dominant races, and if those portions of the plumage which were originally erected under the influence of anger and fear became largely developed and brightly colored, the actual display under the influence of jealousy or sexual excitement would be quite intelligible; the males would soon discover what plumes were most effective, and would endeavor to excel their rivals. It will be seen, therefore, that Mr. Wallace's theory of color might almost be called a molecular one. The causes of color are due to molecular or chemical changes of certain substances, and in the action of these on light, heat, and moisture. They can be produced or intensified by processes of development, and this as the surface bearing these colors is extended or diminished, and as there is a surplus of vital energy; or they may be, as in some plants, acted on by some as yet unknown local action dependent on the soil or on vegetation.

The Growth of Coral.—A Melbourne paper speaks of a remarkable piece of coral taken off the submarine cable near Port Darwin. It is of a common species, about 5 inches in height, 6 inches in diameter at the top, and about 2 inches at the base. It is perfectly formed, and the base bears the distinct impression of the cable and a few fibers of the coil rope used as a sheath for the telegraphic wire still adhering to it. As the cable has been laid only four years, the specimen must have grown to its present height in that time, which seems to prove that the growth of coral is much more rapid than has been supposed.

How the Lobster Annually Casts Off its Shell.—The *Zoologist* for June gives the pith of an article on this subject published by Mr. W. A. Lloyd in the *Field*, in about the following words: The lobster, feeling the time of exuviation approach, seeks a retreat where it may be safe during the period of soft helplessness, which lasts for three or four days after exuviation. This place it usually selects below some overhanging rock, and if there is a protection on each side, so much the better. If there is a good bed of sand and shingle (as there should be) six or eight inches thick, the lobster proceeds to excavate this away behind, and with its anterior limbs pushes it up in front, and makes a kind of defensive earthwork. In this operation it is aided by an occasional motion of its false feet in driving away a current of sand outward, below its tail, the head being then turned inward, toward the hinder part of the little cave thus formed, into which the lobster never allows any other creature to enter. When the moment arrives for casting the shell, the animal falls over on its side, a rupture is made in the membrane uniting the posterior of the cephalo-thorax with the anterior ring of the abdomen, and presently a part of the lobster's new coat may be seen between the two. The rent is made by the lobster suddenly and strongly bending its tail inwardly toward its head. In a few minutes the whole of the tail or abdomen is outside of the old shell, and the two may be seen side by side. Then the exuviation of the front half of the lobster goes on, all at once, legs and head-appendages and body together, and the last portions but one seen of the animal in its fresh covering are the tips of the large anterior limbs, which, as before mentioned, are for a few moments a little misshapen. Last of all appear the longer tentacles. During this whole process, which takes up about a quarter of an hour, the lower edges of the cephalo-thorax become a little separated from each other, laterally, to the extent of about one inch in a large specimen, and this appears to be for the purpose of allowing more room below than would otherwise be possible for the extrication of the limbs. As soon as the old shell is quite detached, and the animal is in its normal position, and has rested a few minutes, it pushes the cast-off shell over the edge of the earthwork of sand and shingle, outside the den, and then sometimes buries it. After solidification of the new shell, in three or four days, the shell or animal never increases till the next moult.

The Edible Pine.—This small scrubby pine (*Pinus edulis*) grows on the dry, rocky mountains of New Mexico, and is called by the Mexicans *piñon*. The seed is about the size of a kidney bean, with a rich oily kernel in a thin shell. It has a pleasant flavor, and sometimes oil is expressed from it. In favorable seasons the seeds are gathered in quantities and sold by the Indians to the people of New Mexico, Arizona, and the border settlements of Mexico. The seeds should be roasted before eaten, though sometimes they are consumed raw. The Indians of Alaska are in the habit, in the Spring, of stripping off the bark of the *Pinus contorta* (twisted-branched pine) and scraping the newly formed cambium from the trunk. This is eaten fresh or dried, pressed into compact cakes of a dark claret brown. It has a coarse look, as if made of tan bark; and, if broken up, presents a checkered appearance. When fresh it is not unpleasant, and the effect is that of a gentle laxative, but as the season advances it becomes strong in turpentine. When the cakes are old they have a bitter taste not unlike that of pine chips.

Voracity of the Blue Fish.—Mr. Carpenter, in an article on the "Fisheries of British North America," in *Nature*, states that one advantage possessed by the fishing grounds of British North America over those of the United States is their immunity from the ravages of the blue-fish—a voracious, wandering fish, whose home is in warm southern waters, its northward migration taking place only during summer, and never extending far beyond Cape Cod. Its destructive agency has had much to do with the diminished productiveness of the New England fisheries, and further south is specially exerted on the mackerel schools. According to the estimate of Fish Commissioner Professor S. F. Baird, the weight of the fish consumed by the blue-fish of the United States coast during the season is about 300,000,000,000 lbs. In its turn the blue-fish is largely consumed as an article of human food; but it is not suited for salting, and is consequently of no value as an export fish.

