

ASTRONOMY AND OUR SOLAR SYSTEM

BY AN EMBRYO ASTRONOMER.

(Continued from last Sunday.)

Before paying our respects to the next planet in this system, a word or two about the "man in the moon" may not be amiss, since more is known about this body than any other, because of its nearness to us.

The moon's diameter is 2000 miles, and its circumference is 6500 miles. It is distant from us about 240,000 miles. It revolves around the earth from west to east in 29 days 12 hours 44 minutes and 3 seconds; this is called the lunar month.

The moon, as seen through a telescope, has its mountains, valleys and plains. It has no atmosphere, therefore, no rivers, lakes or seas. There are comparatively few mountain ranges. One range, called the Apennines, is more extensive than all the others. It has a length of about 400 miles. The highest mountains rise to heights of from 15,000 to 20,000 feet. There are also isolated peaks to be found on the surface of the moon. And one of the most remarkable of these is the "Pico."

It is claimed that the heights of the lunar mountains are more accurately known than those of the mountains on the earth.

As regards the surface of the moon we are able to speak of one side only. The other side is hidden from us, because as the moon revolves once around the earth, it also turns on its own axis just once around.

The rise and fall of the tides are caused, principally, by the attractive power of the moon. The sun also has a certain influence, but the moon has a greater attraction. The tides are caused by the moon's much superior attraction, and in some instances, cause of life.

It was one of the wise (?) that claimed not only intelligent and animated creatures were subject to its influence, but that the minerals and vegetables were under its control. At full moon, cucumbers grow larger, as well as beet-root, turnips, hills and saffrons. Herbs sown while the moon is increasing will be of peculiar excellence.

It is attributable to an eclipse of the moon, that Niclas, the Athenian general, delayed his departure from Syracuse for some months. The moon was the cause of this delay and blocked the port; when Niclas made the attempt to retreat by land he was overtaken, and, after losing 40,000 men, surrendered; the ruin of Athens is dated from this calamity.

The Chinese astronomers were held responsible for the correctness of their calculations. During the reign of one of the Chinese emperors, his two chief astronomers were condemned to death because of their neglect (?) in announcing the precise time of a solar eclipse.

Mars is the last or fourth one of the first group of planets. It is much smaller than Venus or the earth, but is visible to the naked eye. Mars is called the "heaven god of war," and so called on account of its fiery, reddish color. The length of Mars' day is only 40 minutes longer than the earth's. Its year is a little less than that of the other planets.

Very small moons have been found circling around this planet; one of them makes the revolution in 39 hours, and the other makes it in the short period of 7 1/2 hours. Astronomers believe that Mars has its continents and tracts of water, like those of our own globe.

Having briefly passed over the first four principal planets, we now come to the asteroids or telescope planets. These asteroids, which are hidden behind the sun, and make one revolution of it, will take about three or four years; and those lying farthest, to travel once around him take about six or seven years.

New members of this group are sometimes found. The number now known is something over 400. The largest of the asteroids is about 900 miles in diameter, while others measure only a few leagues.

Among the other planets, we find the planetoids, we meet Jupiter as the first one of the second group nearest the sun. It is distant from the sun about 490,000 miles. Jupiter is visible to the eye without telescopic aid; it shines with a brilliant white light, and which exceeds that of every other planet except Venus; its size is enormous; its mass largely exceeds that of all the other planets combined. Its diameter is about 8,000 miles; but it is uncertain as to the measurements of Jupiter, owing to a dense atmosphere or heavy clouds surrounding it, which is supposed to be hidden by the sun.

Jupiter's day is 10 hours' duration only; but its year makes up for the unusually short day; nearly 12 of our years go by before Jupiter has finished one revolution of the sun.

This "giant planet," in his long journey around the sun, does not travel alone; he is accompanied by four moons, which are constantly circling around him.

Leaving Jupiter, we next reach the most interesting of all the planets in our system, viz., Saturn. This planet is not so large as Jupiter, but there is no very great difference in size. It was first spoken of as "twins." This planet is plainly visible without the telescope's aid, and its color is a dingy reddish light, as seen through a smoky atmosphere. Saturn's day is about the same as Jupiter's; Jupiter's long annual journey seems short beside Saturn's journey of 30 earthly years.

The Saturnian system, or family, we might term it, is more wonderful than Jupiter's. Eight moons travel ceaselessly around him; and in addition to the eight moons there are three curious but magnificent rings, which revolve around him constantly. The first one, which lies almost over his equator, has a dusky appearance; the next, or middle ring, is very brilliant; and the third, outside the second, is fainter.

