

ago, and I think from what I have said you will be able to calculate a result that will, I dare say, astonish you. In these forty minutes we have moved about 45,000 miles. No doubt my lecture commenced in this hall, and in your presence; but can I truly say I began it here? Well, no; I began it not here, but at a place 45,000 miles away; but we have all been travelling together, and the journey has been so very smooth and free from all jolts that we never thought anything about the motion. We are about to discuss one of the grandest truths in the whole of nature. We have had occasion to see that this sun of ours is a magnificent globe immensely larger than the greatest of his planets, while the grandest of these planets is immensely larger than this earth; but now we are to learn that our sun is, after all, only a star not nearly so bright as many of those which shine over our heads every night. We are comparatively close to the sun, so that we are able to enjoy his beautiful light and cheerful heat. All those other myriads of stars are each of them suns, and the splendour of those distant suns is often far greater than that of our own. It is impossible to make a fair estimate when we find ourselves situated close up to one star and a million times as far from the other. When we make an allowance for the imperfections of our point of view, we are enabled to realise the majestic truth that our sun is no more than a star, and that the other stars are no less than suns. In addition to those stars the largest telescopes show us there are myriads which make their presence evident in a wholly different way. It is only in quite recent times that an attempt has been made to develop fully the powers of photography in representing the celestial objects. On a photographic plate, which has been exposed to the sky in a great telescope, the stars are recorded in their thousands. Many of these may, of course, be observed with a good telescope, which apparently no one ever could see, though the photograph is able to show them. We do not, however, employ a camera like that which the photographer uses who is going to take your portrait. The astronomer's plate is put into his telescope, and then the telescope is turned towards the sky. On that plate the stars produce their images, each with its own light. Some of these images are excessively faint, but we give a very long exposure of an hour or two hours; sometimes as much as four hours' exposure is given to a plate so sensitive that a mere fraction of a second would sufficiently expose it during the ordinary practice of taking a photograph in daylight. We thus afford sufficient time to enable the fainter objects to indicate their presence upon the sensitive film. Even with an exposure of a single hour a picture exhibiting 16,000 stars has been taken by Mr. Isaac Roberts, of Liverpool. Yet the portion of the sky which it represents is only one ten-thousandth part of the entire heavens. It should be added that the region which Mr. Roberts has photographed is furnished with stars in rather exceptional profusion. Here, at last, we have obtained some conception of the sublime scale on which the stellar universe is constructed. Yet even these plates cannot represent all the stars that the heavens contain. We have reason for knowing that with larger telescopes, with more sensitive plates, with more prolonged exposures, ever fresh myriads of stars will be brought within our view. You must remember that every one of these stars is truly a sun, a lamp, as it were, which doubtless gives light to other objects in its neighbourhood, as our sun sheds light upon this earth and the other planets. In fact, to realise the glories of the heavens, you should try to think that the brilliant points you see are merely the luminous points of the otherwise invisible universe. I must again refer you to the book "Starland" for the illustrations of the distances of the stars, but I must borrow from its pages one that is specially adapted to our present purpose. There is a bright star, Vega, or Alpha Lyrae, a beautiful gem, but so far off that the light from it which we now see started before many of my audience were born. Supposing that there are astronomers residing on worlds amid the stars, and that they have sufficiently powerful telescopes to view this globe, what do you think they will observe? They will not see our earth as it is at present, they will see us as we were years ago. There are stars from which, if England could now be seen, the whole of the country would be observed at this present moment to be in a great state of excitement at a very auspicious event. Distant astronomers might observe a great procession in London, amid the enthusiasm of a nation, and they could watch the coronation of a youthful queen. There are other stars still further off, from which, if the inhabitants had good enough telescopes, they would now see a mighty battle in progress not far from Brussels; they would see one army dashing itself time after time against the immovable ranks of the other. I do not think they would be able to hear the ever memorable "Up Guards, and at them," but there can be no doubt that there are stars so far away that the rays of light which started from the earth on the day of the Battle of Waterloo are only just arriving there. Further off still, there are stars from which a bird's-eye view could be taken at this very moment of the signing of Magna Charta. There are even stars from which England, if it could be seen at all, would now appear, not as the great England we know, but as a country covered by dense forests, and inhabited by painted savages, who waged incessant war with wild beasts that roamed through the island. The geological problems that now puzzle us would be quickly solved could we only go far enough into space, and had we only powerful enough telescopes. We should then

be able view our earth through the successful epochs of past geological time; we should be actually able to see those great animals whose fossil remains are treasured in our museums, tramping about over the earth's surface, splashing across its swamps, or swimming with broad flippers through its oceans. Indeed, if we could view our own earth reflected from mirrors in the stars we could still see Moses crossing the Red Sea, or Adam and Eve being expelled from Eden. I hope that the reading of "Starland" will, at all events, induce you to make a beginning of the study of the heavens, if you have not already done so. If you have the advantage of a telescope, so much the better; but if this is impossible, make the best use of your own eyes. Do not put it off, or wait till you get someone to teach you. If it be clear this very night, go out and find the Great Bear and the Pole Star, and as many of the other constellations as you can, and at once commence your career as an astronomer.