ASTRONOMICAL NOTES.

BY BERLIN H. WRIGHT.

PENN YAN, N. Y., Saturday, July 20, 1878.

The following calculations are adapted to the latitude of New York city, and are expressed in true or clock time, being for the date given in the caption when not otherwise stated.

PLANETS.

	H.M.		H.M.
Venus rises	1 17 mo.	Saturn rises	10 21 eve.
Marssets	8 27 eve.	Saturn in meridian	4 22 mo.
Jupiter rises	7 39 eve.	Uranus sets	8 53 eve.
Jupiter in meridian	0 30 mo.	Neptune rises	11 49 eve.

FIRST MAGNITUDE STARS.

	H.M.		H.M.
Alpheratz rises	8 16 eve.	Regulus sets	8 51 eve.
Algol (var.) rises	9 56 eve.	Spica in meridian	5 25 eve.
7 stars (Pleiades) rises	0 30 mo.	Arcturus in meridian	6 16 eve.
Aldebaran rises	1 39 mo.	Antares in meridian	8 27 eve.
Capella rises	11 3 eve.	Vega in meridian	10 38 eve.
Rigel rises	3 46 mo.	Altair in meridian	11 50 eve.
Betelgeuse rises	3 31 mo.	Deneb in meridian	0 46 mo.
Sirius	invisible.	Fomalhaut rises	10 56 eve.
Procyon	invisible.		

REMARKS.

The sun will be totally eclipsed July 29, in the afternoon, and will be visible generally throughout the United States as a partial eclipse. The line of central eclipse—the region over which the center of the shadow passes—begins in central Asia, Lat. 55° N., Long. 165° W. of Washington, and crosses Behring Strait into Alaska at 65° N. Lat., taking a southeasterly course through British America and the United States. The total phase will be observed from various points along the route of the Union Pacific Railroad. Sherman station and Ogden have been selected as points of observation because of their great elevation, thus avoiding the denser portion of the atmosphere. By this means the distinguishing properties of instruments is increased, and consequently a much higher power can be used than would otherwise be possible and give good results. Near Denver the total occurs at 3h. 27m. P.M., local mean time, with a magnitude of 12·1 digits. The line of totality leaves the United States near Galveston, where a total phase occurs at 4h. 30m. P.M., local mean time, passing across the Gulf of Mexico and the western extremity of Cuba, giving a total phase at Havana at 5h. 34m. P.M., ending in the Carribean Sea just off the southeast shore of the island of St. Domingo, where the total occurs at sunset. At New York city the eclipse begins at 4h. 42m. P.M.; middle, 5h. 35m. P.M.; end, 6h. 28m. P.M. Size 7·8 digits upon the sun's southern limb.

Belgium, Holland, and England.

Bulgium would furnish a capital text for an essay on the advantages of a patent system. When Holland and Belgium separated, the latter was far behind in the matter of commerce; now the commerce of Belgium leads that of Holland by $50,000,000 a year, having increased thirteen fold in forty-four years. Belgium believed that it would pay to encourage invention by means of a patent law; Holland did not; the first promptly shot into the front rank of prosperous manufacturing nations, while the second is nowhere. It would be an interesting study to trace the connection of Belgium's prosperity with the 1,500 patents a year granted by that little state. That the numerous labor-saving inventions embraced by these patents have not diminished the demand there for men is evident from the single fact that Belgium is now by far the most densely populated country on the globe. Should the United States ever attain a similar density of population we should number not less than five hundred millions of people. From a recent report of the British Inspector of Factories it appears that the iron and wool manufactures of Belgium are being imported into Great Britain in large an dconstantly increasing quantities, and that the damaging effect of such competition is particularly felt in Glasgow. Thus Scotland is beginning to suffer the same sort of changes in trade as have been produced in English markets by the increasing introduction of American prints, machinery, hardware and other articles. The inspector thinks these changes "significant and alarming."

Jointed Artillery.

The jointed gun submitted for experiment by Sir William Armstrong has completed its course of firing at the proof butts in the government marshes adjoining the Royal Arsenal, Woolwich, and been handed over to the Pack Saddle Committee to arrange for its carriage by mules over mountains and across irregular country. The gun unscrews into three parts, each of which is light enough for a mule's burden, but when screwed together it forms a powerful long range cannon almost as serviceable as an ordinary field piece, and said to be perfectly gas tight at the joints. The light 7-pounders which constituted the artillery of the Abyssinian campaign and the expedition to Coomassie have, with a few small howitzers, been the only guns of the mountain train; but the invention of Sir William Armstrong is regarded as having opened a way for greatly augmenting the power of that branch of the service.

