Taken from Mr. Elvins's scrap posted in here by C. A. Chant - 1914 - (Given to C.A.S. May 29, of Spring 1914)

See p. 22 of this book

SCIENTIFIC OPINION.

TORONTO ASTRONOMICAL SOCIETY.

MAY 4TH.—Mr. Daniel K. Winder, president, read a paper relating to the late brilliant displays of Aurora, especially as they appeared on the evenings of April 15th and May 3rd. On the former occasion almost the entire sky was covered with brilliant corruscations, light sometimes arising in columns and passing the zenith, and sometimes waving like canvas thrown to the breeze. An unusual feature was the appearance of an arch of light towards both the north and the south, the latter being the more distant. On the evening of May 3rd, the light arose about 11 o'clock, and was seen as an exceedingly beautiful luminous cloud along the horizon in the north, extending from N.W. to N.E. by E. From this high bright cloud, at times majestic columns of a remarkably beautiful purple colour ascended towards the zenith, the display continuing until obscured by clouds after one o'clock, and differing from that of April 15th in being quiet and grand, while the former might be compared to a kaleidoscope, from the rapidity of its changes. Reference was made to the fact that during these displays the magnetic needle becomes restless, and varies several degrees, that lines of telegraph may be worked without the aid of the battery, and that the centre of the arch of light in the north is found to be exactly in the direction of the magnetic needle at the place of observation. He also alluded to the proximate coincidence between *solar phenomena* and the displays of Aurora Borealis and Aurora Australis as pointing to a cosmical origin like that of meteoric showers. He believed the aurora to be of electric origin, and probably connected with excessive humidity in the upper strata of the earth's atmosphere. During the display of May 3rd, he tested the aurora with the spectroscope, and also with the polariscope, and inferred from his observations that the light is exceedingly diffused, the brightest column giving a spectrum of less brilliancy than that of a fifth magnitude star. He did not think it was reflected light, as he failed to detect the slightest trace of polarization.——Mr. Andrew Elvins read a paper "On the Lunar Craters, Messier and Messier A." He had observed these spots with care, under different illuminations, in reference to the change which they have been thought to have undergone, and had come to the conclusion that in all probability they are the same now as they were seen long ago. The two craters are not alike when the sun is just rising on them, or two or three days after, when the true craters are seen filled with shadow, but they soon become two white spots like lime, and are seen thus through the greater part of the lunation. During the whole of this time they are seen precisely alike, and he thought it likely that it is the white spots to which the early observers refer, and not to the black shadows in the craters proper.——June 1st. Mr. Winder, president, in the chair, a long paper was read and an oral exposition given with illustrations by Mr. Mungo Turnbull, on the doctrine of eclipses in general, and especially on the great eclipse of the sun which will be visible from the streets of Toronto (weather permitting) on the 7th August next. The paper being the first on *practical* astronomy read before the society, the writer took occasion to notice among other things the fascination of this department of astronomy, as it is in this division especially that it gets the character of being one of the exact sciences. In every age, especially since the invention of the telescope, the magnitude, the order, and the progressive motions of the celestial bodies have arrested the attention and engrossed the faculties of the most gifted of the sons of

