incorrect to interpret this result giving much significance to the surface-charged drop model for nuclear fission, merely because of the similarity of the first two sets of curves in a very limited range. Calculations reveal that the form of the curves obtained does not depend in any way on how the charge density distribution is related to the radius. The only factor on which it does depend is how the total charge of a drop is related to the radius. The boundary conditions here considered are then $Q \propto R$ for the surface-charged drop and $Q \propto R^3$ for the volume-charged drop. For nuclei in the whole range of mass numbers, $Q \propto R^p$, where $2 \leqslant p \leqslant 3$. This conclusion is reached from a plot of $Z$ and $R$ for different nuclei ($Z$ is the charge number and $R$ the radius of the nucleus). In order to demonstrate that the similarity obtained with $Q \propto R$ is not truly significant, we obtained the corresponding set of curves for $Q \propto R^2$ shown in Fig. 1.

Our set of curves also corresponds to Ryce's Fig. 1, in a limited range of values of $y$ between 0·32 and 0·60. Because a number of important variables have been ignored in this consideration, the match with nuclear fission yield cannot be expected to be better.

We believe that a liquid drop model with more simplifying assumptions and less stringent conditions than the Bohr and Wheeler[4] model is not likely to give results of much significance. Energy arising from deformation, activation energy, shell structure of nucleus, and nuclear binding energy should play a vital part in any calculation pertaining to nuclear fission.

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## Anomalous Reflectivity of Shock Waves

Experimental and theoretical data on the reflexion of light from shock waves have given conflicting results. Hornig *et al.*[1-3] have proposed that, because the shock front separates two regions of different density, Fresnel-type reflexions should occur. Further, they have demonstrated that such reflexions can be observed from shock fronts propagating in dry atmospheres in shock tubes. Mallory[4] has observed a reflexion of a ruby laser beam from the vicinity of a shock front produced by an explosive detonation in air. He found the intensity of the reflected light was three or four orders of magnitude greater than that which could be explained on the basis of a Fresnel reflexion. It seemed that a different phenomenon was giving rise to such reflexions.

There are obvious limitations to the amount of information which can be obtained from the type of experiment carried out on explosions in the atmosphere. (1) It is not possible to control the atmospheric environment. (2) Because of limited accuracy, it is not possible to determine the exact location of the reflecting region. Therefore, it is possible that the reflexion could have originated before, at, or behind the front. (3) The resolution of the equipment used in the explosive experiments is not such that any conclusion can be reached as to whether the reflexions came from a plane or from an extended volume. (4) It is not possible to determine the effect of using a laser instead of a broad-band incoherent source.

It appears that the best method of clarifying previous data is to examine shock waves propagating in shock tubes for reflexions other than those of the Fresnel type.

An experimental configuration was used which was similar to that described by Cowan and Hornig[1]. Illumination was by means of a helium–neon gas laser and the shock tube was fitted with a means for controlling the humidity. No reflexions were observed when the shock tube was operated in a normal manner (the sensitivity was insufficient to enable us to observe Fresnel reflexions). In one experiment the driver section of the shock tube was evacuated rather than pressurized. When the diaphragm was punctured, an expansion wave was initially propagated down the shock tube. Scattering was then observed when, and only when, the propagation media contained moisture. Furthermore, as the shock wave and the expansion wave reverberated in the tube owing to reflexions from the closed ends, the moisture alternately condensed and re-evaporated.

These results led us to examine the pressure history of the shock waves under investigation. When the shock tube was operated in its normal mode, the pressure never dropped below its ambient value. However, the pressure dropped to less than the ambient when the shock tube was operated so that scattering was observed. In fact, the periodic appearance of scattering could be directly correlated with the fall of pressure below ambient.

These experiments suggest that the reflexions observed from the explosively generated shock waves may also have been scattering from water droplets which are condensed in the expansion phase which follows the shock front. Hydrodynamic equations were used to calculate the lowest pressure and temperature reached during this expansion phase. This temperature was below the dew point at the time the explosive experiments were made. Furthermore, the intensity of the observed reflexions was consistent with the assumption that the phenomenon was scattering from particles with radii of 0·1–5 μm.

It was recently brought to our attention that the formation of clouds observed in nuclear explosions had been explained by a similar mechanism[5]. The effect has probably not been previously observed with small explosions because the region in which the "cloud" forms is close to the explosion and the droplets are quickly evaporated by absorbing heat from the fireball. Scattering from the droplets is insufficient to make them observable in shadowgraphic photographs of explosions.

Anomalously high reflectivities have also been reported from regions of the atmosphere. It has been suggested that these reflexions come from regions of clear air turbulence. Munick[6] has shown that it is not possible to detect Fresnel reflexions from the interface between regions of different density. However, it seems possible that air turbulence can produce conditions where local regions of the atmosphere expand adiabatically and are cooled to below the dew point. The condensed water droplets (or ice particles) may be responsible for the observed phenomenon.

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