

## ROTATION VISCOMETERS AND THEIR APPLICATION TO NON-NEWTONIAN MEASUREMENTS

AT the meeting of the Cambridge Rheology Club held on November 27, Mr. R. McKennell (Ferranti, Ltd.) discussed rotation viscometers and their application to non-Newtonian measurements. He stated that the application of rotation viscometers to non-Newtonian measurements could give rise to serious errors, the magnitude of which depended both on the design of the viscometer shearing members and on the degree and type of non-Newtonian behaviour. The nature of these errors in coaxial cylinder viscometers was briefly discussed together with the correction terms derived for the more common types of non-Newtonian flow. Errors were eliminated in the cone-plate viscometer by subjecting the sample fluid to a uniform shear rate. A description of the Ferranti-Shirley cone-plate viscometer was given, followed by a demonstration of automatic flow-curve plotting to depict the rheological properties of typical non-Newtonian fluids.

During the subsequent discussion Prof. K. Weissenberg emphasized the great advantages of Mr. McKennell's viscometer for practical purposes when one has to deal with a series of known materials, where it suffices to investigate only one type of action in one direction of space, and check it by only one characteristic, the 'viscosity'. However, for purposes of research into materials of unknown properties a more elaborate instrument, the rheogoniometer, was required which provided information about all directions in the three dimensions of space with regard to unidirectional and reciprocating actions, and measured 'elasticity' as well as 'viscosity'. The results so obtained were of fundamental importance for attempts to associate a definite colloidal and molecular structure to the materials.

In his reply, Mr. McKennell illustrated how the presence of viscoelasticity, mentioned by Prof. Weissenberg, manifested itself in rotation viscometers. An apparent decrease in viscosity occurred

which was not due to structural breakdown but to geometric effects associated with the angular displacement between the major axes of stress and strain velocity. In order to obtain the true viscosity, a correction term would be applied which was derived from a measurement of the elastic modulus using either a stress method in a rotation viscometer or a rheogoniometer.

Dr. D. A. Kok (University of Cambridge) asked whether low-viscosity blood serum would be ejected from the cone-plate gap by centrifugal force. The reply was that the capillary forces in the thin fluid layer (0.05 mm. mean thickness) acted to prevent this. For example, water might be examined at cone speeds up to 600 r.p.m. If viscoelasticity were present there was a tension along the streamlines of flow which tended to exert a centripetal effect.

Dr. G. H. J. Neville (British Titan Products) inquired if it was valid to extrapolate calibration data obtained with low-viscosity standard fluids to the high-viscosity range. Mr. McKennell felt that the viscometer constants were valid throughout the entire range, but extrapolation was usually necessary owing to the scarcity of suitable Newtonian fluids of high viscosity.

Dr. P. A. G. Munro (University of Cambridge) thought that it might be useful to fit a glass plate to observe the motion of suspended particles under shear. Mr. McKennell agreed, but felt that, unlike that of the rheogoniometer, the design of the Ferranti-Shirley viscometer did not permit this.

The next meeting of the Cambridge Rheology Club will be held on February 5 at 7.45 p.m., when Mr. W. J. Thompson (University of Cambridge) will speak on "The Rheology of Clay Soils".

Further information can be obtained from Mr. H. G. Muller, Spillers, Ltd., Technological Research Station, Station Road, Cambridge.

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## AUDIOGENIC SEIZURES

THE increased interest in, and use which is being made of, sound-induced seizures in several species of experimental animals was made manifest at the international colloquium on "The Psychophysiology, Neuropharmacology and Biochemistry of the Audiogenic Seizure" which was held under the auspices of the Centre National de la Recherche Scientifique at its laboratories at Giv-sur-Yvette, during November 6-9, 1961. The aim of this colloquium was to bring together scientists who are actively working in this field in order that a comparison of their different approaches to this phenomenon could be made, so that knowledge of the different methods which are being used throughout the world could be assembled, and so that the contributions of these different disciplines to the study of audiogenic seizures could be discussed and correlated.

M. R. A. Chance (University of Birmingham) pointed out that adaptive convulsions had been demonstrated in certain strains of mice when they

fall. He suggested that seizures in animals should not necessarily be regarded as pathological, and introduced the interesting concept that the audiogenic seizure might be regarded as an adaptive escape reaction. He emphasized that convulsive discharges in the brain are associated with the occurrence of both normal and pathological seizures in animals, and that a wide biological frame of reference is necessary before it is possible to assess the significance of what may appear to be an 'abnormal' phenomenon. Other contributors to the colloquium concerned themselves more particularly with the factors which influenced the production and mechanism of the seizures. Throughout the colloquium, however, there were numerous references to Chance's plea that audiogenic seizures should be considered against a wide biological frame of reference.

C. W. M. Wilson (University of Liverpool) pointed out that the audiogenic seizure could be considered from two aspects. When anti-convulsant drugs were