The theory now generally held by astronomers is that the rings are composed of a cloud of satellites, or of little "moonlets," which revolve in the same plane around the planet. Just how small they are no one knows yet.

The size of Saturn has perplexed astronomers as much, and for the same reason, as it has perplexed the astronomer. Until the year 1781 Saturn was believed to be the outermost planet of the solar system; but one night Uranus was discovered by Herschel, while he was busy exploring the heavens with a powerful telescope. This planet is 900,000,000 miles from Saturn, and had often been seen; but it was not known as a member of the solar system.

Uranus is notable as the first planet ever "discovered"; all that were known when Herschel found it had been known from prehistoric antiquity. It was supposed that the outermost planet was discovered; but not there was yet another. Astronomers know with great exactness the path of each planet in the heavens. Uranus, at first supposed to be the outermost one, would not follow the path, or orbit, as laid down by astronomers; they were confident that their calculations were correct, consequently the planet must be another planet beyond, whose attractive power prevents Uranus from following its assigned orbit. And it proved to be so. The name of this "new body" is called Neptune. Its discovery is "probably one of the greatest achievements of mathematical science ever recorded."

Little is known about Uranus, two outer planets, owing to their great distance from us. Uranus is equal to 7 1/2 earths in size, and Neptune is equal to about 3 1/2. When about 84 of our years have rolled by, Uranus has made but one revolution of the sun; Neptune takes about 165 of our years to make its annual revolution. Uranus is known to have four moons, and Neptune is believed to have two.

Origin of the Solar System. It was the opinion of La Place, a celebrated French astronomer, "that the origin of the solar system, which is now mostly found in a consolidated state, in the sun and planets, was once a vast

nebula, or gaseous vapor, extending beyond the orbit of the most distant planets; that in the process of gradual condensation, by attraction, a rotary motion was engendered and imparted to the whole mass; that this motion caused the consolidating matter to assume the form of various concentric rings, like those of Saturn; and finally, that these rings collapsed at their respective distances, and, still retaining their motion, were gathered up into planets, as they are now found to exist.

By the invention of the telescope, the Copernican theory, of which previous mention has been made, was sustained. It is not known that the ancients had any knowledge of the telescope. It was invented in 1608 by Galileo, an Italian philosopher, who was the first man to construct one on principles of science; he is, therefore, awarded the honor of its invention.

The telescope, as constructed by Galileo, magnified objects by 30 times, it being only one inch in diameter. With this simple instrument, however, he saw that the moon was full of inequalities, like mountains and valleys, the spots on the sun, the satellites of Jupiter, the motions of Venus, and hundreds of new stars were observed in all parts of the heavens.

At the present time telescopes are used in all parts of the world. They are used in astronomy, in navigation, in surveying, in military operations, and in many other ways. They are used in all parts of the world.

There are several magnetic islands and points along the Atlantic coast of South America. Near the mouth of the Rio de la Plata is a famous magnetic point—the western side of the headland known as the Punta Negra—and navigators of vessels bound for Buenos Ayres or Montevideo have to be careful not to go too near it. Trinidad is another place of the same description, and one reason for its abandonment was the utter uselessness for a telegraphic station, owing to its strong magnetic powers.

France contemplates having a telescope even larger than the Yerkes, the Deloncle, so called because its construction was first suggested by M. Francois Deloncle, of the French chamber of deputies. It will be one of the interesting features of the Paris exposition in 1900, and will be the most remarkable instrument ever constructed. The object-glass will measure 4 feet 3/4 inches, and weigh 922 pounds. The lenses alone will cost between \$100,000 and \$200,000, and the completed instrument will represent an expenditure of \$350,000. It is not merely in size and cost, however, that this great telescope will be remarkable. Its focal distance will be over 180 feet; and to make a tube of that length, over four feet in diameter, capable of sustaining the great weight of the lenses, yet so delicately poised as to be easily adjusted to the changing positions of the planets, would be extremely difficult.

The telescope will be firmly fixed in a horizontal position on a masonry foundation, and the image of the stars reflected into it by a movable mirror which follows the motion of the heavenly bodies by clockwork. About the eyepiece of the telescope has been built an amphitheater, where, upon a vast screen, visitors may see the image of sun, moon or stars magnified from six to ten thousand times.

A correspondent not long since referring to the origin of the solar system uniquely stated that there must have been a long courtship, resulting in marriage, before the planets could be formed, because of an unequal division of real estate at the death of some member of the family.

