Optical Investigations of the Passivity of Metals.

THERE have been published in NATURE communications by Evans (**118**, 51 ; 1926 : **121**, 351 ; 1928) and Constable (**120**, 769 ; 1927 : **123**, 569 ; 1929) showing that the passivity of metals is due to a film of oxide. It may therefore be of interest to record that I have been doing experiments similar to those of Freundlich, Patscheke, and Zocher (*Zeitschr. f. phys. Chem.*, **128**, 321; 1927 : **130**, 289 ; 1927), investigating the state of polarisation of light reflected by mirrors of iron or nickel, which were made passive or activated by an electric current in aqueous solutions.

On passivation, the polarisation of the light changed in the same sense as in the experiments of Freundlich, Patscheke, and Zocher, when they brought an iron mirror out of a vacuum into air. If I made the metal passive and active alternately, the optical constants did not return to the same state as before passivation ; there was always a small increase in the thickness of the oxide film itself. This cannot be explained on the assumption that passivation is only a change in the state of the metal or caused by an oxygen film on the surface, for in that event activation would simply be the reverse of passivation. These experiments show that the oxide film is not totally destroyed on activation ; it only seems to get porous and spongy, whereas on passivation the holes in the film are refilled with oxide, the film itself growing thicker.

These experiments were performed in the Kaiser Wilhelm-Institut für physikalische Chemie und Elektrochemie, Berlin-Dahlem. The complete results are to be published in the *Zeitschrift für physikalische Chemie*.

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        Trondhjem, July 5.

The Number of Excited Atoms and the Absorption Spectrum of Nickel Vapour.

THE equation $N^1/N = e^{-E/RT}$, where N^1 is the number of excited atoms, N the total number of atoms, E the energy, R the gas constant, and T the absolute temperature, was applied by Dr. Loyarte and myself in the case of the absorption spectrum of tin vapour, with good agreement with experimental results (*Phys. Zeit.*, **30**, 68 ; 1929). In this case it is only necessary to consider the numerical values of spectral terms, because these are originated by the same electronic configuration.

In the arc spectrum of nickel the lowest terms are originated by two electronic configurations. The normal atom gives $^3F_{432}$ and the other lowest terms, $^3\bar{D}_{321}$ and $^1\bar{D}_2$, are originated by $(3d)^9 (4s)$, but the levels $^3\bar{D}$ are entirely encompassed by those of ^3F. The absorption spectrum of nickel vapour at 2500° absolute shows as strong absorption lines only those originated in ^3F levels, with preference for the fundamental term $^3F_4$; the lines of $^3\bar{D}$ and $^1\bar{D}$ levels are of medium or faint intensities. The explanation of this fact is the following. The values of N^1/N calculated considering only the numerical values of terms are not true, because it is necessary to calculate also the energy consumed in passing from one normal configuration to the other : $(3d)^8(4s)^2 \longrightarrow (3d)^9(4s) = \Delta E$, and the corrected equation is therefore :

$$N^1/N = e^{-(E+\Delta E)/RT}.$$

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        R. Argentina, June 27.

Reflection of Polarised Light.

WHILE experimenting with a pair of silvered glasses, as in the Edser and Butler method of calibrating a spectroscope, I found that if the films are rotated about an axis either parallel or perpendicular to the slit of the spectroscope, a second line appears alongside each line seen and gradually moves to a point midway between each as the angle of incidence of the light is increased. The light forming these two lines is found to be polarised perpendicular and parallel respectively to the axis of rotation, and the relative sharpness appears to vary with the condition of the surfaces.

The explanation appears to be that on reflection at the first silver surface the light is resolved into two polarised components, one perpendicular and the other parallel to the plane of incidence. These two

FIG. 1.

components are reflected at each surface with different phase changes and therefore the wave-length at which bright lines appear is different for each component. This effect does not appear to have been noticed before and therefore is undergoing further investigation. The accompanying photographs (Fig. 1) were taken with plane polarised light, in one case perpendicular and in the other parallel to the axis of rotation of the films.

A. CHRISTOPHER G. BEACH.

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    London, S.W., July 15.

Geological Age of the Rostro-carinates.

IN reference to my friend Prof. Fairfield Osborn's remark in NATURE (Aug. 31, p. 345), I may say that Sir Ray Lankester's final opinion upon the age of the rostro-carinate flint implements, found beneath the Red Crag, was that they, and the Suffolk Bone Bed from which they were derived, are to be regarded, so far as East Anglia is concerned, as falling within the latest Pliocene, while he looked upon the Crag which surmounts the Bone Bed as being referable to the earliest Pleistocene. This, also, is my opinion.

The descriptive term ' rostro-carinate ' was invented by Sir Ray Lankester, and first used by him in *Phil. Trans.*, B, vol. 202, pp. 283-336.

J. REID MOIR.

Occurrence of Sea-urchins on the Foreshore in Britain.

IN July of this year I noticed several specimens of *Echinus esculentus* on the foreshore at Robin Hood's Bay, Yorkshire, well above the low-water level of all tides. In every case they were on flat reefs without any shelter from overhanging ledges. While constantly searching under ledges for other organisms, I never saw an urchin in such a position. Specimens were seen on dark clay shales of the Lower Lias and on the more sandy Middle Lias of Peak Steel.

C. N. BROMEHEAD.

Geological Survey Office,
        14A Parliament Street,
            York, Aug. 12.