pressibility of elements, amongst other facts, it is evidently possible to influence intra-atomic activity by means of forces applied from without. It seems probable, therefore, that pressure, if sufficiently great, could be transmitted to the interior of a uranium atom and supply the countervailing force required to help the atom past a position of instability. Once we realise this probability, we see a cogent reason why the interior of the earth should be free from radium and all other radio-active substances the formation of which from heavier elements demands an increase in volume, these heavy elements being at great depths only potentially radio-active.

From this point of view radio-activity is, as Dr. Schiller suggests, "an acquired habit of the substances that exhibit it," the habit being acquired when such an element passes by any means whatever from great depths below the earth's surface to regions of less pressure.

In a paper just issued in the Records of the Geological Survey of India (vol. xliii., part 1) I have given a preliminary account of these speculations concerning the mineralogical constitution of the earth's crust, and in a final paragraph have appended a brief reference to this question of the inhibition of the disintegration of uranium at great depths below the earth's surface.

L. L. FERMOR.

Pianoforte Touch.

IN connection with the discussion on this subject originated by Prof. Bryan's paper, I may mention that I have been making some measurements during the past winter with the view of obtaining some idea of the velocities and forces involved in the motion of the transmitting mechanism. By fitting an electric chronographic arrangement to an upright piano I have been able to measure the actual times taken in different stages of the movement with different degrees of loudness.

Among other results, I have found that the time during which the hammer is flying freely towards the string after losing contact with the propelling mechanism varies from about 0·04 sec. for *pp* to 0·001 sec. for *ff*. The distance of flight was about 1 cm., so the velocity ranged from 25 to 1000 cm. per sec. At the latter extreme, however, the force used in striking the key was greater than would be used in ordinary playing. On the other hand, when a weight was allowed to fall on the key from the smallest height to produce a note the time could be brought up to 0·07 sec., corresponding to a velocity of only 14 cm. per sec.

With regard to the much disputed point as to whether it is possible to vary the quality of the note independently of the loudness, this must, I think, still be regarded as an open question. Very positive affirmations are made by musicians on both sides. From a physical point of view the suggestion made by Mr. Tobias Matthay in his work on touch seems to be the only possible way to explain the effect, if it exists, viz. that the quality can be spoiled by vibrations of the hammer-shaft at the instant of striking the string. In accordance with this, Mr. Matthay holds that the tone is good when the final velocity is given to the key gradually, and is bad when the same velocity is imparted by a sudden blow. That vibrations of the shaft occur is, of course, undoubted, but whether they are sufficient to cause an appreciable effect is another matter. On the other side, recent German theorists, such as Breithaupt, Steinhausen, and Ritschl, deny the effect altogether. The last-named author holds that good touch consists in the power to produce fine gradations of intensity and in complete mastery of *legato* and the use of the pedal.

The essential question seems to be whether good and bad touch can be distinguished in a *single note* struck and allowed to die away, or in a succession of notes following each other at so long intervals as to be musically detached. As I understand Prof. Bryan, the improvement effected by his invention is chiefly apparent in a sequence of notes forming a melodic phrase. Further, I think that the exact dynamical effect of the contrivance on the motion of the key has not been made quite clear in the published account.

W. B. MORTON.

The Queen's University of Belfast, July 2.

The Reflection of X-Rays by Crystals.

IT is interesting to find that an X-ray bulb having a rhodium antikathode gives off a strong, sharply defined (and therefore very homogeneous) beam which is reflected from the (100) face of rock-salt at a glancing angle of 6·2°. Its mass absorption coefficient in aluminium is 3·2. A second weaker beam is reflected at an angle of 5·8°, and this appears to complete the rhodium X-spectrum. Assuming the correctness of my son's determination of the spacing of the atoms of rock-salt (in a paper read before the Royal Society on June 26), the wave-length of the stronger beam is $0{\cdot}61 \times 10^{-8}$, and of the weaker $0{\cdot}57 \times 10^{-8}$. It can be calculated that radiation of about this wave-length should be emitted by a rhodium antikathode; the argument is given in a paper recently read before the Royal Society (see abstract on p. 496 of this issue).

Platinum and rhodium give much stronger homogeneous reflected rays than iridium, tungsten, or nickel. The current produced in an ionisation chamber 15 cm. long, filled with SO_2, the slits being 3 mm. long and 0·8 mm. wide (Proc. Roy. Soc., lxxxviii., p. 428), is so great that the leaf of a Wilson electroscope races across the field of view at the rate of thirty or forty measurable divisions (three or four scale divisions) in a second. The setting must be exact, and the bulb should be very soft.

W. H. BRAGG.

Rosehurst, Grosvenor Road, Leeds.

Wireless Antennæ.

PROF. FLEMING, in a recent letter to a contemporary journal, has made a suggestion similar to that of Mr. A. Lander, in NATURE of July 3 (p. 451), to the effect that the space wave in wireless telegraphy is supplemented by some effect which travels through the earth. Indeed, it would appear natural to expect that, in addition to the electric disturbance which must travel outwards in all directions over the conducting surface of the earth when the electrical potential at any point on this surface is disturbed, the passage of the electromagnetic waves through the air above the earth's surface should be accompanied by some form of electrical disturbance along the conducting earth's surface beneath them. This is, however, a subject that, so far as I am aware, has not yet been tackled by mathematical physicists, and I would point out that it is well worth their attention.

In connection with the matter, it may be of interest to mention that I find that my own body, without any wires or anything else, will serve as antenna for the reception of signals from the Admiralty. My receiving apparatus is on the ground floor of my house in Chester Square, and with my ordinary aërial disconnected I find I can get the Admiralty signals, faintly but quite audibly, simply by touching with my finger the terminal to which the aërial is usually connected. No doubt in this case my body does not act as an aërial in the ordinary way, but merely as a capacity into which the electrical disturbance arriving