We must not forget, however, that our solar system is but one of many others. What a grand aggregation of families

carrying trade to Georgian bay and thence by means of a short land haul to Montreal via Lake Ontario and the St. Lawrence.

John Morley's Journalistic Instinct. The Cornhill.

Mr. John Morley, who was a journalist before he became a cabinet minister, delighted the journalists at a press club dinner in London a few years ago by making the instance of the Black Eagle, the Order of St. John, of the Garter, and the Order of O. In all, he has over 200 crosses, stars, badges and other insignia.

Valuable Decorations. Cleveland Leader.

The orders of decoration borne by the emperor of Germany are worth over 1,000,000 marks (a little over \$20,000,000). His principal and most valuable decorations are the insignia of the Black Eagle, the Order of St. John, of the Garter, and the Order of O. In all, he has over 200 crosses, stars, badges and other insignia.

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HOLD KEY TO PUERTO RICO

REASONS WHY UNCLE SAM NEEDS DANISH WEST INDIES.

St. Thomas is the Finest Available Harbor, and it Can Easily be Made Impregnable.

WASHINGTON, Jan. 5.—The Danish West Indies, which Uncle Sam will have to purchase to prevent their acquisition by some European power, will add to our already vast island domain the small specks in the sea, with an aggregate area only as great as that of the city of Philadelphia. Of their 35,000 human souls, 10,000 are engaged in the sugar culture.

The sacred Monroe doctrine has been but one factor in Uncle Sam's concern in these islands. Long before the birth of the new century, five-sixths are negroes engaged mostly in sugar culture.

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BRITISH DEFEATS IN CENTURY

Article Written Before Disasters at Stormberg, Magersfontein, Tugela.

London Chronicle.

The disaster which occurred near Ladysmith recently, when some 300 British and Irish troops were surrounded and captured by the Boers, is only an incident in a war which must eventually end in our favor. Still, it is a serious reverse in itself, since it brings up the total number of prisoners now in the hands of the enemy to a number which probably exceeds 2000—about one-ninth of the force with which we began our campaign in Natal. Without pausing in this place to consider the tactics which led to so unhappy a result, at the very moment when Sir George White was carrying out a fairly successful operation a few miles away it may be of interest to recall some of the principal reverses of British arms during the past three generations.

Our first great disaster after the conclusion of the Napoleonic wars was the loss of 20,000 men, including British infantry and cavalry, and a large contingent of sepoys, in attempting to force the Khyber pass, in 1841. We had sent a double ex-

pedition, under Burnes, by way of Quetta and the Bolan, and under Wade by way of the Khyber, in order to back an unpopular claimant to the throne of Afghanistan, against the Dost Mahomed, who was supposed to lean to the Russians. The Khan of Khet had said to Burnes on his way up, "You have brought an army into the country, but how do you propose to take

it back again?" That is the whole gist of the matter; no one without our resolute advance, but the hill tribes, the mountains the Afghan winter, absolutely barred retreat. Of the 20,000 who retired from Cabul, an solitary doctor escaped to tell the fate of the remainder. We have no space to moralize, but it may be observed that in this case we began by backing a worthless man for an inadequate reason; we went up the country slaughtering all our prisoners without quarter, and we attempted a retreat through a blocked mountain pass in an exceptionally severe winter.

Our reverses in the Crimea were matters of commissariat and organization rather than of arms; but the results were no less war, both in blood and in money, was a disaster in itself. We do not enter it on our black list, but no historian, and few British officers, will make a polemic claim to important victories in the Crimean war. This attack upon Russia was followed at a short interval by the Indian mutiny, whereof the earlier chapters record what may be deemed the most important events of the century. The revolt of the sepoys took the Indian authorities by surprise; the country between Lower Bengal and the Punjab became, in 1857, an almost unbroken area of insurrection to which an Englishman can scarcely bear the names of Delhi, Lucknow and Cawnpore without a shudder. The awfulness of the massacres is only paralleled by the awfulness of the blocked mountain pass in an exceptionally severe winter.

We had our minor reverse during the 50 or 60 expeditions against the hill tribes within the past half century, but the most disastrous have befallen us in India beyond those which have been mentioned. The Zulu war inflicted on us the great disaster of Isandhlana, when 16,000 of the British surrounded the camp of the Zulus, and the Zulus, with two battalions of the Fourth, and a battery and a few levies. This calamity was almost an extermination; and the news, as it reached the country, was only relieved by the account of the splendid stand of Lieutenant Chard and Bromhead, with 90 men, who defended the commissariat store at Rorke's drift against 4000 natives, and so repulsed the Zulus into the impi of the Zulus from entering Natal.

