

tions like the Pan-American Exposition, to be held in 1901, can we hope to compete with the German in markets which he hopes some day to consider exclusively as his own.

#### ROBERT SIMPSON WOODWARD.

BY MARCUS BENJAMIN, PH.D.

After an absence of thirteen years the American Association for the Advancement of Science returns to New York and will hold its forty-ninth meeting in this city during the week beginning with June 25.

In 1887, Dr. Samuel P. Langley, the secretary of the Smithsonian Institution, presided over the meeting, succeeding on that occasion Edward S. Morse, the director of the Peabody Academy of Science, in Salem, Mass. For this meeting Robert S. Woodward has been chosen to preside, and he will succeed Grove K. Gilbert, of the United States Geological Survey, who was elected last December to fill the unexpired term of the late Edward Orton, a sketch of whom appeared in the SCIENTIFIC AMERICAN for August 18, 1899.

Prof. Woodward was born in Rochester, Mich., on July 21, 1849. Loyal to the State of his birth, he entered the University of Michigan, in Ann Arbor, and was graduated there in 1872 with the degree of Civil Engineer. An appointment as assistant engineer in the United States Lake Survey was offered to him, and for ten years he continued in that service.

In 1882, he resigned from the Lake Survey to become astronomer on the United States Transit of Venus Commission. Two years later he passed to the service of the United States Geological Survey with which he remained for six years, serving in the successive capacities of astronomer, geographer, and chief geographer. He then became an assistant in the United States Coast Survey, with which he continued for three years.

The death of Prof. William P. Trowbridge, in 1892, created a vacancy in the scientific faculty of Columbia University that at first sight seemed almost impossible to fill, and indeed the department over which he had charge was so extended that the difficulty was only met by dividing his chair into several co-ordinate professorships. To that which was designated as Mechanics, Prof. Woodward was called, he having gained his professorial title by filling, during 1886-88, the chair of civil engineering in the Corcoran Scientific School of Columbia University in Washington, D. C., where he acquired much reputation by his success as a teacher.

The choice of the trustees proved a wise one, for with the growth of the college into a university, additional duties have been assigned to Prof. Woodward in the accomplishments of which he has shown exceptional ability. It is not necessary to enumerate the various offices that he holds in connection with Columbia, and they are many, for the most important is that of Dean of the School of Pure Science, which he has filled since 1895, and it is sufficient to show the high esteem in which he is held by his associates.

His scientific work has included numerous contributions in the domains of precise mensuration, geodesy, the physics of the earth, physical astronomy, and pure mathematics, and of the hundred or more titles of papers that he has published the following are the more important: "On the Actual and Probable Errors of Interpolated Values from Numerical Tables by Means of First Differences" (1882); "Results of Experiment to Determine the Variations in Length of Certain Bars at the Temperature of Melting Ice" (1883); "On Errors Incident to Interpolated Values from Numerical Tables" (1886); "On the Free Cooling of a Homogeneous Sphere" (1887); "On the Conditioned Cooling and Cubical Contraction of a Homogeneous Sphere" (1887); "On the Diffusion of Heat in Homogeneous Rectangular Masses, with Special Reference to Bars Used as Standards of Length" (1887); "On the Form and Position of the Sea Level" (1888); "The Effects of the Atmosphere and Oceans on the Secular Cooling of the Earth" (1890); "Recent Experience of the United States Coast and Geodetic Survey in the Use of Long Steel Tapes for Measuring Base Lines" (1893); "The Iced Bar and Long Tape Base Apparatus, and the Results of Measures made with them on the Holton and St. Albans Bases" (1892); "An Historical Survey of the Science of Mechanics" (1894); and "Mechanical Interpretation of the Variations of Latitudes" (1895); and in book form the "Smithsonian Geographical Tables" (1894), a volume of nearly three hundred pages, published by the Smithsonian Institution.

The degree of Ph.D. was conferred on him by his Alma Mater in 1892, and in 1896 he was chosen to membership in the National Academy of Sciences. For more than ten years he has been an associate editor of The Annals of Mathematics; and since 1894 he has been an associate editor of Science; also, he is one of the editorial corps of The Columbia Quarterly.

