THE CELESTIAL WORLD.

A REMARKABLE METEOR.

L'Astronomie gives a description of a remarkable meteor that appeared in Cochin China on October 25, 1887. It was seen at Tay-Ninh and at Saigon, and moved from west to east. It was of a globular form, its diameter being more than half that of the full moon. Its color was a brilliant white with a violet tinge, and it was followed by a long train of light continuing nearly thirty seconds.

A few days after the occurrence, the chief official of Tay-Ninh received a letter from the chief official at Triem-Hoa, announcing that in the village of Than-Duc—south of Tay-Ninh—an uncommon animal had appeared, its advent being accompanied by rain and peals of thunder. "The animal had returned to the sky!" It had, however, left behind traces of its presence in the form of a hollow place in the soil 65 feet long, 16 feet wide, and 13 feet deep. The official felt that it was his duty to make a report of the extraordinary phenomenon.

A comparison of the time and the direction of the movement left no doubt that the passage of the meteor of October 25 had caused the commotion at Than-Duc.

A party of observers was sent to Than-Duc to investigate the matter. It was found that the meteor touched ground on a rice plantation, near a small stream that serves as a boundary line between Than-Duc and Hiep-Hoa. The impression left on the soil was that of an elongated pear. Diligent search was made for the meteor, but it was impossible to find the least trace of it either beneath the earth or in the neighborhood. The conclusion was inevitable. The meteor had ricocheted. This opinion was confirmed by the intelligent observers in the neighborhood, and by the artillerymen, who heard, as the meteor descended, first a great noise like the blow of a whip lash, and then a succession of rumblings, gradually dying away—sounds characteristic of ricochet movement. The meteor after the first impress, probably, just skimmed over the soil, losing in the shock only a small portion of its force. It then rebounded with enormous velocity, and finally fell at a great distance from the point where it first touched ground.

Meteors with a ricochet movement, and meteors containing small diamonds, like the one that recently fell in Russia, are something new in the history of the meteoric family, and strengthen the hope that at some future time one of these celestial bodies may pay us a visit and bring internal proof of the existence of animate life in other worlds than ours. A fragment of fossil or a bit of architectural work would be more welcome than the discovery of a new planet, or half a dozen moons, or the return of the bright star of 1572, for it would give tangible proof of the existence of life in other worlds than ours, the most interesting of the pending problems of astronomy.

THE CONJUNCTION OF JUPITER AND BETA SCORPII.

An unusual event enlivens the planetary annals of May. The brilliant planet Jupiter is in conjunction with the second magnitude star Beta Scorpii. The exhibition comes off on the 20th at 10 h. P. M. The time is favorable for observation, and the actors in the celestial scene are easily visible. The observer has only to look upward in the southeastern sky at 10 h. P. M., and Jupiter will be recognized at a glance, with Beta Scorpii close to him on the north, only 2′ of sky intervening between planet and star. The celestial bodies will seem to touch each other, for 2′ of arc is a very narrow dividing line. This is the closest conjunction that takes place between a planet and a star during the year.

Jupiter was near the same star on January 24, passing 8′ south. He was then moving eastward or in a direct course. He continued to move in this direction until March 23, when he began to retrograde, or move westward, passing close to Beta Scorpii on May 20. He will continue to retrograde until July 23, when he commences to move eastward, or in a direct course. This brings him again in the neighborhood of Beta Scorpii, with whom he is in conjunction for the third and last time on September 22. He is then 28′ south of the star.

The conjunction will be curious and interesting to observe, either with the naked eye or with an opera glass, or, best of all, with the telescope, where the star will seem to belong to the retinue of Jupiter's satellites.

Insect Pests.

Dr. J. A. Lintner, the well known entomologist, of New York, says there are in the world 320,000 species of insects; 25,000 of these belong to the United States, and about 25,000 prey upon the productions of man; 7,000 or 8,000 of these could be considered as being fruit pests. On the apple alone 210 species are known, and probably more extended investigation will increase the number to 300. The future successful fruit grower should study entomology, and be acquainted with insects and their habits, so as to be able to tell friends from foes. Professor Lintner recommends the study of feeding and habits as a guide to the use of insecticides, which should also receive notice.

