support the idea that a major cause of the production of negative ions might be sputtering of persistently occluded electronegative films by bombardment with positive ions. We have now been able to show that the latter process does occur, by using a double mass-spectrograph.

Positive ions were drawn from a mercury discharge, and after magnetic sorting were projected on to a nickel-chrome disk. Negative ions again appeared and were identified by a second magnetic analysis. It was found that Hg^+ and Hg^{++} both produced a spectrum of light negative ions, with maximum peak currents of the order of 10^{-11} amp. Again Hg^- was not detected, although the Compton electrometer used could have measured currents of the order of 10^{-16} amp. A complex positive ion beam of mass about 28 (presumably mainly CO^+) also gave a negative ion beam of about the same mass. In all cases the yield of negative ions was proportional to the bombarding positive ion current. The light negative ions of mass about 28 produced by bombardment with Hg^+ were found again to have excess energies ; the other beams have not yet been studied in this way.

The fact that we did not obtain Hg^- is not necessarily incompatible with Arnot's observation of it. We cannot exclude the possibility that differences in surface structure may be responsible for the discrepancy. A question of greater moment is whether in fact any process other than sputtering occurs.

Experiments similar to ours, except that magnetic sorting of the positive ions was not employed, were apparently done by J. S. Thompson[3] in 1931, but, so far as we know, details of this work have never been published.

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Response of Barrier-Layer Cells to X-Rays of Long Wave-Length

In 1931 Selenyi and Lange[1] reported that they had obtained photo-currents from barrier-layer cells exposed to X-rays of short wave-length. Later, Gleason[2] studied the effect of X-rays on a large number of cells, and Scharf and Weinbaum[3] made a thorough investigation on this subject.

However, these investigations were all made with hard X-rays ; nothing has so far been known of the response of barrier-layer cells to X-rays of long wave-length. I therefore undertook to study this question. Naturally, in this wave-length region such an investigation has to be carried out in a vacuum, and a special apparatus was built for this purpose. The intensity of the radiation falling on the barrier-layer cell could be varied by changing the distance between the focus and the cell. Visible light was completely screened off by two aluminium foils, each of them 0·5 μ thick. For the preliminary investigations two commercial selenium cells of different origin were used. Both these cells had a protective foil of celluloid. This foil together with the two aluminium foils brought the long wave-length boundary of the effective radiation somewhat below 20 A. The short wave-length boundary was given by the voltage of the X-ray tube.

The data in the accompanying table may give a conception of the sensitivity of the cells in this wave-length region. A rough calculation gave the order of magnitude of the photo-electromotive forces to 10^{-4} volt. It has to be observed that in the first case the radiation contained the whole *M*-series of tungsten, and in the second that part of it which contains the strongest lines, but in the last case none of it was present.

Current through the X-ray tube	Distance focus—cell	Short wave-length boundary of radiation	Photo-current
30 m. amp.	15 cm.	3·5 A.	0·86 μ amp.
50	15	5·5	0·66
150	15	8·0	0·62

Further, below 0·9 μ amp., the photo-current was found to be a rectilinear function of the intensity, when the outer resistance was 100, 300 and 1,100 ohms, thus giving a complete resemblance to the conditions in the case of visible light.

Full particulars of the experimental arrangements and further results will be published later.

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Composition of Minima in Binary Systems of the Solid Solution Type

In about twelve of the completely isomorphous binary systems which so far have been investigated, the freezing-point curve passes through a minimum. The compositions of these minima are expressed as chemical formulæ in the accompanying table. This table makes clear the remarkable fact that a simple integral relationship exists between the numbers of the atoms of the two metals in the alloy of lowest freezing-point.

System	Composition of minimum point
Au—Cu	Au_3Cu_2
Au—Ni	Au_3Ni_2
Rb—Cs	RbCs
Rb—K	Rb_2K
Pd—Fe	PdFe (?)
Pd—Co	PdCo
Pd—Ni	Pd_9Ni_{11}*
Pt—Co	$PtCo_3$ (?)
Fe—Ni	$FeNi_3$
Fe—Cr	Fe_3Cr
Fe—V	Fe_2V
Sb—As	Sb_4As

* Perhaps more exact experiment may give PdNi, analogous to PdFe and PdCo.

According to Stockdale[1,2], there is a similar relationship between the components of a binary eutectic mixture. However, perhaps owing to some unknown factor, the relationship is not always one of simple integers in this case, but somewhat complex numbers are sometimes given. The law of simple integral ratios seems to be particularly applicable to binary systems of the solid solution type. A system of this type in which the liquidus curve

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