

which we have any record. At the same time he determined the time of vibration of a horizontally suspended needle at the stations where he observed the dip. This occurred in 1720. Had Whiston likewise observed the magnetic declination he would have had the honor of making the first complete magnetic survey on record. As it is we must credit him with the following achievements:

1. He drew the earliest isoclinics (1720).
2. He invented the vibration method for determining the dip.
3. He made the first relative intensity observations (1720).
4. The first intensity observations (1722) revealing the law of decrease of horizontal terrestrial magnetic force with approach towards magnetic pole were made under his instructions.

It is, furthermore, owing to Whiston's enthusiasm that we have a dip observation in this country dating back to 1722.

Improvements in the method of determining relative intensity were made by various magneticians and additional observations were made, notably by Humboldt and by Hansteen. No really marked advance, however, was made until Gauss, in the early part of the third decade of the present century, invented his method for determining the intensity *absolutely*. This gave a new and powerful impulse to the subject of terrestrial magnetism.

This method in principle was to eliminate the magnetic moment, m , of the suspended magnetic needle from the formula for the value of the horizontal intensity, H , with the aid of another formula, which involved the same quantities, m and H , but in different relations. In this second formula the known quantities were the angle of deflection caused when the magnetic needle, whose time of vibration had been determined, acted upon a second magnet at a definite distance and in a known relative position. Thus with the aid of two distinct sets of operations—one consisting of measurements of deflection angles and the other of noting the times of vibration—Gauss determined the absolute value of the strength of the earth's magnetic pull.

The second grand epoch in terrestrial magnetism is now ushered in. A wonderful enthusiasm and quickening spreads throughout the civilized world. A magnetic association is formed, magnetic observatories