

The Transit of Venus.

HINTS TO AMATEURS—PREPARATIONS IN CANADA—
TABLE OF ELEMENTS.

(To the Editor of the Weather Bulletin.)

SIR.—The greatest activity prevails at present in astronomical circles all over the civilized globe, in anticipation of an event of transcendent importance, namely, the transit of the earth's sister planet Venus over the disc of the sun on December 6th, 1882. Some scientists have been preparing for months past, I might safely say years, instruments have been constructed, and observers familiarized themselves with frequent observations of the god of day. No less than forty scientific expeditions will be stationed in different parts of the world. Their object is, I need hardly add, to try and determine the earth's exact distance from the sun, for given this known measure as unity, probabilities of distance in the immeasurable star depths become resolvable by human calculations. One thing is certain, whatever else occurs, no human eye uplifted to the sun and that apparently small world crossing its face, can ever behold the like again, as no other transit occurs until A. D. 2004.

Giant strides have been accomplished by science since 1639, little more than two centuries since, when a transit occurring visible in England it only had one observer. On December 4th of that year Jeremiah Horrox, a young man devoted to science, calculated the time aright and watched the planet across the sun. He had no suitable instruments, but simply cut a hole in the shutter of his room, to admit some rays of light, which he contrived should fall on a sheet of prepared paper. With this primitive invention Horrox fortunately succeeded, and with the scanty data gleaned therefrom was enabled to instruct his successors to prepare for the next in 1761. This lad, of whom it might be said, the scientific world of that day was not worthy, died in the prime of youth, leaving a name behind to be remembered as long as the planets run their courses, or at least so long as man takes a delight in their observation. In 1639, it should be remembered, the Copernican theory was but coldly received (Dr. Gosd, an eminent mathematician, writing in 1686, throws out doubts as to its truth) therefore a transit of Venus was of great importance because it went a long way toward establishing the theory of the Prussian monk. A transit of Mercury, it is true, had been observed by Gassendi, on November 7th, 1631, which was the very first achievement of the kind. He projected the sun's image on a screen through a telescope, but the result was very unsatisfactory.

Venus has been "evening star" and an object of great interest ever since her superior conjunction, passing behind the sun on Feb. 20th last, she commenced that progress through the constellations which terminates in the transit. I do not purpose telling your readers "why" Venus transits the sun; that may be found in any primer, but a few outside facts not so easily gathered together may be of interest.

In Canada, observations will be made at Fredericton, Quebec, Montreal, Ottawa, Kingston, Toronto, Woodstock and Winnipeg. A government grant of \$5,000 has been voted and will be expended under the superintendence of Mr. Carpmæl of the observatory, Toronto. This gentleman has ordered from England a six-inch aperture refracting telescope for this special purpose. At the McGill College observatory, the six-inch refractor now in use, will be the chief instrument, this is probably the best public glass in Canada, which fact is a very humiliating one to record of a comparatively well to do nation. Private instruments in Montreal are unfortunately few, far between

and of low powers. I am not acquainted with any over three inch aperture, which scarcely admits in the calmest weather a power over two hundred. In the United States very different is the record, the very best instruments will be utilised by the most skilful observer.

To those persons fortunate enough to possess "dark heads" specially adapted for solar observation, no instructions are necessary, but to the unscientific many a few words may prove useful. All persons having common field glasses of low power may watch this unusual event. Let them take a piece of card and with it form a cap covering the object glass or large end, make it like a pill box lid, see that it fits exactly so that any wind stirring at the time will not displace it. In the centre of the card cut a circular hole half to three-quarter inch diameter (about the size of a five cent piece) and one end of the spy-glass will be complete. The necessity for this covering is, to cut off all extraneous sunlight and admit into the tube as few rays as is consistent with perfect visibility. Any dust should be removed from the lens with chamois leather. I would caution all amateurs against attempting to view the sun through a telescope without thorough protection, let them remember the light is both focused and magnified. It will certainly injure the sight, possibly occasion blindness. When the covering of the object glass is finished, the eye-piece will need some attention. Obtain some pieces of stained glass (blue is suitable) see there are no scratches on them, cut two or three into circles exactly fitting a cardboard tube which must be made to slip on over the eye-piece end. The glass may be cut easily enough with a pair of scissors if it is held under water at the time. Fix the telescope securely, the firmer the better, because every motion is magnified according to the power used. When I say fix the telescope, of course I mean upon a moveable, because the sun will need to be followed as it progresses. If these directions are properly attended to a very fair observation will be obtained.

