series limits of the high terms, being normal terms in the He I-like spectra, one can predict the location of higher series members such as $1s^2.2s - 1s\,3p.2s$ or $1s^2.2p - 1s\,3p.2p$. Confirming the explanation of A, the group A' falls at the position for second series members to lines of group A. The original spectrogram even shows traces of the third group of the same series.

As a consequence of the above explanation, one must assume the existence of discrete energy levels lying *above* the ionization limits by amounts up to *five times* the ionization potential of the same spectrum, in the case of F VII nearly 600 volts above the ionization limit of F VII. A previously known analogy to these terms are those found by Beutler[1] in the absorption spectra of metal vapours, which in certain cases surpassed the ionization limit by almost 17 volts.

The lines of group B, approaching the line $1s\ ^2S - 2p\ ^2P^0$ from the long wave-length side, are undoubtedly analogous to the lines in He I found by Compton and Boyce[2] and interpreted by them as transitions of the type $1s.2s - 2p.2s$ and $1s.2p - 2p.2p$, an explanation which has later been confirmed by several theoretical calculations[3].

We may recall that the X-ray line $K\alpha$ of a free carbon atom may be written as $1s^2.2s^2\,2p - 1s\,2p.2s^2\,2p$, being essentially the same transition as the resonance line of C V, $1s^2\ ^1S_0 - 1s\,2p\ ^1P_1$, at 40·3 A. The presence of additional outer electrons will reduce the field in which the transition takes place, and consequently cause a shift towards longer wave-lengths. The $K\alpha$ of carbon, as observed in various crystal lattices[4], extends with several maxima from 42·5 to 46 A. It is then obvious that the lines of group A with respect to both configuration and wave-length take a place intermediate between a true optical line and the corresponding X-ray line.

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[1] Beutler, H., *Z. Phys.*, **86**, 495 (1933); and eight subsequent papers.
[2] Compton, K. T., and Boyce, J. C., *J. Franklin Inst.*, **205**, 497 (1928).
[3] See for references: Kiang, A. T., Ma, S. T., and Wu, T. Y., *Chinese J. Phys.*, **2**, 117 (1936).
[4] Siegbahn, M., and Magnusson, T., *Z. Phys.*, **96**, 1 (1935).

Aurora and Geomagnetic Disturbance

IN the course of analysis of simultaneous auroral and geomagnetic events at Fort Rae, North West Canada, during the Second International Polar Year, a feature has emerged about which we consider it advisable to make a preliminary report. If the elevation above the horizon of an auroral arc be φ, and if θ be the elevation of a concentrated linear electric current to which the simultaneous vector components $\triangle H$ and $\triangle Z$ in the geomagnetic meridian field may be attributed, then in seventy cases selected solely on the basis of a substantial magnitude of each of $\triangle H$ and $\triangle Z$, θ and φ are on the same side of the magnetic vertical plane five times as frequently as on opposite sides.

This result is significant only because Fort Rae is almost under the zone of maximum auroral frequency, where arcs are formed with equal frequency on either side of the zenith.

In 35 per cent of the selected cases, $\theta - \varphi$ is less than 10°; in 60 per cent within 20°. On occasion, the movement of an arc across the zenith was accompanied by a simultaneous change in the direction of the vertical disturbance vector, indicating a movement of similar sense of the overhead current system responsible for the vector change.

We deduce that, at least in high magnetic latitudes, there is probably a closer spatial association than has hitherto been supposed between the current system which produces the major short-period perturbations in the earth's field and the currents which manifest themselves as auroral arcs at heights mainly between 100 km. and 115 km.

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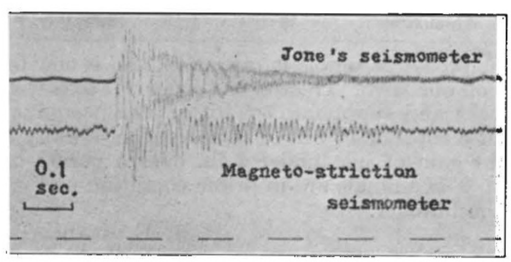
Sensitivity of the Geophone

IN experimenting with a magneto-striction seismometer originally designed for geophysical prospecting, some characteristics of the instrument were observed to be of interest. The geophone, when combined with a suitable amplifier, is capable of yielding a very high sensitivity, yet by itself it is so strong that it can be handled without a clamp just like a piece of metal, and it appears to be a most suitable instrument to study the effect of bomb explosions on buildings, steel structures and shelters. Actually it can be built into the steel structure and placed almost on the site of an explosion.

The geophone consists of a coil and a magnetized nickel rod carrying a weight. Working in combination with an amplifier, consisting of 4 D.C. valves coupled with resistances, and an improved Shire's oscillograph[1], the sensitivity of the instrument is of the same order as Jone's seismometer[2], one of the most sensitive portable instruments existing.



The accompanying plate is a record of these two types of seismometers placed side by side recording the same 'earthquake', which was produced by the dropping of a 20 gm. mass from a height of one metre on to a carpet-covered concrete floor about 20 ft. away from the instruments. Being an accelerometer, the new instrument shows a much sharper onset in its record. The natural frequency of the magneto-striction instrument is extremely high. Its oscillation is damped down by internal friction so rapidly that it is not detectable by the camera. In another model, a mechanical lever has been used which increases the sensitivity 30–50 times further.

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[1] *J. Sci. Inst.*, **11**, 379 (1934).
[2] *J. Sci. Inst.*, **9**, 8 (1932).

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