thematical artifices for deducing the values of V and its differentials in converging series, he is able to derive the coefficients of these series from the observed magnetic elements at certain places, and hence, to calculate them for all places. The comparison of the calculation with the observed results is, of course, the test of the truth of the theory.

The degree of convergence of the series depends upon the unknown distribution of magnetism within the earth. "If we could venture to assume," says M. Gauss, "that the members have a sensible influence only as far as the fourth order, complete observations from eight points would be sufficient, theoretically considered, for the determination of the coefficients." And under certain limitations, making this assumption, as the best we can do at present, M. Gauss obtains from eight places, 24 coefficients (each supplying three elements), and hence calculates the magnetic elements (intensity, variation and dip) at 91 places in all parts of the earth. He finds his calculations approach the observed values with a degree of exactness which appears to be quite convincing as to the general truth of his results; especially taking into account how entirely unlimited is his original hypothesis.

It is one of the most curious results of this investigation that according to the most simple meaning which we can give to the term "pole" the earth has only *two* magnetic poles; that is, two points where the direction of the magnetic force is vertical. And thus the *isogonal curves* may be looked upon as *deformations* of the curves deduced by Euler from the supposition of two poles, the deformation arising from this, that the earth does not contain a single definite magnet, but irregularly diffused magnetical elements, which still have collectively a distinct resemblance to a single magnet. And instead of Hansteen's Siberian pole, we have a Siberian region in which the needles converge; but if the apparent convergence be pursued it nowhere comes to a point; and the like is the case in the Antarctic region. When the 24 Gaussian elements at any time are known the magnetic condition of the globe is known, just as the mechanical condition of the solar system is known, when we know the elements of the orbits of the satellites and planets and the mass of each. And the comparison of this magnetic condition of the globe at distant periods of time cannot fail to supply materials for future researches and speculations with regard to the agencies by which the condition of the earth is determined. The condition of which we here speak must necessarily be its *mechanico-chemical* condition, being expressed, as it will be, in terms of the mechanico-chemical sciences. The investi-