one less and one more electron per atom, important information connected with the electronic energy band forms can be obtained. The determination of the specific heats over a range of temperature of a series of binary alloys was, however, a very lengthy and laborious undertaking. In this connexion an important technical advance was recently made by Hoare and his associates. A method was developed for semi-automatic recording on punched tapes which can be fed into a computer; this in turn, suitably programmed, provides a print-out of the magnitude and standard errors of the various contributions to the specific heat. By this means, most of the routine drudgery has been eliminated, and the overall time requirements have been greatly reduced. A vast wealth of information has now been obtained particularly on elements of the nickel, palladium and platinum triads and their alloys. The results, while consistent with the general present theoretical outlook, provide many challenging problems to be faced in the future development of the theory of the metallic state.

Hoare's extensive contributions in research at Leeds were not made at the expense of other university activities. He played a full part in lecture and laboratory teaching, gave valuable service on many university committees and was actively interested in general educational matters outside as well as inside the university.

E. C. STONER