"Manuring for Higher Crop Production," Dr. E. J. Russell.

A BOOK which should be of interest and value is announced by the Chiswick Press, viz. "The Ancient Earthworks of the New Forest," described and delineated in plans founded on the 25-in.-to-one-mile Ordnance Survey, with a coloured map showing the physical features of the ancient sites of the New Forest founded on the 1-in.-to-one-mile Ordnance Survey, by H. Sumner.

MESSRS. LONGMANS AND CO. announce a new edition of Sir W. Crookes's "The Wheat Problem," containing an additional chapter on "Future Wheat Supplies," by Sir R. H. Rew, and an introduction by Lord Rhondda.

OUR ASTRONOMICAL COLUMN.

EPHEMERIS OF ENCKE'S COMET.—The following ephemeris of Encke's comet, which is due at perihelion on March 25, 1918, is given by M. Viljev :—

1917	R.A. h. m. s.	Decl. °	Log r	Log Δ
Oct. 11	23 41 24	+10 17·5		0·1732
15	34 27	9 37·9		
19	27 45	8 57·2	0·3757	0·1674
23	21 24	8 16·4		
27	15 29	7 36·1		0·1670
31	10 2	6 57·0		
Nov. 4	5 12	6 19·7	0·3473	0·1709
8	23 0 53	5 44·7		
12	22 57 12	5 12·6		0·1780
16	54 13	4 43·6		
20	51 53	4 18·0	0·3145	0·1869
24	50 9	3 56·0		
28	49 0	3 37·6		0·1964
Dec. 2	48 27	3 22·9		
6	48 29	3 11·7	0·2762	0·2054
10	49 3	3 4·2		
14	50 8	3 0·3		0·2130
18	51 45	2 59·9		
22	53 50	3 2·9	0·2307	0·2188
26	56 22	3 9·2		
30	22 59 19	+3 18·6		0·2218

THE NEW STAR IN N.G.C. 6946.—A further account of the new star discovered by Ritchey in the spiral nebula N.G.C. 6946 (H. iv. 76 Cephei) has been given by Dr. Max Wolf (*Astronomische Nachrichten*, No. 4902), including a reproduction of a photograph taken with the Königstuhl reflector on August 21. The region is very rich in faint stars, but the only B.D. star in the neighbourhood is +59° 2662, magnitude 9·5, which is slightly preceding, and about 7′ north of the centre of the nebula. The nova was identified by comparison with earlier photographs of the nebula, and its estimated position, for 1917·0, was R.A. 20h. 33m. 3·1s., declination +59° 50′ 15″. The central star of the nebula follows the nova by about 4·05s., and is 105″ to the north. On August 21 the magnitude of the nova was estimated to be 13·5; on the photograph reproduced it appears to be less bright than the central star, but this is an illusion produced by the nebulosity about the latter, as in photographs taken with short exposures the nova was considerably the brighter. The nebula extends about 6′ to 7′ in the direction east and west, and the spirals exhibit a very complex knotted structure. The nova is situated near the southern end of an arm which runs obliquely from east to south of the central star. It was not possible to photograph the spectrum of the nova on account of the feeble luminosity.

WORK-HARDENED METALS.

ONE of the most interesting of the papers presented at the autumn meeting of the Institute of Metals was that by Prof. Jeffries, of the Case School of Applied Science, Cleveland, U.S.A. Hanriot came to the conclusion in 1912 that metals subjected to very high hydrostatic pressures, of the order of 10,000 kilograms per square centimetre, even though they underwent no change of shape, showed an increase of hardness (Brinell test). Although cubes of silver, copper, and aluminium showed a considerable increase of ball-hardness in these experiments, he decided that in no case were they appreciably deformed, and that the pressure was sufficient for hard-hammering the metals without deformation. Prof. Jeffries reviews this work, and has repeated the experiments. Tests were carried out by Dr. Bridgman with pure aluminium and an alloy containing 88 per cent. of aluminium and 12 per cent. of copper, in the form of cylinders 7/16 in. diameter by ½ in. long, the dimensions of which were accurately measured. The tensile strengths and scleroscope hardness values of the materials were determined with the following results :—

	Tensile stress lb. per sq. in.	Scleroscope hardness
Aluminium	14,890 ...	6·5
Aluminium-copper alloy ...	31,950 ...	24·0

Cylinders of each kind of metal were then exposed to a maximum pressure of 12,400 kg. per sq. cm. at 25° C., the transmitting liquid being petroleum ether mixed with kerosene. The pressure was maintained at the maximum for twenty minutes, and the total period of the test was about 2½ hours. The cylinders were then measured and found to be unaltered in size, and the following results were obtained in the subsequent tests :

	Tensile stress lb. per sq. in.	Scleroscope hardness
Aluminium	14,300 ...	6·5
Aluminium-copper alloy ...	27,300 ...	24·0

In the case of the alloy the threads were stripped at the stress specified, and the specimen was unbroken. Similar experiments at 40° C., using kerosene alone as the transmitting medium, gave a similar result, except for a slight increase of tenacity, and no alteration in structure was observed. These results contradict those of Hanriot, who found a 30 per cent. increase of ball-hardness in the case of aluminium under a hydrostatic pressure lower than the above. Bridgman directs attention to the fact that Hanriot used vaseline to transmit the pressure, and that this freezes hard under pressure, so that at the higher pressures the stress applied was not hydrostatic. This explanation is plausible. Prof. Jeffries concludes from these and other tests that the hardness of metals cannot be increased without permanent deformations unless such an increase in hardness is due to an allotropic change. The latter might, of course, cause either an increase or a decrease in hardness. As all Hanriot's results pointed to an increase of hardness it is probable that there was slight permanent deformation which he did not detect, and that this was the immediate cause of the increase.

In spite of the large number of researches which have been carried out, both on the purely scientific and technical aspects of the annealing of work-hardened metals and alloys, the subject still presents features which require more detailed investigation than they have yet received. The laws of annealing are considerably more complicated than the early investigators suspected. Especially does this apply to the first effects liable to be produced by heating. That in certain cases a hardening of the metal or alloy is produced, as measured by the tensile and ball-hardness