Military Notes.

The part that cavalry is likely to play in war seems to be more rather than less important than we have been taught to believe. Up to a quite recent date we were told that, because of the quick-firing small arms, there would be no use for cavalry, for that they could not hope to get within striking distance. We all remember to have read how the French squares in the battle of the Pyramids beat the famous Mameluke cavalry, 10,000 strong, under Mourad Bey; and if muzzle loaders could do this, how could horses avail against magazine guns? But supposing the Mameluke cavalry to have had machine guns like those the Continental cavalry are now being re-enforced with, perhaps then the result would have been quite different, and forty centuries would have looked down upon broken squares and inriding horses and routed infantry—the flying battery of machine guns being brought into play before the charge.

The havoc wrought by the French mitrailleuse in the Franco-German war realized the promises made for it by the French war minister Lebœuf, this, so far as is known, being the only instance where his estimates proved reliable. Yet the only use made of the experience with the machine gun, up to quite recently, was to increase the number assigned to each brigade of infantry. Now, however, both Germans and French are practicing the cavalry in their use, in the wise belief that the next best thing after having a destructive arm is to get it quickly to work upon an unprepared enemy.

So far, all efforts, and they have been many and untiring, to supply the British cavalry with machine guns have failed, the "circumlocution office," of which General Wolseley complained so bitterly recently, being, no doubt, at the bottom of the trouble, though there is reason to believe that rivalry between the companies making the various types of machine guns has had something to do with the procrastinating policy that would seem to have been adopted at the war office. From time to time, excellent military authorities have pictured the potency of cavalry supported by machine guns, declaring that infantry, if not similarly armed, could not oppose such a force, the machine gun having a range of 3,500 yards, nearly three times that of the effective even of the improved rifle. Unless they occupied a fortified camp, they would have to run for it, which, with horsemen in pursuit, would not better their chances of safety, but, on the contrary, place them at the mercy of the troopers.

The Germans claim that their musketry instruction is enough better than the French to make up for the superiority of the French magazine rifle, the *Heeres Zeitung* declaring recently in a confident tone that "a fairly good rifle in the hands of marksmen well commanded, all else being equal, is more effective than a superior rifle can be in slovenly and too confident hands." No one will doubt the truth of this who has seen large bodies of troops at work at the butts, nor can those who know how careful is German military instruction doubt that the arm used by German troops will be made the most of, so far as untiring drill will suffice to make up for natural awkwardness. But the men from the farming districts, the *Bauerleute*, especially those from Saxony, Wurtemberg, and Hanover, have big, clumsy fingers, and those who have seen the time they make over the simple and heavy apparatus of the needle gun will be slow to believe that they can approach the French in the skillful use of the mechanism of the magazine rifle. Under the new regulations the German soldier is taught to fire standing, kneeling, lying down, behind a parapet, from a shelter trench, behind a tree, and at a running target. Attempts are making to teach the soldier how to judge distance by sound, that is to say, by the striking of the first bullet fired; and knowing the adjustment of the sights and the wind gauges for three ranges, 400, 800, and 1,200 meters, he is expected to be able to estimate a new range by means of these known points in his practice firing.

The British military authorities seem to be of one mind as to the dispositions to be made of the fleet in case of war. They say that there should be two great fleets, one in the English Channel, the other in the Mediterranean, and that their combined effectiveness should more than equal the combined fleets of any two powers. At the same time, they would have ships guarding British interests on the Pacific, Indian Ocean, West Indies, and China stations. With so elaborate a plan as this, and such expectations, it is not at all surprising that expert naval critics should declare, as they are doing, that Britain is unready. Captain Beresford, who recently resigned his place in the Admiralty board, insists that 20 cruisers of the first class should be at once laid down, and the military press give it as their opinion that if unarmored ships are to be built, small vessels of high speed are to be preferred to big ones, like the Buzzard and Pheasant, that cannot make more than 12 or 14 knots an hour.

Henderson Steel.

