for the higher temperatures, for forward potentials, when the image force can in any case be neglected, and for high reverse potentials which depress the maximum potential $V(b,U)$ to a value of the order of the temperature potential W.

For Mott's barrier[2] and reverse currents, the characteristic

$$-\bar{j} = (\bar{V}_D - \bar{U})^{3/4} \exp [(\bar{V}_D - \bar{U})^{1/2}] \quad (4)$$

is obtained. Currents and potentials are here expressed in the units

$$j_0 = (2/\pi)^{1/2} k W^2 v n \exp (- V_D/W) \text{ and } V_0 = kdW^2/e \quad (5)$$

respectively, and the characteristic is plotted in the accompanying figure. V_D is the maximum potential in the absence of the image force. Comparison has been made with the characteristics of copper oxide rectifiers[7], using $V_D = 0{\cdot}5$ volt. With $j_0 = 0{\cdot}45$ μamp./cm.^{2} and $V_0 = 0{\cdot}67$ volt, a good fit is obtained at 20° C. Using $v = 40$ cm.^{2}/volt-sec. and $k = 10$, these constants yield the reasonable values

$$d = 1{\cdot}54 \times 10^{-5} \text{ cm.} \quad \text{and} \quad n = 10^{15} \text{ cm.}^{-3}$$

for the copper oxide rectifier. Neglecting the variation of mobility with temperature, the constants (5) may now be calculated for other temperatures :

	20° C.	40° C.	60° C.	80° C.
j_0 (μamp./cm.^{2})	0·45	1·89	6·41	19·6
V_0 (volts)	0·67	0·76	0·87	0·97

Using the calculated values for the three last temperatures, the four experimental graphs can be plotted in the form shown in the figure.

The graphs confirm with some accuracy the prediction of the theory that, expressed in the proper units, the reverse characteristics should have the same form (4) at all moderate temperatures.

I am indebted to Dr. E. Billig of this Laboratory for his helpful comments. More detailed applications of the present calculations to Schottky's theory of rectification and to current carrier distributions in rectifying contacts will be published in due course.

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Effect of Rain in Calming the Sea

IN *Nature* of August 20, p. 320, a letter appeared giving details of experiments which indicated that falling drops, which strike the surface of water at their terminal velocity, do not produce vortex rings in the water. I have, however, recently performed experiments, on similar lines, which in no way agree with this result.

In my experiments, drops of an aqueous solution of disulphine blue were allowed to fall into a vessel of water. The vessel had a square cross-section, side 12 in., and was 18 in. deep. The drops fell from various heights, the greatest of which was 39 ft. At this height it was found that at least 50 per cent of the drops, which weighed 0·05 gm. weight, produced vortex rings. When the drops hit the water surface, smaller drops were produced in the splash, which rose to a height of a few inches, and re-entered the water forming small vortex rings. To investigate the effect of these smaller drops more fully, drops were produced varying in diameter from 500 microns to 1½ mm. These drops were allowed to fall through distances of 2 in., 4 in. and 6 in. A number of counts was taken at these heights using drops varying in size between the above limits. In every case the percentage number of drops forming vortex rings exceeded 70. From these results it seems that Reynolds's explanation of the calming of the sea by rain may be the correct one. If we regard the rain as consisting of drops hitting the sea at their terminal velocity and producing smaller drops by splashing, then the total number of drops, large and small, which produce vortex rings will be considerable—in fact, more than 50 per cent of the actual raindrops, and more than 70 per cent of the 'splash-drops'.

In the experiment, the vortex rings of the large drops falling through 39 ft. frequently travelled to the bottom of the tank with a velocity which indicated that they would have gone much farther had the tank been deeper. Although the vortex rings of the smaller drops did not travel so far, they would certainly transfer momentum from the surface to lower regions, thereby having a calming effect on the surface.

Other experiments were carried out, using various combinations of drop-size and height. As the above results have most bearing on the point at issue, a complete statistical report giving all the results seems superfluous.

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A Method for Staining the Cuticular Lattice of *Paramecium*

VON GELEI'S Toluidin Blue technique[1] yields beautifully stained preparations of the cuticular lattice of *Paramecium*, but considerable experience is required before satisfactory results are obtained, and the method takes so long (five hours) that it is of little use for class purposes. Adequate staining of the lattice can be obtained, however, by treating Schaudinn-fixed films of *Paramecium* with Giemsa's stain.

Drops of a thick culture of *Paramecium* are pipetted on to slides covered with a thin film of albumen. When the *Paramecium* film is nearly dry, the slide is placed for fifteen minutes, film face upwards, in a covered dish containing Schaudinn's fixative. The slides are then transferred through 50 and 70 to 90 per cent alcohol, where they can be stored until required. Omission of iodine treatment does not affect the preparations. The slides for staining are transferred to water, drained, and then stained for 15–20 min. with a 2·5 per cent solution of Giemsa's stain in distilled water, washed in tap water, dried in air, and examined without a coverslip under oil immersion.

While the staining of the lattice by this method is not so clear as in preparations made by von Gelei's