The American Mathematical Society has honored him by successive elections to the offices of treasurer, vice-president, and president, and he is now president of the New York Academy of Sciences.

He joined the American Association for the Advancement of Science, at its Philadelphia meeting held in 1884, and a few years later was elected to the vice-presidency over the section of Mathematics and Astron-

omy; delivering an address at the Toronto Meeting in 1889, on "The Mathematic Theories of the Earth," which attracted considerable attention and was largely reprinted in the scientific journals of this country. In 1894, he was chosen treasurer of the association, an office which he still holds. Prof. Woodward has on several occasions been urged for the presidency of the association and would have been elected at the Boston meeting two years ago had he not gracefully withdrawn in favor of Prof. Edward Orton.

Applied Mathematics has no more distinguished representative in this country than Prof. Woodward, and the association has honored itself by choosing its most loyal member in that branch of science to preside over its sessions to be held in this city.

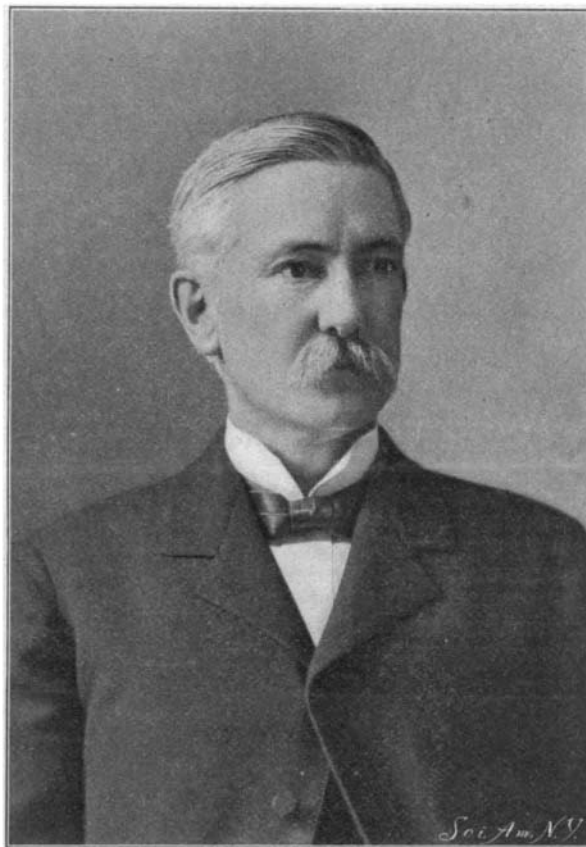
#### THE HEAVENS IN JULY.

BY HENRY NORRIS RUSSELL, PH.D.

Astronomers have never had less occasion to complain of the weather than on the 28th of last May. All along the eclipse tracks, from the Gulf of Mexico to Northern Africa, cloudless skies were the rule, and no one seems to have been unable to see the sun.

But for this very reason, it will be some time before the results of the day's observations are fully known. At the time of writing it is hardly probable that all the eclipse plates have been developed, and their measurement and reduction, especially in the case of those of the spectrum, and those made in the search for a possible intra-mercurial planet, will take a lone time.

The present statement must, therefore, deal simply with some of the results obtained by the Princeton University party stationed at Wadesboro, N. C.



ROBERT SIMPSON WOODWARD.

The eclipse was an unusually bright one, a great deal of light being diffused into the shadow from the illuminated air outside its limits, so that only first magnitude stars were visible, and it would have been perfectly easy to read an ordinary watch face during totality.

The observations of the corona and lower layers of the sun's atmosphere showed that the sun's surroundings were in a decidedly quiescent state. The flash spectrum was faint, and the prominences relatively few—only one being large—while the unknown gas which produce the green line in the spectrum of the corona was conspicuous by its absence, being too faint to be seen or photographed at all, and disappointing those who tried to observe it.

The form of the corona was very close to that predicted by Hansley, showing long equatorial extensions and short curved rays near the poles.

The inner corona showed very little telescopic structure, with no conspicuous evidence of connection with the prominences.

The shadow bands, which appear just before and after totality, were well seen. They moved in different directions at the stations only a short distance apart—a circumstance which strongly supports the theory that they originate in the earth's atmosphere.