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men, from Pythagoras down to the present venerable astronomer royal, Professor Airy. We find every nation or tribe on earth which has made any intellectual mark in the world's progress, when exempt from the busy cares of life, has had an earnest desire to lift higher and still higher that veil which hangs between it and those wonderful sparkling objects scattered so profusely in our nocturnal sky. We find ours is no exception to the onward progress of this law. Taking, for example, this speck of space in the universe which we name the Solar System, our forefathers could only count about nine primary members, even including the great luminary of day, and that which at times doth regulate the night. Now, in 1869, we can number them by scores, upwards of one hundred having been added since Olbers discovered Pallas in 1802. Of all the members of the Solar System the moon has attracted the greatest notice, her motions have been the most scrupulously scrutinized; she has also been the most refractory, for it is only since the beginning of this century that the practical astronomer has been able to ascertain her motions with the precision attained in the cases of the other planets. The essayist enumerated a number of the causes and mentioned as an illustration that to ascertain the place of any of the planets it requires the employment of only five or six equations, but to get the moon's true place at an eclipse by the modern tables, at least twelve times that number are necessary. Tycho Brahé and Kepler were the first to register the lunar irregularities for the use of the computer. This was before the application of the telescope to accurately-graduated instruments to find her true place in the heavens. Allusion was made to the various tables which have been issued within the last century to perfect our knowledge of the lunar motions, mentioning particularly Halley's and Flamstead's. Then Meyer's, which was published in 1753, with about fourteen tabular arguments; then Mason's, about the end of last century, with twenty-two arguments; then the French Bureau of Longitude issued Burg's tables, with twenty-eight corrections. The next was Burckhardt's; and lastly, Carlini's, which brings the arguments up from fourteen to seventy-nine. Carlini's tables also include Hausen's and Airy's, two inequalities arising from the action of Venus on the lunar orbit, an addition which shows how closely the astronomer has sifted the moon's orbital variations even in her longest cycle of change, and traced them to their proper source. In the study of the mechanical phenomena of the moon's motions, as resolved by the tables, the use or value of considering space geometrically and physically was shortly touched upon, showing how here in a great measure the mind can grapple with space as a quantity, and examine clearly the positive and negative equations exhibited by the solar and lunar anomalies, and also to keep before the mind's eye the true place and position of the terrestrial and lunar apsides of the two orbits as rendered by the anomalies. The part of the subject next examined was to find the various elements by the tables to exhibit the obscuration for Toronto, that is, when the umbra in its transit over the northern hemisphere was at its nearest point to the city, and, consequently, the visible conjunction of the two luminaries. The several findings, as given by the tables, which were exhibited in large type, may be summed up as follows:—

	Toronto solar time.
First contact at Toronto	4h. 48m. 30s.
Greatest phase	5h. 46m.
Last contact	6h. 38m.
Duration.....	1h. 49m. 30s.

Greatest obscuration ..... 10½ twelfths.
Diameter of penumbra ... 4,223 miles.
" " umbra ..... 51½ "

semi-diameter

The centre of totality in its transit over the earth's disc crosses the path which Toronto describes on the 7th of August next, at the exact

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place where the city is situate, at twenty-eight minutes past four o'clock in the afternoon. Had the umbra been so far advanced on the earth at this time, Toronto would have experienced nearly midnight darkness for the space of about two minutes. In conclusion, the essayist drew a parallel between the objects sought in prosecuting the study of astronomy in our times and those aimed at by the ancients. In early times astronomy was practised only as an art, and the chief object was to know the seasons, to appoint public meetings, and to record passing events. This era has passed away, still the motions of the heavenly bodies are as closely watched; but, relative to social affairs, for a different purpose. Navigation, on which both commerce and civilization depend, has now in a great measure its foundations resting on the accurate observations made of the solar and lunar motions. Along the moon's path there are at least nine conspicuous sparkling objects that are used in determining longitude at sea. They are named nautical stars, and constitute, as it were, the great hours fixed on our sky dial-plate. One of the great objects of search at the Observatory is to register the true places of the solar and lunar centres with the above-mentioned stars—all the findings being arranged under the superintendence of the highly-gifted astronomer, Hind, so that "he whose tread is on the mountain wave, and whose home is on the deep," can pilot his vessel with safety, thus contributing directly to give prosperity to commerce and boundless wealth to our commercial cities. The bearings of this theme in every direction are of a lofty character. To the devout, especially, the motions of the two great luminaries furnish great consolation, since the mind is completely emancipated from that mental terror which seized our forefathers on the approach of an obscuration of the solar disc in a clear sky, or of the moon by night. A clear view of a presiding Divine power working by the unerring laws of nature attunes the soul to join Addison in his beautiful devotional stanza which paints the fascinating grandeur of our great luminary :—

"The unwearied sun from day to day
Does his Creator's power display,
And publishes to every land
The work of an Almighty hand."