number of minor matters discussed, President Smith read the following paper on "Pre-Historic Astronomy:"

The traveller in a desert, who reposes delighted beneath the shade of a palm tree at an oasis, may not think of the sources of strength and nourishment below him, around the trees' deep roots, hidden in the sand, gathering sustenance and increasing during the passing years. The modern astronomer, like, yet unlike the traveller, safe beneath the shade of the glorious temple that science has perfected, and whose foundations are deep on the rock of unchanging truth, cannot help but remember with reverence and gratitude the stupendous achievements, the herculean labors, the mighty tasks that his predecessors have accomplished, as well as the unconquerable persistence of purpose exhibited by them.

I know it is customary, when reviewing our so-called "progress," to sneer at the accomplishments of our predecessors, to look with pitying eye, and turn with scornful lip from the labors of earlier generations. Such shallow minds apparently forget that

"Great events from trivial causes spring,"

and fail to remember that if there were no acorns there could certainly not be any oaks.

I have often thought what a satisfaction it would be, could we, in tracing backward, lay a finger finally upon the first astronomer and say it was in this or that mighty mind our science had its beginning. We cannot do this, but we can, nevertheless, see him" in our mind's eye." Not perhaps "in the first age of mankind," as affirmed by Rolleston, because I conceive that the exigencies of existence in those barbaric ages were too great for man to find time to permit his mind to soar upwards in contemplation of sun, moon and stars. Pre-historic, primitive man, must have been too preoccupied in his daily struggle for very existence—his hand naturally turned day and night against the overwhelming forces of nature which it was his unenviable lot to contend with. The earth was his—true, but he had to subdue, to conquer it, and in that contest, of which we can now only form terrible conjectures—when the gigantic mastodon and the mighty mammoth roamed the primeval forests as well as when every man's hand was turned against his fellow, little time could have been left for anything else, much less devoted to star gazing.

Centuries ran their course, the earth became less wild, and the mind of man, not entirely occupied with a perpetual struggle for existence, had time for contemplation, time for thoughts beyond self and its preservation. Familiar with its surroundings, the soul filled with a longing for the Infinite, the eye would naturally wander heavenward and the brain busy itself with problems—speculations, the magnitude and difficulty of which, we, after others have solved them for us, can have no conception.

Astronomy, naturally, intuitively, was the first-born of the sciences. In fact it must have been almost coeval with mankind. Certainly co-existent with the dawn of civilization. Bailly asserts that astronomy began when the summer solstice was in the first degree of *Virgo*, that is, about 4,000 years before Christ. Bailly and others suppose it to have originated amongst an ancient civilized people, living in about 40° N., and that this people was swept out of existence by some sudden destruction, leaving only traces of their knowledge behind. He believed, in fact, that the first astronomers were antediluvians, and their destruction, the Noachian deluge. To this people he attributes a knowledge of the true system of the world—as enunciated in modern times by Copernicus and Galileo—the return of comets; the exact measure of the earth; the starry nature of the galaxy and the plurality of worlds. From this people the Chinese, Babylonians, Persians and Indians he declares originated, and the traditions of the Persians, Arabs and Hebrews are said to substantiate his theory.

Sir W. Drummond affirms as a fact which cannot be disputed, that at some remote period there were astronomers who knew that the earth, itself a planet, revolves around the Sun. According to Origen, as far back as the time of Enoch, the constellations had already been named and divided.

Be this as it may, it seems to me that the first astronomers must have been shepherds, whose business led them to watch and tend their flocks. While primitive man slumbered or caroused, they needed to be on the alert to guard their charge from human or animal robbers. Weary with the length of their vigils, without any method of computing time, it was but natural that such men should turn their eyes towards the heavens, and these would soon become the dial on which the watches of the night were recorded. Their work, their discoveries, their mapping of the heavens, have survived, not only their existence, but the rise, the fall of States and Empires, have remained for thousands of years, and are likely to endure as long as science has a votary.

Let us stand beside those primitive observers and count with them the secrets which the starry vault yielded, after years of patient watching, toil and labor. The moon, because of her size, and above all—her changes, must have been the object first watched. On that birth night of astronomy, perhaps she was but a thin crescent alongside some bright star, say *Aldebaran*, in *Taurus*. Her place, supposed fixed in the sky, is marked down. The succeeding night she is again noted. She is discovered to have increased in light, the circle of illumination is wider, and more wonderful still she appears to have moved! *Aldebaran*, last night to the east of her, is now to the west! Surely there must be some mistake. Once again, her position is accurately noted, and perhaps for verification, a rough diagram is cut in an adjacent stone. The third evening arrives, and one by one the larger stars drop into sight. There can now be no mistake, the diagram on the stone proves it—the moon is discovered to be moving among the stars. Marching steadily along, she was found to make an entire circuit in the heavens, until she once more reappeared, a thin crescent in the evening sky.

Discovery must have led to discovery. These primitive astronomers doubtless concluded that, if the moon made the whole circle of the heavens in a given time, that at similar changes she would always be alongside similar stars. This was found not to be so. In her successive revolutions from "full" to "full," she was found ever lagging behind, and to be apparently moving backwards among the stars. This led to the additional discovery that the constellations along the moon's path were constantly moving to the west, being absorbed in the sun's rays, and finally re-appearing before sunrise in the east. Thus it became apparent that the sun was also moving slower than the moon, and that finally, after the lapse of what was found to be a year, he had returned to his original position. The sun's motion was found to coincide with the seasons; the seasons were attributed entirely to him, and it is small cause to wonder that, in those early ages men, unacquainted with the majesty of the infinite, worshipped the sun as a god, mistaking the creature for the Creator. They accordingly celebrated his solstices when he was highest or lowest, with great solemnity about the dates that we celebrate Christmas and St. John the Baptist days, and his equinoxes when he moved from one declination to another, at the time when we celebrate Annunciation and Michaelmas.

In watching sun and moon, the need of tracing their paths through the heavens led to the mapping of the stars into groups; hence the great antiquity, long anterior to the days of the Egyptian astronomers, to whom these figures are wrongly ascribed by Arago—of the signs of the Zodiac. The vernal equinox is at present in the Constellation *Pisces*, in the days of the Jews and Greeks it was in *Aries*, the former taking the latter sign, the lamb, as their symbol; earlier still the vernal equinox was in *Taurus*, the Bull, proved by the reverence shown that animal by the ancient Egyptians. Earlier yet, it was in *Gemini*, a time looked back to by those we call the Ancients, as the "Golden Age" of love and prosperity, when all things multiplied and were abundantly fruitful.

In tracing the Sun's course from North to South,—from midsummer to midwinter—the shepherd astronomers were