of the solar spots, leaves, I think, little doubt that the coincidence is not accidental but causal.

Professor Balfour Stewart, of Owen's college, Manchester, has lately been investigating the observations of temperature taken at the Toronto observatory with a view to determining the existence of a thermometric period similar to the sun spot period. His results are published in appendix G, to the report of the committee to advise on the methods of carrying on observations in solar physics. I shall now quote from the concluding portion of Professor Stewart's report:

"In the course of this paper I have given evidence which tends to show that there are in all probability solar variations of short period, and that these are connected with variations in the temperature range. Toronto was chosen as a station from which accurate information, with regard to temperature, was to be obtained, and also as one which, being in America, may be supposed to be influenced more directly and immediately by solar changes than an equally good station in Europe."

Similar results have been obtained from a comparison with the temperature ranges at Kew and Utrecht, as well as in the magnetic declination ranges at Kew, Prague and Trevandrum.

Evidence has also been adduced to show that the phase of a given meteorological inequality is not the same at different stations, but that the maximum or any other salient point reaches Kew about eight days after it has appeared in Toronto, and Utrecht about a day and a half after it has appeared at Kew.

A similar progress from west to east, but only quicker, is suspected in what may be called magnetic weather.

In conclusion Professor Stewart says the evidence tends not only to show that solar variations of short period exist, but to render it possible, if not probable, that they are the cause of temperature range periods of similar length, in such a way that a maximum amount of spots corresponds to a maximum and not a minimum temperature range, or in other words denotes, in all probability, an accession of solar energy and not a diminution thereof.

The fact, then, may be admitted as established that there are fluctuations in the meteorological and magnetical conditions of the earth, which have epochs coincident with disturbances in the solar atmosphere and that the major period is approximately eleven years. It has also been determined that both magnetical and meteorological weather travel from west to east. The magnetic weather (as we may call it) preceding the meteorological, and it remains for continued careful observation and study to develop results which may be of the greatest practical utility, for if the laws which govern the relations between magnetism, solar spots and terrestrial meteorology were once established, the magnetic needle would take its place as one of the instruments to be carefully watched in making weather predictions, extending over comparatively longer periods than we are at present able to attempt.

I shall now endeavor to describe the magnetic instrumental appliances in use at the Toronto observatory.

Besides the instrument used for making the absolute determinations, we have two sets of differential instruments, one for noting the changes by direct eye observation, and the other recording by aid of photography, the changes which take place in the magnetic elements.

The changes in declination are measured by means of a magnet enclosed in a box and suspended by a thread of unspun silk. The magnet carries a mirror which reflects a finely divided scale fixed some distance off, the scale being read by means of a telescope which is securely fastened to a stone pillar. In this way small changes in azamuth of four or five seconds of arc can be immediately detected.

The changes in the horizontal component of the force are measured by an instrument invented by M. Ganss many years ago. In this instrument the magnet is suspended by two threads separated by an arbitrary interval, the circle to which the upper ends of the thread are attached is then turned until the torsion of the threads compels the magnet to take up a position as nearly as possible at right angles to the magnetic meridian, any increase of force will then pull the marked end of the magnet towards the north; whilst if the force decrease, the torsion of the threads pulls the marked end southwards again. As in the declinometer the needle carries a mirror which reflects the fixed scale by means of which the amount of change is measured.

Changes in the vertical component of the force are measured by a magnet suspended by means of knife edges on agate planes and therefore only free to move in the vertical plane, this needle is mechanically balanced so that at the normal force the magnet shall be as nearly as possible horizontal an increase of force will cause the north end of the magnet to dip, the angle through which it moves being measured by means of micrometers.