Our disasters in the Transvaal war of 1881, arising out of the annexation of 1877, have been sufficiently recalled to mind in the past few months. The comparatively insignificant defeat at Bronkhorst Spruit might well have been succeeded by a calm consideration of the Boers, who demanded the restoration of their independence. But what we may call the "Trafalgar" of the South Africa; Sir George Colley was dispatched with less than 1000 men, of whom he lost more than a quarter at Laing's Nek on January 28. The Highlanders were hurried up in time to share in a further defeat on the Ingogo river; and Colley's fatal occupation of Mafuba hill led to the disaster of the 23rd of February 1881. The Highlanders, two companies of the Fifty-eighth, two companies of the Sixtieth, and 61 bluejackets reached the "saucer-like summit" at 5 in the morning. Soon after sunrise the Boers, who in practical security, shot down half of our men, with Colley at their head.

The occupation of Egypt brought with it sundry disasters in the Sudan. Hicks Pasha lost an army of 7000 men. Osman Digna massacred the garrison of Sinkat, and inflicted a heavy defeat on Baker Pasha at Triakinta. In these cases the numerous troops which were sent to the Sudan for an additional while. Since these reverses took place, Denmark has refused to open negotiations unless first assured that we would not object to the purchase of the islands. Our present efforts to purchase have to be made through an unofficial representative, Captain von Christmas, of the Danish navy. Denmark is sure to sell the islands if not to some European power. A repetition of the senate's behavior of 33 years ago would result in serious complications. It is rumored that Santa Cruz cannot be sold to us without the consent of France.

JOHN ELPRETH WATKINS, JR.

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Our reverses in the Crimea were matters of commissariat and organization rather than of arms; but the results were no less war, both in blood and in money, was a disaster in itself. We do not enter it on our black list, but no historian, and few British officers, will make a polemic claim to important victories in the Crimean war. This attack upon Russia was followed at a short interval by the Indian mutiny, whereof the earlier chapters record what may be deemed the most important events of the century. The revolt of the sepoys took the Indian authorities by surprise; the country between Lower Bengal and the Punjab became, in 1857, an almost unbroken area of insurrection to which an Englishman can scarcely bear the names of Delhi, Lucknow and Cawnpore without a shudder. The awfulness of the massacres is only paralleled by the awfulness of the blocked mountain pass in an exceptionally severe winter.

We had our minor reverse during the 50 or 60 expeditions against the hill tribes within the past half century, but the most disastrous have befallen us in India beyond those which have been mentioned. The Zulu war inflicted on us the great disaster of Isandhlana, when 16,000 of the British surrounded the camp of the Zulus, and the Zulus, with two battalions of the Fourth, and a battery and a few levies. This calamity was almost an extermination; and the news, as it reached the country, was only relieved by the account of the splendid stand of Lieutenant Chard and Bromhead, with 90 men, who defended the commissariat store at Rorke's drift against 4000 natives, and so repulsed the Zulus into the impi of the Zulus from entering Natal.

Our disasters in the Transvaal war of 1881, arising out of the annexation of 1877, have been sufficiently recalled to mind in the past few months. The comparatively insignificant defeat at Bronkhorst Spruit might well have been succeeded by a calm consideration of the Boers, who demanded the restoration of their independence. But what we may call the "Trafalgar" of the South Africa; Sir George Colley was dispatched with less than 1000 men, of whom he lost more than a quarter at Laing's Nek on January 28. The Highlanders were hurried up in time to share in a further defeat on the Ingogo river; and Colley's fatal occupation of Mafuba hill led to the disaster of the 23rd of February 1881. The Highlanders, two companies of the Fifty-eighth, two companies of the Sixtieth, and 61 bluejackets reached the "saucer-like summit" at 5 in the morning. Soon after sunrise the Boers, who in practical security, shot down half of our men, with Colley at their head.

The occupation of Egypt brought with it sundry disasters in the Sudan. Hicks Pasha lost an army of 7000 men. Osman Digna massacred the garrison of Sinkat, and inflicted a heavy defeat on Baker Pasha at Triakinta. In these cases the numerous troops which were sent to the Sudan for an additional while. Since these reverses took place, Denmark has refused to open negotiations unless first assured that we would not object to the purchase of the islands. Our present efforts to purchase have to be made through an unofficial representative, Captain von Christmas, of the Danish navy. Denmark is sure to sell the islands if not to some European power. A repetition of the senate's behavior of 33 years ago would result in serious complications. It is rumored that Santa Cruz cannot be sold to us without the consent of France.

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