About fifteen good negatives of the corona were obtained with instruments up to 12 feet focal length. Those, with exposure of 20 seconds, show extensions of the corona considerably more than the sun's diameter in length.

#### THE HEAVENS.

At 10 P. M. on July 15, the constellations of summer are visible to great advantage.

The Milky Way forms a great arch across the east, with one foot almost under the pole and the other in the extreme south; and along its line are the constellations described last month.

The present is a good time to note the complex structure of the Galaxy. From Cygnus to the southern horizon it is divided into two streams of unequal brightness and variable width, with several marked condensations and knots, of which the brightest are in Sagittarius, near the southern horizon.

In the northwest appears the Great Bear, standing on his head, and the west is lighted by Arcturus and Spica, the latter being near its setting. The southern constellation Scorpio and Sagittarius are at their highest above our horizon. Scorpio is identified by the presence of Jupiter within its borders, and Sagittarius by the fainter and yellower Saturn and also by the little group of stars called the Milky Dipper, which, though it is in the Milky Way, must always be empty, for it is wrong side up.

In the southeast is a pair of moderately bright stars close together which is worth looking at. They are Alpha and Beta Capricorni and are both double. Alpha—the upper one—has a close companion on the right and a fainter and more remote one on the left. Both are visible to a good eye without a glass. Beta shows in a field glass a still closer companion of the seventh magnitude. With the telescope the stars are much more remarkable. The companions of both Alpha and Beta are double in powerful telescopes, and the companion of Alpha is separated by the most powerful instruments into two stars!

#### THE PLANETS.

Mercury is in Cancer, and is evening star till the last day of July, setting nearly two hours after the sun on the 1st and easily visible in the evening twilight. On the 31st he is in inferior conjunction with the sun and becomes a morning star again.

Venus is the evening star at the beginning of the month, but sets only  $\frac{3}{4}$  of an hour after sunset, and rapidly approaches the sun, passing inferior conjunction on the 7th. As she passes south of the sun she will be invisible to the unaided eye till late in the month, when she reappears as morning star, and rises about an hour before the sun on August 1. Those who have telescopes may follow with interest the narrowing of her crescent, and may, perhaps, see its extension beyond the half of her circumference, due to twilight in her atmosphere.

Mars is being slowly overtaken by the earth, but is still far from opposition. He moves eastward through Taurus during the month and rises between two and three hours before the sun.

Jupiter is in Scorpio, and is well up in the southeast at sunset. The belts on his surface and his satellites are beautiful objects in the smallest telescope. To aid the identification of the outer two, last months list of their positions is continued.

Satellite III. will be east of Jupiter on the 1st, 8th, 15th, 22d and 29th, and west on the 4th, 11th, 18th and 25th.

Satellite IV. will be east on the 6th and 23d, and west on the 15th and 31st.

Saturn is just past opposition and is visible throughout the night, but as he is as far south as possible and at his greatest distance from the sun the present opposition is very unfavorable.

He figures, however, in the most interesting astronomical event of the month, for American observers—an occultation on the 10th visible throughout the United States.

As in the case of a solar eclipse and for the same reason, the time of the phenomenon is different at different places. At Washington Saturn disappears behind the moon's dark limb at 10:43 P. M., and reappears at 12:05 A. M. from behind the bright limb.

The local time of occultation will be about an hour earlier in the Middle West, and two hours earlier on the Pacific Coast. It will take about a minute and a half for the moon to hide the planet, so that the gradual character of the decrease of its light will be evident to the naked eye, while with the telescope the spectacle of the moon's dark limb slowly and steadily hiding the rings and ball of the planet will be one of uncommon interest.

Uranus is in Scorpio east of Jupiter, and Neptune is too near the sun to be seen.

#### THE MOON.

First quarter occurs on the night of the 4th, full moon on the afternoon of the 12th, last quarter on the morning of the 19th, and new moon on the afternoon of the 26th. The moon is farthest from the earth on the 3d and again on the 31st, and nearest on the 15th.

In addition to the occultation of Saturn there should be noted conjunctions of the moon with Jupiter on the afternoon of the 8th, Uranus the following morning, Mars on the afternoon of the 22d, Neptune on that of the 23d, Venus on the forenoon of the 24th and Mercury on the night of the 26th.

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