

treatment of *each* element, has been clearly demonstrated by recent researches. We have in this way obtained a grasp of the secular variation phenomenon such as but a very few years ago we had no hope of possessing for many centuries to come. And the only reason why the grasp is not still more powerful is because of the very fact that we do not possess sufficient inclination and intensity data to go with the early observations of the magnetic declination.

If we next turn to the consideration of the so-called local disturbances we shall be most thoroughly convinced of the absolute necessity of observing the effect of the earth's magnetism in its *totality*. And this question of local disturbances is of no less interest to the practical needs of the land surveyor than that of the actual value of the magnetic declination or that of the secular change of declination.

The outcome of all detailed magnetic surveys has been that the lines of equal magnetic declination are very far from being smooth and beautifully curved lines. The more numerous the observations on which the chart is based, the more sinuous the magnetic lines. Compare the successive isogonic charts of the Coast and Geodetic Survey and note how the sinuosities have multiplied with increase of data. Or behold the extremely devious isogonic lines which resulted from the most thorough state declination survey thus far made in this country—that of New Jersey. There was a time when these sinuosities were looked upon as unnatural, due doubtless to defective data and what not, and hence to be cut out and eliminated. But the magnetician has begun to recognize that these sinuosities are the very things he wants and that *they* represent the normal state of things, and the *smooth* curves, the abnormal. To cut out, therefore, entirely, or at best smooth down “local disturbance” phenomena, does not satisfy even the *practical* needs, much less the demands of science.

A glance over the values of the magnetic declination data, given on the chart in a later chapter, shows how impractical and misleading it is to give an *average* value, or an estimated value, from an isogonic chart for a county on the Piedmont Plateau, for example, a value which the surveyor would naturally think could be applied over his entire county if given by an authoritative publication. If there are