Those that are without instruments of any kind need not despair, let them deprive the sun of his glare with some smoked or colored glass and they will discern a tiny black dot making its way across his disc. On the eventful morning of Dec. 6th, if the sky is clear, take up position a little before nine o'clock. To those who may feel sufficient interest to watch the most beautiful star that ever sparkles from the depths of the firmament along her future path I give the following:—

1882—83

Feb. 20.	Venus at superior conjunctions with the sun.
Sept. 26.	" greatest elongation East, 46 deg 31 min
Nov. 1.	" at greatest brilliancy
Dec. 6.	" at inferior conjunction (Transit)
Jan. 9.	" at Perihelion (nearest sun)
Jan. 11.	" at greatest brilliancy.
Feb. 16.	" greatest elong. W, 46 deg 45 min.
May 2.	" Aphelion (furthest from sun)
May 10.	" Conjunction with Mars passing 45 min S
June 19.	" " Saturn passing 35 min N
July 21.	" " Jupiter passing 10 min N
Sept. 27.	" Venus at superior conjunctions with the sun.

The transit elements are as follows:—

Greenwich mean time to Right Ascension	4 h. 20 m. 2 s.
Venus and Sun's Right Ascension	16 h. 52 m. 43 s.
Venus Declination South	22 deg. 14 m. 12 s.
Sun's	22 deg. 33 m. 6 s.
Venus true semi-diameter	31 s.
Sun's	16 m. 13 s.

The transit begins on the eastern side of the sun and passes off on the western. It may be expected to commence at Montreal 9a. 1 m. 40s. Internal contact at Ingress, when the phenomena of the "black drop" may occur, 9 h. 22 m. 1 s. Least distance of centres (Middle of Transit) 12 h. 9 m. 45 s. Internal contact at Egress ("black drop" again possible) 2 h. 57 m. 29 s. External contact at Egress (end of Transit) 3h. 17 m. 52 s. These times are corrected from tables in Nautical Almanac and are reliable, although Venus may upset them by commencing to transit a little earlier or later than anticipated.

A word in conclusion to those who give but little attention to this subject and may have seen the affair anticipated in every newspaper for months past. Once for all I advise them not to expect a grand sight, a solar eclipse is far more impressive, and an occultation of a large star by the moon more noticeable, the intrinsic value is known only to the astronomer, whose toil and watching is condensed in a few moments observation to the end that a most puzzling question, asked in vain for ages, may be definitely answered.

WALTER H. SMITH.

Montreal, Oct. 23rd, 1882.

(Toronto Mail.)

OBSERVERS PRACTISING FOR THE GREAT EVENT.

Mr. Carpmæl, Superintendent of the Meteorological Office in this city, has returned home from a six weeks' trip in the Eastern Provinces. His trip, although a very pleasant one, was not for pleasure, but to make the necessary arrangements for the great astronomical event of the century—the transit of Venus. Mr. Carpmæl first visited Montreal, where, in conjunction with Prof. Johnston, of McGill College, Prof. McLeod, and others, he had a long practice with the "model," and instructed the observers in their work. The model is a mechanical arrangement: whereby a ball or disc is made to pass across an illuminated space, and supplies a very good artificial transit for training the observers for the 6th of December next. The observers from Fredericton, Quebec, and Montreal were present. The probability is that the weather will be favorable at two of the stations on that day, and it so Mr. Carpmæl is sanguine of success. The importance of obtaining more accurate data on which to calculate the distance of the sun cannot be over estimated, and as there will not be

ANOTHER TRANSIT FOR A CENTURY

it is to be hoped the weather will be fine at a large number of the stations on this occasion. Mr. Carpmæl next visited Quebec, Halifax, Rimouski, Digby, Yarmouth, and Fredericton for the purpose of observing and calculating the magnetic declination at these places. As soon as they are through with the model in Montreal it will be sent to Toronto for the purpose of practising the Western observers.

The new equatorial for the observatory here has reached Montreal, and will probably arrive at its destination within the next few days. The massive pillar is ready for its necessary to place it in position, and make the necessary adjustments. To give an idea of how small a matter may affect the observations, it may be stated that the passage of a wagon two or three hundred yards from the instrument will often cause a very perceptible tremor. The passage of a railway train even more than a mile away will sometimes set a star dancing about in the field of the instrument, much to the disgust of the observer. Every possible arrangement has been made, however, to secure solidity for the instrument at the Toronto observatory. It is intended to use it as soon as the transit is over for making observations on the sun.

I am convinced that we have a degree of delight, and that no small one, in the real misfortunes and pains of others.—[Burke]
Conscience is a coward, and whose fault it is not strength to prevent, it seldom has justice enough to accuse.—[Goldsmith]
It is safer to affront some people than to oblige them; for the better a man deserves the worse they will speak of him.—[Seneca]
Peace rules the day where the reason rules the mind.—[Collins].