

As a matter of fact, we have not at present the materials for a definite conclusion. What is urgently needed is a systematic series of observations in a number of localities differently situated with reference to the more important features of the surface of the earth.

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The Electrodeless Discharge.

IN the electrodeless ring discharge, the type of spectrum produced depends largely upon the voltage drop per mean free path. This is in general only a few volts, under ordinary operating conditions. A comprehensive survey of the entire subject has been given recently by Mierdel (*Phys. Zeit.* 25, pp. 241-55, 1924). As discussed in this article, spark spectra may be excited by increasing the voltage or by reducing the pressure. Both methods have been employed effectively; the former especially by L. and E. Bloch. We have used the latter method with potassium. At high vapour pressure the arc spectrum alone is observed. When the pressure is reduced, the spark lines appear. Observations on the stages in the excitation of known spectra furnish a trustworthy means for estimating the potential gradient in the electrodeless discharge.

The presence of several differently coloured, concentric rings of discharge has been often noted. The voltage gradient is a maximum at the circumference of the bulb and approaches zero at the centre. This effect is beautifully marked with bulbs 25 cm. or more in diameter, especially with the vapour HCl.

We have operated the electrodeless discharge at extremely low pressures. Mercury at 0.002 mm. and iodine cooled to -50° C. are sufficient for a brilliant and uniform luminosity throughout the bulb. In the spectrum of the latter the line at 2063 Å is strongly developed.

On disconnecting one terminal of the ring, a "capacity discharge" fills the entire vacuum system and a uniform glow appears in the bulb. The spectrum of this glow from a molecular vapour is usually almost free from atomic lines.

Because of the low pressures under which the electrodeless discharge may be operated with high intensity, it should rival the low voltage arc for the production of sharp, unreversed lines, and by proper adjustment for low field strength, might be desirable as a source in fine structure analysis. It does not appear, however, to be satisfactory for exciting resonance radiation in mercury.

It was thought that this type of discharge should be especially suitable for the production of the hydrogen Balmer lines. At a pressure of a few thousandths of a millimetre, the probability of two dissociated atoms colliding and recombining is small, so that, once the gas is dissociated, further excitation should give the atomic lines. To our surprise only five or six members of the Balmer series were observed. This is probably due to the fact that collisions of electrons having velocities comparable with the ionisation potential, with hydrogen molecules, usually result in excitation or ionisation without dissociation. Franck has recently given some attention to a theoretical discussion of this phenomenon (cf. "Ergebnisse der Exakten Naturwissenschaften," vol. 2, p. 120, 1923, Julius Springer).

If a liquid air trap is sealed directly to the large bulb, and moist hydrogen is streamed through the system, a rapid "clean up" is observed, so that a considerable amount of hydrogen disappears. On removing the liquid air, a momentary, brilliant red flash occurs. We did not determine whether this is

due to condensed monatomic hydrogen or simply to water vapour.

When a bulb containing mercury vapour at room temperature is first operated, before the glass walls have warmed appreciably, a beautiful mercury mirror ring is deposited on the glass, concentric with the metal conducting ring. This is due to the tangential velocity impressed by the circular field upon the mercury ions formed. Under the conditions of our experiment magnetic forces upon the ions may be neglected. Such a large deposit of mercury occurs that possibly the method could be modified for the separation of isotopes.

The ring discharge with a large bulb is an effective means for producing the activated form of nitrogen observed by E. P. Lewis. There can be little doubt that active nitrogen consists of N_2 molecules in a metastable condition. First, evidence in favour of this view was the observation by Fowler and Strutt that the spectrum of active nitrogen consists of a selection of the positive bands, while L. and E. Bloch as well as Foote, Meggers, and Mohler (Cf. "Origin of Spectra," p. 190) found these bands to be excited well below the ionisation potential of the molecule. Further evidence may be drawn from Strutt's observation that no appreciable current flows between sounding electrodes (unless these are in actual contact with the luminous vapour), indicating that glowing active nitrogen is not ionised. The production of current when the active nitrogen is in contact with the electrodes, appears to be a confirmation of the Holst-Oosterhuis hypothesis (*Phil. Mag.* 46, p. 1117, 1923) that excited molecules upon encountering a metal surface may liberate electrons. This phenomenon might be useful in fixing superior limits for thermionic work functions or for critical potentials.

Saha and Sur (*Phil. Mag.* 48, p. 421, 1924) have discussed the data of Lewis, Strutt, and Fowler on the excitation of the spectra of gases and metal vapours in contact with active nitrogen, and assuming the observed effects to be due to collisions of the "second kind," have estimated the energy of active nitrogen to be slightly less than 8.8 volts (incorrectly computed as 9.4 volts).

We have found that mercury lines requiring 9.5 volts for their excitation are strongly developed. It does not appear that these may be attributed to molecules or atoms having abnormally high translational energy.

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Pyramid and Prophecy.

IN the notice in NATURE of October 25 of the work entitled "The Great Pyramid: its Divine Message," by the late Dr. H. Aldersmith and myself, the reviewer, by a careful selection of remotely secondary features of the book, convinces himself he has proved the work to be of the "assertionist class." He represents that I have obtained the length of the Pyramid base from the positions of the sockets, which is not the case. He also represents that I have obtained the Pyramid base side by adding ten inches to the longest existing socket base side, which is also not the case. Sir Flinders Petrie's survey has shown that the core masonry surfaces are hollowed in up the centre, and that the base casing stones still exist in the centre of each base side. With the casing surfaces hollowed in to the same extent as the core masonry surfaces are hollowed in to receive them, we obtain the Pyramid base circuit of the same dimension as the ancient Egyptian literature shows it to have been, namely,