defects and anomalies explicable. Indeed, it is also possible to elucidate in detail the results of quantitative studies of those defects and anomalies. The subject has been fully discussed in an earlier memoir by the author (Reference 1). It will therefore suffice here to indicate broadly the approach developed in that publication.

As has already been explained, ferroheme is the visual pigment functioning in the green and ferriheme in the red ; in the region of overlap of the absorption spectra of the two pigments, homogeneous light exhibits the various intermediate colours. The precise sequence of the luminosity and colour observed would evidently depend on the proportions of ferroheme and ferriheme functioning in the retina. The proportion in which iron is present in the ferrous and ferric states would presumably be determined by some regulating biochemical mechanism. Any malfunctioning of that mechanism would result in an alteration of the proportion in one direction or the other. This is the clue to the explanation of the observed deviations from the normal in the perception of light and colour.

If ferriheme be totally absent in the retinal pigment, the observer would fail to perceive the red end of the spectrum and the latter would therefore appear distinctly shortened. This is the state referred to as protanopic vision in the literature of the subject. If, on the other hand, the ferriheme is present in excess of the normal proportion, the region in which the two pigments function jointly would extend further towards the green. In consequence, the regular sequence of colour normally seen between the green and the red would tend to disappear. Ultimately, green and red would merge and be indistinguishable. This is the condition known as deuteronopia. Both in protanopia and in deuteronopia, the rapid change of hue appearing at 490 mμ would be observable. In both cases also, the colour progression from the green to the red would be unobservable, but for wholly different reasons.

Protoanomalous and deuteranomalous vision may be considered as intermediate states between the normal condition and the conditions of protanopia and deuteronopia respectively. The luminosity and hue discrimination curves determined by observation for these anomalous types of vision are in satisfactory accord with the results to be expected on that basis.

1. "The Perception of Light and Colour and the Physiology of Vision," Memoir No. 125 of the Raman Research Institute, *Proc., Ind. Acad. Sci.*, 1960, **52**, 255.

SECOND-ORDER EFFECTS IN ELASTICITY, PLASTICITY AND FLUID DYNAMICS*

THE importance of non-linear continuum mechanics in bridging the gulf between microscopic and macroscopic theories of matter is now well recognized. The large amount of work produced in different fields had to be examined scientifically and placed on sound foundations. This was attempted at the International symposium in Haifa. It was found that fluids like Reiner-Rivlin which obey the constitutive equation

$$r = A_0 + A_1 d + A_2 d^2 \qquad (A)$$

do not exist, r being the stress-tensors, d is the rate of strain velocity tensor and A's functions of the invariants of d. In like manner the need for generalized strain measures. suggested by Seth and Reiner, was felt. Concepts like that of simple fluids and transition phenomenon were also put forward.

Three types of non-linearity—parametrical, deformational and tensorial—were discussed in all the 41 papers presented at the symposium. Elasticity claimed 14 papers, plasticity 8 papers and fluid dynamics 19 papers.

Professor Reiner of Technion, Haifa, was the Chairman of the symposium. After his opening address, Truesdell gave a general lecture on the growth and development of constitutive equations, which for the most part have remained of theoretical interest on account of their complicated nature.

Seth, Reiner and Karni gave generalized measures of deformation. Seth showed that the non-linear measure

$$s = (1 - ne)^{-1/n} \qquad (B)$$

includes all the known measures. Its use does away with the need of using increased number of coefficients of the medium and indicates the directions in which results may be extended to conform to experimental data.

Odqvist gave a critical review of existing theories of creep rupture.

The meeting ended with three survey lectures. Seth gave the one on elasticity, Drucker on plasticity and Oldroyd on fluid dynamics.

B. R. SETH.

*International symposium held under the auspices of the International Union of Theoretical and Applied Mechanics at Haifa, Israel, April 21–29, 1962.