

Book Notices.

The New Astronomy. By SAMUEL PIERPONT LANGLEY, PH.D., LL.D. Square 8vo., illustrated. Boston and New York: Houghton, Mifflin & Co. Toronto: Wm. Briggs.

Within a few years there has come into existence what may be called an almost entirely new science, that of Celestial Physics, or the New Astronomy. It questions the heavenly bodies as to their physical constitution and their relations to man in his existence on earth. This new science has made some wonderful discoveries, many of which are recorded in the handsome volume before us. These fairy tales of science are of extraordinary interest, and illustrate the saying of Mrs. Browning, "God is far the sweetest poet, and the real is His song."

Our author starts out with a study of the sun. It is hard for us to realize that this orb is so vast that if the earth were in its centre the moon might go on moving in her present orbit 240,000 miles from the earth, *all within the globe of the sun itself*, and have plenty of room to spare. It is known that sensation occupies a definite time in travelling along the nerves, but it is hard to conceive that the sun's distance is so great that if one could reach it with his arm it would take over one hundred years to feel the sensation of being burned by its heat.

The strange phenomena of sun spots, with their relations to good and bad harvests and commercial panics, are fully described. Some of these spots are more than five times the entire surface of the globe, both land and water. The book is copiously illustrated with diagrams, many of them drawn to the scale of 75,000 miles to an inch, by which we are shown the results of the tremendous cyclones and explosions in the sun, driving vast volumes of hydrogen gas to the height of 200,000 miles from its surface.

The calculations as to the sun's energy almost stagger the imagination. In every minute the sun's heat, falling on the earth, would raise from freezing to boiling point 37,000,000,000 tons of water. Yet, so little of the sun's heat does the earth intercept that the sun could warm 2,200,000,000 worlds like ours. In other words, the sun's concentrated energy could convert into vapor in a second a column of ice fifteen miles in diameter and 240,000 miles long. By what means is this enormous radiation of heat sustained? Not by a rain of meteors into the sun. All the coal of Pennsylvania shot into the sun would maintain its heat for less than the thousandth part of a second. If the sun were a solid block of coal it would be burned out to a cinder in less time than man has been upon the earth. Our author's answer to the above question is that it is the shrinkage of the sun at the rate of about three hundred feet in diameter a year. On this basis the whole future radiation of the sun, including all possible fall of meteors, will not last sixty million years. The solar temperature is not less than 3,000 degrees centigrade, by which thermometer water boils at one hundred degrees. The heat from any single square foot is eighty-seven times that of molten steel, and the light is 5,000 times as great. When all the coal and other fuel in the earth is consumed, men can still derive mechanical energy from the sun to move all the machinery of the world, not only of the present, but of the future; but the seats of empire will have to be removed to what are now heated deserts of the earth—to the Sahara, to Arizona and other super-heated areas.

In like manner as he has discussed the sun in his physical aspects, our learned author takes up in succession the planets, the moon, meteors,