From a preliminary analysis of results I found that singly charged, positive, atomic argon ions were first produced in detectable numbers when an accelerating potential of about 17 volts (uncorrected) was applied to electrons striking the atoms. I do not consider that the accuracy of the determination is sufficient to distinguish between the varying results of other observers.

Doubly charged, positive atomic ions were not produced at all until an accelerating potential of more than about 45 volts was applied. For the most part these must have been produced by single impacts as the pressures and thermionic currents used were so small as to make successive impacts very improbable. This result is contrary to the assumption that the critical potential of about 34 volts at which the first part of the blue spectrum appears (Horton and Davies, Proc. Roy. Soc. A, 102, p. 131 (1922), and Déjardin, *Ann. de Phys.*, 10th Series, v. ii., p. 241 (1924)) corresponds to the production of doubly charged ions. Therefore this portion of the blue spectrum cannot be the entire first enhanced spectrum of argon. It may be due to excitation of the singly ionised atom, but the detailed application of this hypothesis meets difficulties which are too complicated to discuss here.

I also found that large quantities of negative ions could be produced. These apparently originated in a region of the tube where impacting electrons had just sufficient energy to excite the atoms. It therefore appears that in argon it is a necessary and sufficient condition for the capture of an electron that the atom first be in an excited state.

A full report of this work is to be published shortly.

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November 3.

Flow of Sap in Trees.

IN recent discussions on the upward movement of sap in trees, I have seen no mention of an interesting observation of Charles Darwin to be found in his "Voyage of the Beagle" (p. 258, John Murray, 1912 edition). He was exploring the Campana or Bell Mountain about 26 miles from Valparaiso, and he writes as follows, for the quotation is worthy to be reprinted in full:

"In a few places there were palms, and I was surprised to see one at an elevation of at least 4500 feet. These palms are, for their family, ugly trees. Their stem is very large, and of a curious form, being thicker in the middle than at the base or top. They are excessively numerous in some parts of Chile, and valuable on account of a sort of treacle made from the sap. On one estate near Petorca they tried to count them, but failed, after having numbered several hundred thousand. Every year in the early spring, in August, very many are cut down, and when the trunk is lying on the ground the crown of leaves is lopped off. The sap then immediately begins to flow from the upper end, and continues so doing for some months; it is, however, necessary that a thin slice should be shaved off from that end every morning, so as to expose a fresh surface. A good tree will give ninety gallons, and all this must have been contained in the vessels of the apparently dry trunk. It is said that the sap flows much more quickly on those days when the sun is powerful; and likewise, that it is absolutely necessary to take care, in cutting down the tree, that it should fall with its head upwards on the side of the hill; for if it falls down the slope, scarcely any sap will flow; although in that case one would have thought that the action would have been aided, instead of checked, by the force of gravity. The sap is concentrated by boiling, and is then called treacle, which it very much resembles in taste."

The effect of the sun and the great quantity of sap from a felled tree are both noteworthy, but the effect, or rather inhibition, due to gravitation, adds mystery to an obscure subject. A friend has proposed to test this gravitational effect with two young felled sugar maples next spring.

A. S. EVE.

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November 1.

The Colour of Sulphur Suspensions.

IN the review of Ostwald's "Licht und Farbe in Kolloiden" which appeared in NATURE of November 8, p. 672, the reviewer alludes to the investigations of Keen and Porter on "sulphur suspensions containing particles *large compared with wave-lengths* and indigo in *transmitted light*." He adds, "No theory of this phenomenon is available so far; until one is found there will be a distinct gap in the optics of disperse systems."

A theory of the effect observed by Keen and Porter was given by Prof. C. V. Raman and Mr. B. Ray in 1922 ("On the Transmission Colours of Sulphur Suspensions," Proc. Roy. Soc. A, vol. c., pp. 102-109), the explanation offered being that the colour of the transmitted light is due to interference between the primary wave and the light scattered by the particles in the direction of the primary wave. Results were given of calculations based on Rayleigh's theory of the scattering of light by a transparent sphere.

Raman and Ray repeated Keen and Porter's experiments and found that the diameter of the sulphur particles when the indigo colour first appeared was considerably less than that quoted by Keen and Porter, but that the amended value agreed satisfactorily with the theory. The theory appears to be adequate, although the computation of numerical results is extremely tedious. A more complete comparison of theoretical with experimental results than has yet been published is desirable.

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Absorption Spectra of Mixed Metallic Vapours.

DURING work on the absorption spectra of mixtures of metallic vapours, I have obtained band spectra peculiar to mixtures of magnesium and alkali metals, and also to mixtures of calcium and alkali metals. A sodium-potassium band spectrum has already been described (Proc. Roy. Soc., 1924). The existence of such band spectra is of interest, as it points to the presence of molecules of volatile alloys of these metals in the mixed vapours.

I have incidentally observed that lines of the series $1S - md$ are developed in the absorption spectra of rubidium and cæsium vapours. As has been remarked by Datta, who observed the corresponding absorption in potassium, the development of such series in the absence of an electric field is a contravention of the selection principle, since it involves a change of two in the azimuthal quantum number.

I have, further, been unable to trace any previous observation of the cæsium series $1S - md$, either in emission or absorption, and wave-length measurements, as well as experiments upon the conditions necessary for its appearance, are at present in progress.

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November 12.