

THE SOCIETY FOR ANALYTICAL CHEMISTRY

PHYSICAL METHODS GROUP

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April 16th, 1956.

The 54th Ordinary Meeting of the Physical Methods Group will be held jointly with the Photoelectric Spectrometry Group on **Friday, May 25th, 1956**, in the Physical Chemistry Laboratory, South Parks Road, Oxford, *by* kind permission of Professor Sir Cyril Hinshelwood, F.R.S.

The subject of the meeting will be:

NUCLEAR AND PARAMAGNETIC RESONANCE

The programme is as follows:—

- 2.30 p.m. **"Analytical Applications of Nuclear Resonance Spectroscopy,"** by R. E. RICHARDS, M.A., D.Phil. (Lincoln College, Oxford).
- 3.45 p.m. Laboratory visit and tea.
- 5.15 p.m. **"Techniques of Magnetic Resonance Spectroscopy,"** by E. E. SCHNEIDER, Dr.Phil.Nat. (King's College, University of Durham).
- 6.00 p.m. **"The Detection of Photochemically-formed Radicals by Magnetic Resonance,"** by D. J. E. INGRAM, M.A., D.Phil. (University of Southampton).
- 6.30 p.m. (approx.) Discussion to *be* opened by Drs. WHIFFEN, FERRETT AND PARKER.

Tea will be served in Halifax House at 2s. 6d. a head; since the number has to be limited, those requiring tea should fill in the attached slip and return it at the earliest possible moment.

L. BREALEY,

Honorary Secretary.

To: L. BREALEY, B.Sc., Hon. Secretary, Physical Methods Group, Boots Pure Drug Co. Ltd.,
Standards Department, Station Street, Nottingham.

I shall require tea at Oxford on Friday, May 25th.

Name.....

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Address

SUMMARIES OF PAPERS

*"Analytical Applications of Nuclear Resonance Spectroscopy." By R. Richards, M.A.,
D.Phil.*

A short description will be given of what happens when a nuclear resonance spectrum is excited. Some of the factors which determine absorption line shape, width and intensity will be discussed with particular reference to the analytical applications of the method. The nature of the "chemical shift" and "multiplet interactions" which are observable under conditions of high resolution will be described.

The scope and limitations of the method for various types of analysis, as they appear at present, will be discussed and illustrated with representative examples.

"Techniques of Magnetic Resonance Spectroscopy." By E. E. Schneider, Dr.Phil.Nat.

Electron spin magnetic resonance (usually described simply as "paramagnetic resonance") is observed with paramagnetic atoms, ions or molecules and is associated with unpaired electron spins. Nuclear magnetic resonance is observed in diamagnetic materials and is entirely due to the magnetism of the atomic nuclei. These phenomena can be understood most easily by considering the Larmor precession of classical magnetic gyroscopes in a constant magnetic field. A resonant absorption of magnetic energy occurs if a high frequency magnetic field applied normal to the constant field is in resonance with the precession frequency. Because of the different order of magnitude of the magnetic moments of electrons and nuclei, electron spin resonance at a constant magnetic field of some kilogauss occurs at microwave frequencies while nuclear resonance frequencies lie in the radio frequency range. The aspects of magnetic resonance studies which are of interest to the chemist, will be surveyed and the relevant experimental techniques will be described. A number of special experimental problems will be discussed in some detail. These concern observation of

paramagnetic resonance in aqueous solutions, the quantitative determination of the concentration of unpaired electron spins and magnetic nuclei from the intensity of paramagnetic and nuclear resonance absorption respectively, and the accurate measurement and analysis of complex paramagnetic resonance spectra of organic radicals arising from the hyperfine interaction of the unpaired electrons with neighbouring nuclei.

"The Detection of Photochemically-formed Radicals by Magnetic Resonance." By D. J. E. Ingram, M.A., D.Phil.

The technique of electron resonance has been employed for some time now not only to observe the state and presence of normal paramagnetic atoms but also to study organic free radicals. Until recently the work on free radicals had been confined to known stable compounds. Measurements are outlined here which show that the technique can now be extended to cover many different types of radicals formed by breakage of bonds with U.V. irradiation. This method can be applied quite generally to any system in which the resultant radicals can be trapped and observed after their production, or alternatively can be observed during irradiation. In this way OH radicals trapped in frozen water - peroxide solutions have been studied, as well as several different organic radicals formed from ethyl iodide, benzyl chloride and other similar compounds.

Trapped radicals can also be formed by X and γ -ray irradiation and in both this and the U.V. experiments, a marked hyperfine structure is often obtained. The occurrence of such a hyperfine structure is one of the powerful analytical tools of electron resonance as it gives immediate identification of the particular atoms involved, even if they are only present in concentrations of 10^{-9} molar or lower.