others[4] based on the change of ΔT in the interval 1955·50–1958·25. The corrections which should be applied to ΔT at these epochs, on the assumption that the true value of the ellipticity is 1/298, are −0·36 s. and −0·19 s., respectively, and the corresponding correction to this particular determination of the frequency is −18 c./s.

More generally, if e is the true value of the ellipticity, then the correction to be applied to an observed frequency of cæsium in terms of U.T. + ΔT, where ΔT has been determined from the lunar ephemeris, is + 8·8 $(e^{-1} - 294)$ cos Ω c./s.

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C. A. Murray

Royal Greenwich Observatory.
Herstmonceux Castle,
Hailsham, Sussex.

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GEOPHYSICS

Geophysical Effects of High-Altitude Nuclear Explosions

Recent observations of geophysical effects of high-altitude nuclear explosion[1] have indicated that such blasts give rise to signals similar to solar flares when recorded in the 27 kc./s. range. A re-examination of the 27 kc./s. record of August 12, 1958, obtained in Pittsburgh, Pa., shows a striking similarity to the integrated atmospherics obtained in Japan, but delayed by about 1 hr.

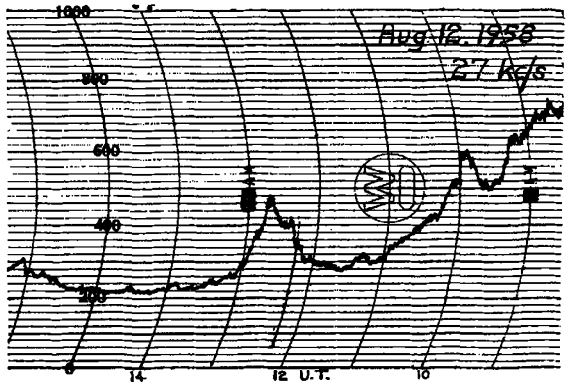

Fig. 1

The accompanying graph (Fig. 1) shows the enhancement between 12 and 13 hr. U.T. The line at 12.15 (8.15 E.D.T.) is a time check mark. Local sunrise was at 10 U.T. and is shown by the characteristic sunrise hump. This sunrise effect is present on all records previous to and following August 12. The local weather report for August 12 indicates clear skies at sunrise, followed by fog later in the morning and thunderstorms in the late afternoon. There was no major solar activity at the time of enhancement.

While these results are not entirely unambiguous, they may add interesting speculation on the detectability of high-altitude nuclear blasts.

W. A. Feibelman

1063 Findley Dr.,
Pittsburg 21, Pa.
July 2.

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PHYSICS

Quadrupole Anti-Shielding Factor in Copper

Recent measurements of the nuclear magnetic resonance absorption line in heavily deformed copper sheet[1] showed that, although the plastic deformation caused some reduction in the intensity of the line, this reduction was only one-third of that predicted by Bloembergen[2] on the basis of nuclear quadrupole interactions; furthermore, there was no apparent broadening of the line.

Assuming a value of $\lambda = 60$ for the quadrupole anti-shielding factor in the copper lattice (see below), Bloembergen showed by an approximate calculation that a dislocation density of 3×10^8 lines/cm.^{2} would be sufficient to render unobservable the satellite components of the resonance line, and thus cause a reduction of 60 per cent in the intensity of the observed line. In the specimens of rolled sheet referred to above, which had undergone 25 per cent–90 per cent reduction in thickness by rolling, the dislocation density was probably[3] of the order of 10^{11} lines/cm.^{2} and the reduction in intensity compared with the annealed material was only 20 per cent; it therefore appears that the estimate of $\lambda = 60$, which is deduced indirectly from measurements on copper-zinc alloys, may be too high.

In the present investigation a series of experiments has been performed with the object of determining λ directly from measurements of the broadening of the resonance line in specimens of copper subjected to elastic strain. The maximum strains available are of the same order of magnitude as those to be expected, on the basis of a simple model, in the main part of the strain field due to a random array of dislocations with a density of 10^{10} lines/cm.^{2}

The specimens were made from the same sample of electrolytic copper that was used in the earlier experiments on plastic deformation; a preliminary experiment on annealed filings showed that the intensity of the resonance line was the same as that from an annealed sample of spectroscopically pure copper. Each specimen was a strip 2·0 × 0·6 × 0·0045 cm. which had been annealed for 2½ minutes at a temperature of 300° after 97 per cent reduction in thickness by rolling. Metallographic examination revealed that the material had fully recrystallized and had a grain size of 5–10 μ. The strip was in the shape of a spiral of 1½ turns with an air space of 0·1 cm. between adjacent surfaces; this was mounted in a special holder in which the spiral could be 'wound up' like a clock spring while remaining in the specimen coil of the spectrometer. It was found that after the centre had been rotated in either sense through an angle of 45° there was less than 5° change in the equilibrium position, from which it was assumed that this deformation was predominantly within the elastic range; it corresponds to a maximum strain of approximately 9×10^{-4}.

The nuclear magnetic resonance absorption line was observed by means of a Colpitts marginal oscillator operating at a frequency of 5·5 Mc./s., with the specimen in the equilibrium position and in the deformed positions. About 50 lines were recorded from 5 specimens. The result was that no difference could be detected, either in width or intensity, between the lines obtained in the two states. The signal-noise ratio was reasonably high (about 5:1 with an inte-