Dr. E. VAN EVERDINGEN Jr. On the increase of the resistance of bismuth in the magnetic field, in connection with the dissymmetry of the Hall-effect.

In a communication to the Academy, presented in the Session of 18 April 1895, Dr. A. LEBRET 1) has pointed out, that the dissymmetry of the Hall-effect in bismuth may be described mathematically by supposing the resistance of bismuth to increase unequally in the magnetic field for different directions. At the same time the possibility was pointed out of a connection between these directions and the principal crystallographic directions.

Also in my communications on this subject, presented in the Session of 30 May 1896 2), this description is continually used, and the value of the difference in increase of resistance was calculated for some plates. Besides, the connection with the crystallographic directions was established almost beyond doubt. It was a matter of importance to decide whether the existence of this difference in resistance might be proved directly.

1) Communications № 19, p. 23.
2) Communications № 26.
For this purpose the following experiments were made.

1. After determining the axes of symmetry in a round plate, a square was cut out of it with sides parallel to those axes. From the remaining borders two oblong pieces of bismuth were obtained; to each of them by means of Woop's metal two "resistance-electrodes" were soldered on the same side-plane, which were connected through a resistance-box and one of the coils of a differential-galvanometer. Then the pieces were placed between the poles of the magnet so as wholly to cover each other, though they remained apart, and a current was sent through them traversing one after the other. In one of the resistance-boxes the resistance was left constant, say 100 Ohms, and in the other was determined for different magnetic fields the resistance necessary to annul the deflection observed at the differential-galvanometer on closing the primary current. In order to eliminate the error, caused by Hall-effect, the mean was taken of the values, obtained thus for both directions of the magnetic field.

Indicating by \( a \) the ratio of the resistances when not in the field, that same ratio was found to be

- \( 1,005 a \) in a magnetic field of 5500 c.g.s.
- \( 1,022 a \) in a magnetic field of 7800 c.g.s.

2. In order to decide, whether the difference thus found between the resistances in different directions might he discovered also in the plates themselves, which served for the determination of the dissymmetry, "resistance-electrodes" were pressed against them along the directions of the axes, and the resistance was measured by means of the compensative-current. (See communication of 18 April 1895 \(^1\)). Hence the primary current flows through the rheotau-wires (see that same communication) and the plate of bismuth in succession. The result was not satisfactory. The current in these plates flows by no means exclusively in the direction of the line joining the primary electrodes. Accordingly I had not expected to obtain in this manner the true ratio of the resistances. The unfavourable result however induced me to calculate the difference of potential between the primary electrodes, taking into account the difference in the increase of resistance in different directions, which calculation brought the result, that the difference of potential contains no term with the first power of the difference in resistance. So this method could afford no results and was abandoned accordingly.

3. One of the round plates used for other experiments was made out of a piece of bismuth, the crystalline structure of which looked homogeneous. From the remaining piece two little bars of bismuth were cut, with their greatest dimension parallel to the plane of the plate (which itself was parallel to a cleavage-plane of the crystalline piece of bismuth), in two perpendicular directions. These little bars were fastened in a frame of ebonite between two brass screws, which entirely covered the limiting planes whilst two thin resistance-electrodes were screwed on to one of the sides. The little bar was traversed by the primary current, and the resistance between the resistance-

\(^1\) Communications No. 19, p. 5.
The increase of resistance in the magnetic field being determined for the little bars, mentioned in the latter part of the former communication, the same experiments were repeated with a bar, cut from the same crystalline piece in a direction \( \perp \) the former two and \( \parallel \) the principal cleavage-plane. It appeared, not only that this bar had a greater specific resistance, but also that it showed a much greater magnetic increase of resistance. Whereas for instance with \( N^0.2 \) a resistance was found of \( 154000 \) c. g. s. when not in the field, and a magnetic increase of resistance of \( 7.4 \) per cent.