frequently resulted in an unusual rise of the 'dark current' value after the discharge had ceased.

It is improbable that the marked action of the cathode rays can be attributable to the production of X-rays in the selenium, because in that case the decrease of resistance and recovery would have been far less and taken place much more slowly.

Experiments made by enclosing the cell in an earth-connected brass tube provided with an aluminium window 3/1000 inch thick looking towards the cathode, but through which the cathode rays could not penetrate, produced a very slight and gradual decrease of resistance; this and the slow increase on cessation of the discharge are typical of the action of X-rays upon selenium. In this case the X-rays were generated at the aluminium window.

Under these conditions, and with a P.D. of 60 volts across the cell, the reading of the microammeter rose slowly 10 microamperes, whereas on replacing the aluminium window by one of metal gauze the deflection suddenly increased to 250 microamperes and fell rapidly, with a slight lag, before returning to the 'dark current' value, when the cathode rays were momentarily allowed to impinge upon the selenium. The alternate spark gap at the induction coil was two inches, and the only luminosity appearing in the tube was that due to fluorescence.

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Deposition and Surface Tension.

THE publication of a lengthy study of related phenomena by L. K. Luce (*Ann. de Phys.*, February 1929, pp. 167-257) prompted this preliminary report of similar results found by the same as well as other methods during the last two years, under the direction of Prof. Gerlach, in Tübingen.

Iodine deposits resulting from directional molecular rays, as in the Dunoyer experiments (*C.R.*, **152**, 592-594; 1911), showed that those of a homogeneous nature are only possible on smooth, clean, perfectly annealed surfaces. On a surface, which was etched, rubbed, or scratched in any particular portion, crystal nuclei started growing immediately. A long series of experiments on glass and silver surfaces of various convex and concave curvatures, showed that deposition and chemical attack are a function of the curvature, cold working; or, in short, a function of the surface tension of the underlying surface. Reboul's early work (*C.R.*, **155**, p. 1227; 1912, and **156**, p. 1376; 1913) on the chemical attack of silver rods of different curvatures, as well as Luce's later work, give functional curves which are not unlike those obtained in Tübingen.

That the factors of adsorption and diffusion play a part in these experiments, as Luce remarks in his work, we find very probable. Adsorption experiments on glass surfaces of known curvature carried out on a long series of glass tubing, and on plane glass of different varieties, show similar functional relations to the results for deposition and reaction. Such thin layers can be weighed with a microbalance. For plane and slightly curved surfaces the sorption layer does not exceed monomolecular thickness, which agrees with the theory of Langmuir (*Zt. f. Elektrochemie*, **26**, p. 197; 1920), but with increasing curvature the adsorbed layer increases. In capillaries 0·8 mm. in diameter and less, the adsorbed layer is of the order of seven molecules in thickness. Where chemical attack plays the primary rôle, diffusion is of greater importance. Experiments on single crystals of silver are being carried on, and it is hoped that they will throw light on the nature of diffusion.

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Invisible Oxide Films on Metals.

IN his letter in NATURE of April 13, page 569, Dr. F. H. Constable adduces interesting evidence bearing upon the formation of invisible oxide films on copper at room temperatures. In fairness to Dr. W. H. J. Vernon, whose researches in this field are not mentioned by Dr. Constable, it should be stated that, working in my laboratories under the auspices of the British Non-Ferrous Metals Research Association, he demonstrated the formation of invisible oxide films on copper, and studied their inhibiting effect on tarnishing.

Dr. Vernon's results were communicated to the Atmospheric Corrosion Research Committee in 1923 though they were not published until three years later (*Journal of the Chemical Society*, p. 2273; 1926). Invisible protective films were obtained by exposure to air at room temperatures, while at higher temperatures (from 50° C. upwards) certain quantitative relationships were established. A critical thickness of film was recognised, *within the invisible range*, below which protection was no longer afforded; it was concluded that this corresponded with the unit lattice of cuprous oxide. Later (*Transactions of the Faraday Society*, **23**, 113; 1927) it was shown by the same worker that under favourable conditions, invisible protective oxide films are also produced at room temperatures upon lead and iron.

It is interesting to note that some of Dr. Vernon's earlier conclusions are confirmed by the spectrophotometric methods employed by Dr. Constable. Moreover, it is satisfactory that there is now general agreement as to the part played by the direct oxidation of metals at ordinary temperatures, about which only a few years ago differences of opinion existed.

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Skull Thickness.

WITH reference to Mr. Wilfred Trotter's paper, published in NATURE of April 6, the following quotations from Herodotus (Isaac Taylor's translation) may be of interest:

"A remarkable Fact was pointed out to me by the People who live on the Spot where this Battle took Place. The bones of the slain being heaped apart—the Persians lying by themselves as they fell in their Ranks, and the Egyptians separately also;—the skulls of the Persians are so weak, that you may, if you please, break them in, by throwing a Pebble; while those of the Egyptians are so strong, that you scarcely produce a Fracture by dashing a stone at them."—"I observed also a similar appearance on the Field at Papremis, where lay those slain by Inarus, the Lybian, under Achaemenes, son of Darius."

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