LETTERS TO THE EDITOR.

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Efficiency of Damped Seismographs.

IN NATURE (April 2, 1914, p. 119) I found reprinted a statement of Dr. Cavasino, concerning the influence of damping on recording seismographs, which I think is based upon a misunderstanding.

There is no doubt that when damping is introduced, until the limit of aperiodicity is attained, the proper period of the instrument exists as such. But it is not that point at all which is important, but the fact that more or less heavy damping diminishes the influence of the proper motion of the instrument on the record and enables one to obtain a much more trustworthy picture of the true motion of the ground.

Further, if you have an instrument of low sensitivity and simply introduce a heavy damping you will make a very bad seismograph; but nobody proceeds in this way. When damping is introduced, one must simultaneously provide to augment the magnification, be it by introducing magnifying levers like those in Wiechert's instruments, or by using galvanometric registration as in the aperiodic seismographs. The lengthening of the proper period of the instrument also gives good results for the longer seismic waves.

If these precautions are taken, heavily damped instruments give absolutely the same moments for the commencement of both first preliminary phases of an earthquake as undamped ones; moreover, the three different components give absolutely the same results. There can be no question of a difference of several minutes, not even of seconds, as Cavasino states. The difference in the times of arrival of the first longitudinal waves for the aperiodic instruments of the Pulkovo seismological station for the three components of the movement of the ground differ from another only by a fraction of a second.

Cavasino's assertion, that damped pendulums give fewer records of earthquakes than undamped ones only depends upon the way in which the damping is introduced, and as a general statement does not hold good. In fact, the aperiodic instruments in Pulkovo registered in 1912, 671, and in 1913, 576 earthquakes; the number of azimuths of the epicentre determined at Pulkovo were, in 1912, 137, and in 1913, 103.

In 1913 the number of earthquakes registered by aperiodic instruments were:—In Tiflis, 456; Irkutsk, 738; and Taschkent, 954.

I doubt whether any other seismological station using undamped seismographs has approached these figures.

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Spectra of Secondary X-Rays.

HITHERTO all X-ray spectra have been obtained by using the body, the spectrum of which is to be examined, as an antikathode inside the tube. All the trouble of exhausting the tube, etc., can be avoided by illuminating the substance of which the spectrum is to be determined with the primary rays from a tube of any of the usual types, and only allowing the secondary rays to enter the spectrograph. I have photographed the secondary spectra of copper, zinc, mercury (amalgam of zinc), etc., by this method with-

out any trouble. Zinc amalgam, for instance, shows five rays, two due to zinc, one due to some impurity—probably iron—and two due to mercury.

If a quantity of the substance to be examined is placed in a thin paper bag, the experiment is particularly striking. Using zinc oxide, for instance, the presence of zinc was evident immediately, so that the chemical analysis of a substance inside a closed envelope without in any way touching or manipulating it is no longer beyond the bounds of possibility.

The method promises to be particularly useful for any experiment in which the rays emitted under various conditions are to be examined, such as those on the effect of an electric or magnetic field upon the spectra, with which I am now engaged.

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29 Rue Chateaubriand, Paris, May 30.

Weather Forecasts.

At the conclusion of my former note on this subject (NATURE, February 26, 1914, vol. xcii., p. 711) I said that it seemed improbable that trustworthy forecasts of the weather for twenty-four hours in advance ever would, or could, be made for latitudes far removed from the equator, and in the present communication I give the reasons for that opinion.

Enough is now known concerning the average weather conditions on the globe to show that were it possible to make the surface wind currents visible and to observe their distribution from a distance, the appearance would be

very much like that given in the accompanying figure, provided that the surface was level and uniform in quality, i.e. all land or all sea.

The wind currents on the actual earth if viewed in this way would no doubt be seen to be considerably affected by differences in the nature of the surface over

which they passed, more particularly where that surface was mountainous, but the general character of the flow would still be that given in the figure, namely, that round the equator (leaving seasonal variations out of account), there would be a region of calms bordered on each side by fairly regular trade winds extending roughly to latitude 30° N. and S.; whilst outside this region again, the whole surface would be covered by eddies of various sizes in which the direction of circulation was left-handed in the northern, and right-handed in the southern hemisphere.

If pressure could be observed, as well as the direction of the wind, the central parts of the eddies would always appear as regions of low barometer. Were the observations extended over a few hours, it would be seen that the eddies themselves (i.e. their centres) were in motion travelling on the whole to the N.E. and S.E. in the northern and southern hemispheres respectively.

Continuing the observations for days or weeks, it would be found that the eddies were mostly short-lived, few lasting more than two or three days, and that although their average course was N.E. or S.E.,