in abstract thinking, but Riemannian geometry provided Einstein with the tool for a similar advance in mathematical physics. This in its turn led to extensive developments in the concepts of parallelism and of affine geometry.

Just a century ago, Clerk Maxwell, in the College where this address was being given, was formulating for the physical electromagnetic concepts of Faraday the mathematical equations which bear their author's name. The development and applications of Fourier's work provided another example of the co-existent roles of queen and servant.

So also Dirac introduces his delta function into Fourier theory for mathematical-physical purposes, Schwartz produces the rigorous generalized theory, Temple simplifies it, and Lighthill produces a text-book which might have satisfied Hardy and might even have been classified by him as 'real' mathematics.

It is not, however, a question of mathematics alone. Mathematics may be entirely an expression of human thought; it may be an objective reality awaiting investigation and discovery; the truth is probably somewhere between. But the mathematical world consists of mathematics and mathematicians, and the total of these is something different from the arithmetical sum of the several parts. It is not necessary to elevate mathematics to the category of personality; it has not the faculty of responsiveness in the way that human personality has. But (as Henri Poincaré, for example, has shown) it does partake of the activities of the subconscious mind. It calls for and responds to our questionings just as our body will demand and respond to alternations of exercise, work and rest. It is not astonishing therefore to find that principle of simultaneous service and supremacy, which we discern in the development of mathematics, operating in the mathematical world—the world of mathematicians and their mathematics—as a whole.

Moreover, this mathematical world is itself an intrinsic part of nature, and so, as a curve on a curved surface is also a curve in the Euclidean space of higher dimensions in which that surface may be considered as embedded, the laws of the mathematical world are laws of the nature that is intrinsic to all. Progress will be achieved by working with them and not ignoring them. The noteworthy feature of mathematical development, the constant interplay of service and supremacy, should also characterize the policy of the Mathematical Association. The Association should refuse to give up freedom for itself or for others; the mathematical world must not be allowed to become merely a tool or a slave for the world of materialism. But when it has freedom it should not disdain to serve; only those who are free can serve, and there is a service that is perfect freedom; and service—the service of one's neighbour as one's self—brings the intrinsic right to existence, to individuality, to personality, to continual freedom, and to the only kind of sovereignty worth having.

Subjects of other papers read at the conference included "Matrices for the Million", by Dr. G. Matthews, of St. Dunstan's College, Catford, and "Radar", by Dr. E. Eastwood of Marconi's. A talk, with demonstrations, on mathematical films by Mr. W. M. Brookes of the University of Southampton was widely acclaimed.

At the business meeting Prof. V. C. A. Ferraro was elected president for 1962–63. Mr. F. W. Kellaway was re-elected as honorary secretary for the thirteenth year and will serve as general secretary of the Association. Miss R. K. Tobias was elected an honorary secretary in place of Miss W. A. Cooke, tribute to whose services was paid. Miss Cooke was elected a vice-president. Prof. R. L. Goodstein of the University of Leicester will continue as librarian and editor and Mr. W. M. Brown was re-elected as honorary treasurer. A number of posts of honorary assistant secretaries was also established. Mr. B. J. F. Dorrington, Mr. R. E. Green and Dr. E. Kerr were elected; Mr. Dorrington will also serve as secretary to the Examination Board.

VISCO-ELASTICITY AND THE WEISSENBERG RHEOGONIOMETER

THE meeting of the Cambridge Rheology Club held on May 7 was opened by Mr. R. G. King (Farol Research Engineers), who spoke on "Visco-elasticity and the Weissenberg Rheogoniometer". He described the instrument as a rotating cone and plate viscometer which, while measuring viscous behaviour additionally recorded any normal forces which might be produced by a visco-elastic material. Thus it was an instrument specifically designed for testing visco-elastic materials. The upper cone was free to move about its axis against a torsion bar measuring tangential stress. The lower platen was driven and the normal force on it measured. From values of tangential stress and normal force the coefficient of viscosity and elastic modulus could be calculated. Variations in shear-rate might affect both separately and to a different extent. An alternative method of measurement was by oscillation about the vertical axis. If the material was completely elastic, the input strain and resultant stress would be in phase, if purely viscous, the phase difference would be 90°. Visco-elastic materials would exhibit intermediate phase differences.

Mr. King described the *R*14 rheogoniometer with particular reference to latest developments. The instrument was fitted with two synchronous motors (one for oscillation, one for rotation experiments) each driving one 60-speed gearbox. A shear-rate of from 10^{-4} to 4×10^{3} sec.$^{-1}$ could be obtained. In oscillation experiments a range of frequency from 25 cycles/sec. to $25 \times 10^{-5.9}$ cycles/sec. was available. Tangential stress measurements could be taken from 1×10^{2} to $1{\cdot}5 \times 10^{7}$ dynes/cm.^{2}, normal pressure measurements from 2×10^{2} to $2{\cdot}7 \times 10^{6}$ dynes/cm.^{2}. A servo system was fitted to maintain a constant gap between the plates during the experiment. Five displacement transducers in conjunction with Pendeford multimeters were used for calibration and measurement. The test could be conducted in an inert atmosphere and a temperature range of from $-40°$ C. to $+400°$ C. $\pm$ 0·5° C. A small window and a light source in the walls of the chamber allowed observation of the sample during the test.