AMERICAN MILLIONAIRES.

THE New York *World* has published a list of Americans who are worth 5,000,000dols. or over. The list is a long one, and the *World* informs us that a thousand persons in America who are worth 1,000,000dols. or more. The richest individual in Europe is the Duke of Westminster, whose fortune is 50,000,000dols. It is the inherited accumulations of centuries of an entailed estate. The richest men in America are John D. Rockefeller and William Waldorf Astor, each estimated to have 125,000,000dols. Every cent of Rockefeller's money has been made within a few years in standard oil. He originated the pipe lines for petroleum. He began life as a newspaper reporter, and when the happy thought of doing something in oils struck him he was the keeper of a small store in Cleveland, O.

The Rothschilds of Europe are together worth nearly a billion dollars, but there are so many of them that no individual has over 40,000,000dols. The Vanderbilt properties are valued at 250,000,000dols, but held in so few hands that, of the younger generation, Cornelius has 80,000,000dols. and William K. 75,000,000dols.

The United States is the richest country in the world, and contains more millionaires than probably all the nations of Europe together. We are not the most wealthy per capita of population, however. Australia has that distinction. But there are numerous American citizens, plain or otherwise, according to the degree of snobbery to which they are inclined, who are richer than any monarch of Europe, Queen Victoria not excepted, and she is the richest ruler in the world.

Jay Gould, the strange, silent man of iron, heaps up wealth with as much determination as he did when he began life as a partner in a sawmill that shortly became bankrupt, causing Mr. Gould's partner to commit suicide. Jay Gould is already worth 100,000,000dols., but it is his ambition to become the richest man in the world. For this he toils on day by day, and there is every reason to believe his modest ambition will be realised if he lives long enough. The richest man of modern times, perhaps of any time, was William H. Vanderbilt, whose possessions amounted to 160,000,000dols.

The Astors' estate is in land and realties. They draw their rents. Their estate is the oldest great one in America, and perhaps managed in the most conservative way. "Only an earthquake devastating Manhattan island could wipe it out." Collis P. Huntington, down in list at 40,000,000dols., was the son of a small farmer in Connecticut. He began life as a peddler of Yankee clocks, and then went to California when the gold fever broke out.

Many of the millionaires have done well with their money. They have cultivated and refined the taste of Americans by bringing into the country noble works of art. They have also improved American live stock to an immeasurable extent. The Jersey cattle, blooded sheep and turf horses, as well as the magnificent Clyde and Percheron horses owe their general distribution over the United States largely to the interest American rich men have taken in improved live stock. Let us give them their due.

Among persons in the *World's* list worth 5,000,000dols or more are two preachers, Rev. Charles Hoffman and Rev. Dean Hoffman, who have 5,000,000dols each. Here is the list of those who have as much as 10 000 000dols or more:—John D. Rockefeller, 125,000 000dols; William Waldorf Astor, 125,000,000dols; Jay Gould, 100,000,000dols; Cornelius Vanderbilt, 80 000,000dols; William K. Vanderbilt, 75,000,000dols; Collis P. Huntington, 40,000,000dols; Russell Sage, 35,000 000dols; John I. Blair, 30,000,000dols; William Rockefeller, 30,000,000dols; Leland Stanford, 30,000,000dols; Mrs. Hetty Green, 30,000,000dols; William Astor, 30,000,000dols; Darius O. Mills, 25,000,000dols; Philip D. Armour, 25,000,000dols; Mrs. Mark Hopkins, 25,000 000dols; Charles Crocker estate, 25,000,000dols; Henry Hilton, 20,000,000dols; E. S. Higgins estate, 20,000,000dols; George Westinghouse, Junr., 15,000 000dols; Anthony J. Drexel, 15,000,000dols; J. Pierpont Morgan, 15,000,000dols; Andrew Carnegie, 15,000 000dols; Oliver H. Payne, 15,000,000dols; Frederick W. Vanderbilt, 15,000,000dols; George W. Vanderbilt, 15,000,000dols; Mrs. Elliot F. Shepard, 12,000,000dols; Mrs. William D. Sloane, 12,000,000dols; Mrs. Hamilton McK. Twombly, 12,000,000dols; Mrs. W. Seward