The Armstrong 100-Ton Gun.

The 100-ton experimental gun, the first made by Sir William Armstrong at Elswick for the Italian Government and proved at Spezzia, is said to have cracked its inner tube. This is a possibility not unlooked for in the case of an experimental gun, and it may be recollected that a similar mishap occurred both to the first of the 80-ton guns and the experimental 35-ton gun, the original "Woolwich Infant." Both these guns have been retubed and rendered serviceable.

THE PHONOGRAPH.

Although the phonograph is expensive, and difficult to construct in its most perfect form, it is nevertheless capable of being made on a cheaper scale, so as to afford a world of amusement for both young and old.

The materials for a phonograph which will talk, whistle and sing, and which may be used by our experimenters in developing any new ideas concerning it, may be purchased for $1.50, and full directions and complete scale drawings which will enable any one to make the instrument may be found in the current number (No. 133) of the SCIENTIFIC AMERICAN SUPPLEMENT.

Scientific American Boat Drawings.

The San Francisco *Chronicle* gives an instructive account of the pluck and perseverance of two young men of that city. During their off hours, and often by the light of a lantern at night, these lads have built a 33 foot jib and mainsail yacht with no other instruction than the directions and drawings published in the SCIENTIFIC AMERICAN SUPPLEMENT of April 14, 1877. "It seems incredible," says the *Chronicle*, "that two young men, scarcely more than lads, unaccustomed to the use of tools, should have succeeded in constructing a seaworthy vessel from drawings;" but it is no greater feat than many others may do by consulting the full and practical instructions for building large and small sail and row boats and steam launches, published in many numbers of the SCIENTIFIC AMERICAN SUPPLEMENT.

Wire Tramway Worked by Water Wheels.

The tramway connecting the town of Lausanne with its harbor Ouchy, on the lake of Geneva, consists of two lines of rail, and two trains which are connected by a wire rope. At the top of the tramway the rope passes over a winding drum, through which the trains are put in motion. The two trains keep each other in equilibrium, the one ascending upon one line while the other descends on the other line, and *vice versa*.

The tramway is 1,650 yards long, and leads in a straight line from Ouchy up to Lausanne, passing on the way a tunnel several hundred yards in length. The steepest gradient is 1 in 9.

The winding drum is driven by two Girard turbines, which work under a head of 393 feet; they are made of brass on account of the high velocity of the water, due to the great head; they have a diameter of 7 feet 4 inches, and run at a speed of 170 revolutions per minute. The water can easily be turned on and off the turbines by means of circular slides worked by hydraulic gear.

The two turbines are fixed upon a horizontal shaft, which carries also a brake wheel, the band of which is worked by gears similar to the slides, and spur gear for transmitting the motion to the winding drum.

The winding drum is 19 feet 8 inches in diameter and 13 feet long, and is covered with wood lagging. As it has to transmit by mere friction a force of 180 H. P., making at the same time only a few revolutions per minute, the following arrangement to produce the necessary friction has been contrived by M. Callon, the designer of the tramway: The winding drum is placed in a position parallel to the direction of the tramway and considerably lower than the level of the rails; the rope is wound on the drum in two coils, and above the drum; the two ends of the rope are made to pass over two guide pulleys, which stand at right angles to the drum, and are carried in sliding bearings. By means of bevel gear and screw spindles, these pulleys are made to move to and fro along the winding drum, thus forcing the rope to travel continually from one end of the drum to the other, and preventing the surface of the latter from being worn smooth, as it would be if the coil were always on the same spot.

Shell Polishing.

The Royal Laboratory Department in the Royal Arsenal, Woolwich, have practically abolished the operation of giving a smooth surface to shot and shell by the use of the lathe. The method of casting these projectiles of exact size and smooth exterior was first carried out on account of the expense which would be saved by the abolition of turning, but a still greater advantage has been found in the superior hardness of the unturned shells, the one tenth of an inch of the outer skin which it has been usual to turn off the Palliser projectiles being equal in strength to one third of the interior surface. By reducing the thickness of the walls the shell is thus enabled to contain a much larger bursting charge without any diminution of penetrative power, and the whole mass proves to be more cohesive and serviceable in what may be regarded as its natural skin than after the material and chemical changes wrought in its constitution by the friction of the lathe.

FLOATING BATTERIES AT KERTCH.—Two powerful floating batteries have been launched by the Russians, at Kertch. Each battery is constructed of several boats fastened together and fitted with a large number of watertight compartments, to which are attached powerful pumps. Their armament consists of 9 inch rifled guns. Four of these floating batteries are now connected with the defenses of Kertch, and others are under course of construction.