A correspondent says: There has been recently erected at Birmingham, Alabama, a Henderson gas open hearth steel furnace, to make steel from the phosphoric pig iron of that locality. Its peculiarity consists in producing a measured amount of highly heated gas, which is burned with a measured quantity of heated air in the flues leading from the gas producer to the heating chamber, and in such manner as to produce perfect combustion, the elements being all so thoroughly mixed in the flame that it becomes homogeneous, and impinges in a downward direction upon the iron in the heating chamber, which, when lined with dolomite, causes the metal to yield most of its phosphorus in the form of vapor.

The pig iron made at Birmingham analyzes:

Combined carbon	1·871	per cent.
Graphitic "	1·7886	" "
Silicon	1·9597	" "
Phosphorus	0·6493	" "
Sulphur	0·3286	" "

This, when treated by the Henderson process, becomes tool steel by leaving in 0·75 per cent of the carbon. The pig is treated in the furnace with red fossil hematite ore, raw dolomite, and fluorspar. The time from charging the pig iron to pouring the steel is 5½ hours.

The steel analyzes:

Carbon	0·75	per cent.
Silicon	0·009	" "
Phosphorus	0·051	" "
Manganese	trace.	

Experts at the railroad and other machine shops say it is equal to Mushet's, that they pay 48 cents per pound for wholesale. Mr. Vittur, a noted cutler at Atlanta, Ga., made some razors from it which he says are equal to those that he imports English steel for.

Pig iron and ore with 25 per cent of scrap steel produced soft steel, with use of flourspar and dolomite, in three hours from charging pig metal to pouring steel. It analyzes:

Carbon	0·20	per cent.
Manganese	0·78	" "
Phosphorus	0·075	" "

The analysis of the slags is:

Metal iron, as peroxide	8·190	per cent.
Silica	29·250	" "
Sulphur	0·095	" "
Phosphorus	1·1035	" "

The remainder of the slag is lime and magnesia. The pig and ore contained about 13·5 pounds of phosphorus, and there was 0·7 pound left in the steel; the difference, about 10¾ pounds, was volatilized. The iron ore used was 250 pounds of 45 per cent metallic iron, and there was about 200 pounds of slag to the ton of steel, so that about 85 per cent of the iron in the ore was reduced to metal, and added to the steel in the furnace. A large portion of the phosphorus in the ore was volatilized.

The vaporized phosphorus will be conveyed to ammonia refrigerating chambers and condensed to hydrous phosphoric acid, and afterward used for fertilizing, either by mixing it with lime or by sprinkling it over land.

The ores of Alabama range from 0·18 to 37 per cent of phosphoric acid. Pig iron smelted from mixtures that will give it 3½ per cent is readily converted to steel with but 0·05 per cent of phosphorus. The residue—except the small portion in the slag—is from 80 to 90 per cent of that in the pig and ore, and is vaporized and becomes an available by-product for the mere nominal cost of condensing it in water; 150 pounds of the acid may be thus produced per ton of steel, and is worth as much as the steel costs to make from pig iron, costing $8 per ton, or is worth $12 to $14.50 per ton in excess of the steel, which costs $11, if by-products are not saved. Royalties for use of the patents will be charged that will be commensurate with the advantages gained. Since the publication of the Henderson patents, in 1883, M. H. Moissan, a French chemist, has contributed several papers to the public journals, upon the vaporization of phosphorus, and utilizing it by condensing it with milk of lime for fertilizing.

The Henderson steel contains but one-third to one-half of the phosphorus of that usually present in Bessemer steel, which ranges from 0·10 to 0·15 per cent.

The Henderson furnace will produce four times as many charges per day as the regenerative furnace, as it has two working chambers. The molten iron from a blast furnace is poured into one of the chambers lined with sand, where it is treated with iron ore to remove silicon and half its carbon. This takes about 2 hours. The molten metal is then transferred to the other chamber, where all the carbon and the phosphorus are removed, and the scrap of the works is melted. That will take 2 hours. So that the melts or casts may be made every three hours, which gives an hour on each cast for repairs, and charging and tapping the metal. The consumption of coal in this way of working is about 3 bushels per ton of steel, which is about one-sixth of that used abroad in the Siemens furnace. The coal costs $1.75 per ton delivered, which is less than 3 cents per 1,000 cubic feet of combustible gas. It is of excellent quality, equal, in fact, to any mined in this country for this use.