P_i Atmos.	T_m° K.	$\log_{10} \frac{Kp \text{ obs.}}{Kp \text{ theor.}}$	L. E. % heat of combustion
Large Explosion Vessel			
½	2590	0·47	5·0
1	2650	0·40	3·5
3	2750	0·32	2·5
Small Explosion Vessel			
½	2510	0·81	7·0
1	2585	0·67	6·0
3	2645	0·73	5·5

remarkable proportionality between $\log_{10} \frac{Kp \text{ obs.}}{Kp \text{ theor.}}$ and the latent energy, indicating the dependence of abnormal dissociation upon latent energy.

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[1] See preceeding letter.
[2] *Phil. Mag.*, (7), **14**, 764 (1932).
[3] *Phil. Mag.*, (7), **22**, 513 (1936).
Proc. Roy. Soc., A, **115**, 318 (1927).

Diffusion in Palladium

THERE has been considerable discussion[1,2,3] as to why the rate of diffusion of hydrogen through metals, instead of reaching a limiting constant value, continues to obey a $\sqrt{p}$-law even when the pressure p is several hundred atmospheres. Recently the view was advanced[3] that although the pressure outside the metal may be high, owing to a slow rate of transport through the boundary

adsorbed layer → metal

as compared with a rapid diffusion within the metal, there is always only a small concentration just inside the metal, which is built up according to the $\sqrt{p}$-law. If, however, it can be built up sufficiently, the concentration just inside the metal will approach the saturation value, and the $\sqrt{p}$-law can then no longer hold. This condition has previously never been realized.

Two circumstances would contribute to the breakdown of the $\sqrt{p}$-law : (*a*) a very high rate of supply of atoms to the metal surface ; (*b*) a high rate of transport across the surface.

To achieve (*a*) caustic soda solutions were electrolysed (at considerable current density) with a palladium tube as cathode. (*b*) requires a freshly oxidized and reduced palladium surface[4]. Of several tubes, only one gave the desired surface activity, which decreased successively between experiments, and gave the following results : (i) in its most active state the palladium showed a permeation rate for hydrogen *independent of current density* ; (ii) in its next most active state the curve between permeation-rate and $\sqrt{I}$ (I is current density) was parabolic (convex to the $\sqrt{I}$ axis) ; (iii) with successive stages of deactivation the curve approached a linear form.

These and other results on diffusion in metals will shortly be discussed more fully. The present results afford very satisfactory evidence of changes in the relative velocities of phase boundary reactions and of diffusion with time, and of the theory of diffusion discussed earlier[3].

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April 23.

[1] Smithells, C., "Gases and Metals" (Chapman and Hall, 1937), p. 105.
[2] Wang, J., *Proc. Camb. Phil. Soc.*, **32**, 652 (1936).
[3] Barrer, R., *Phil. Mag.*, **28**, 353 (1939).
[4] Lombard, Eichner and Albert, *Bull. Soc. Chim.*, **3**, 2203 (1936).

Solar and Terrestrial Relationships of March 23-29, 1940

IT is of interest to compare Father Rowland's account[1] of the great magnetic storms in the last week of March with the record of disturbances in the solar chromosphere during the same period.

The first bright chromospheric eruption of great intensity was observed with the Greenwich spectrohelioscope in $H\alpha$ light on March 23 at 11h. 30m.[2] The area covered by this eruption included the group of sunspots which was at the time three days before central meridian passage. A simultaneous wireless fade-out on wave-lengths below 50 metres was reported by the Cable and Wireless Co., starting at 11h. 8m. and lasting for 1¼ hours. It is significant that this fade-out only occurred in the channels of communication on the sunlit side of the earth. Communications through the opposite hemisphere were normal. The first of the magnetic storms followed approximately 26 hours later, beginning on March 24 at 13h. 45m., and a brilliant aurora was observed from the north of England the same evening.

The second period of activity began on March 27, when a bright eruption covering the same sunspot group was observed here at 17h. 10m. This was the brightest eruption of its kind so far observed with the Sherborne spectrohelioscope, and, like that of March 23, it was accompanied by a wireless fade-out lasting from 16h. 19m. to 18h. 30m. The magnetic storm of March 29, 16h., began just 48 hours later, and an aurora was again observed from British stations on the same evening.

This record of magnetic and solar activity, though possibly not yet complete, tends to confirm the evidence, recently summarized by H. W. Newton[3], suggesting a critical relationship between major chromospheric eruptions and 'great' magnetic storms, with an average time lag of 1½ days between the two phenomena. In neither of the above cases was it possible to observe the beginning of the eruption, so that the synchronism with the sudden beginning of the wireless fade-out could not be verified. In previous coincidences there has been an average interval of a few minutes between the beginning of the eruption and the onset of the fade-out, from which we may possibly conclude that the growing eruption must reach a certain limit of intensity or area, or of both combined, before the increase in ultra-violet radiation is sufficient to affect the ionosphere.

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Sherborne,
Dorset. April 26.

[1] NATURE, **145**, 625 (1940).
[2] *J. Brit. Astro. Assoc.*, 202 (April 1940).
[3] *The Observatory*, **62**, No. 787