Mr. H. G. Muller (Spillers, Ltd.) briefly described results obtained with the *R*7 type rheogoniometer on wheat flour dough. A cone of 2·5 cm. diameter with

an angle of 2° had been used at 24° C. and the lower platen modified so that the sample could be surrounded by an annulus of solution to keep it at constant humidity. It had been found that rotation experiments could not be conducted as the dough immediately rolled out of the gap. Using oscillation experiments the effect of relaxation between the plates had been studied. The doughs (56·0 per cent absorption, 2·5 per cent sodium chloride) had been mixed on a farinograph under constant conditions and allowed to relax between the platens from 15 sec. to 120 min. They were tested at 6 cycles/min. and an amplitude of 1° 15′. This was the largest amplitude at which no normal pressure was discernible. Elastic modulus and coefficient of viscosity, both of the order of 10^4 c.g.s., dropped during 120-min. relaxation from $6{\cdot}5 \times 10^4$ to $1{\cdot}5 \times 10^4$ c.g.s., the largest reduction occurring during the first 45 min. When the frequency was altered from 4 to 15 cycles/min. at a relaxation time of 60 min., the modulus remained unchanged while the coefficient of viscosity decreased from $3{\cdot}5 \times 10^4$ to $1{\cdot}5 \times 10^4$ c.g.s. At 15 cycles/min. vibrations were observed in the instrument. It was proposed that exchangeable cone and plate assemblies should be designed for substances requiring longer relaxation times.

In reply, Mr. King pointed out that certain plastics showed cavitation during tests, but as yet no other material had rolled up making rotation experiments impossible. Exchangeable assemblies had been considered, but technical difficulties had so far prevented a solution. He also suggested that perhaps dough should be regarded as a readily deformable solid, and testing programmes be formulated accordingly, as this material does not exhibit viscous behaviour during rotational tests with a cone and plate.

On the day following the meeting, samples of human blood plasma, provided by Drs. D'A. Kok and J. Mehrishi (University of Cambridge), and bovine synovial fluid, submitted by Dr. J. Harris (Orthopædic Hospital, Stanmore), were tested. With the former no readings could be obtained. Using a 1° cone of 7·5 cm. diameter at 30° C. and a shear-rate of 360 $sec.^{-1}$ with the latter, no normal force was observed. The viscosity was 0·0104 poises. At 9·04, 57 and 180 $sec.^{-1}$ and a 2° cone no stress readings could be obtained. The fluid broke down rapidly during the test. A drop of it spilt during the experiment immediately corroded the cast-iron base of the instrument.

The next meeting of the club will be held on October 29 at the Technological Research Station, Spillers, Ltd., Station Road, Cambridge, when Mr. J. F. Hutton (Shell Research, Ltd.) will speak on "The Rheology of Motor Oils". H. G. Muller

STANDARDS IN SCIENTIFIC PUBLICATION

THE Scientific Publications Council met at University College, London, on May 31, to discuss "What is a High Standard of Scientific Publication and how is it Attained?". Prof. G. W. Harris (Maudsley Hospital, London) took the chair.

Prof. W. V. Thorpe (Department of Physiology, Birmingham) introduced the subject. As editor-in-chief of the *Biochemical Journal*, he confined his remarks to periodicals publishing original scientific work, as opposed to reviews or monographs. High standards in such journals imply publishing clear and accurate accounts of original contributions to research on which others can build. How is this achieved?

First, Prof. Thorpe suggested the editorial board must refrain from selecting topical and interesting papers in preference to unexciting routine work, for what is dull to a man working in one field, may be of vital importance to those working in others. The editors must guard against rejecting poorly written papers for that reason alone, since it is their duty to help inexperienced or foreign authors to describe their work in an acceptable style. Since science is an international endeavour, colloquialisms, jargon and abbreviations should be avoided and care taken that unfamiliar terms are explained so that the meaning may be clear to foreign readers unversed in the language of publication. For the same reason it is good practice to adopt, so far as possible, internationally agreed usage with regard to nomenclature and units, and a standard form should be used for references. The International Union of Biochemistry recently set up a Commission of Editors of Biochemical Journals to encourage international agreement on such matters.

Verbose and repetitive styles must be amended, since clarity and conciseness not only make the text more easily intelligible but also save readers' time and, incidentally, reduce the cost of publication. Experiments should be so described that they can be repeated without further research or correspondence with the authors. An author can assist in reducing the delay between submission and publication by preparing his contribution carefully so as to reduce editorial processing to a minimum and to eliminate any necessity for revising the manuscript.

Editors should be vigilant to the point of suspicion and should check all statements which are readily susceptible to testing, for example, that totals are correctly added and that theoretical values for elementary analyses are correctly calculated.

Ultimately the Editorial Board is the custodian of a journal's standards. That of the *Biochemical Journal* does not itself prepare papers for the press—this is done by the editorial office staff—but exercises a judicial and very critical selection, communicates suggestions to authors on how to improve their manuscripts and, where necessary, explains why one has been rejected. Only 15 or 20 per cent of papers submitted have to be refused. Members of the Board are all active scientific workers and selected so as to provide collectively a balanced and critical judgment in many fields. Before a paper is accepted, it is normally submitted to the scrutiny of at least two members of the Board, one of whom is a specialist in the subject of the paper, while the other provides the point of view of the general scientific reader. If necessary an independent referee is consulted. High editorial morale is achieved by frequent discussion and self-criticism, including periodical scrutiny of the statistics of time-lag in publication so that causes of delay may be identified and so far as possible removed.