omy. We only wish the publisher had done as well as the authors. The illustrations are numerous, and probably sufficient to fulfil the end of helping the student in his work; but, from an artistic point of view, they are, with rare exceptions, simply atrocious.

MINOR BOOK NOTICES.

Guesses at purpose in nature, with especial reference to plants. By W. Powell James, M.A. London, 1883. 192 p. 12°.

This is a little book of ten chapters, which has just reached us, and which we would notice with a word or two in addition to an announcement of its title. The author, we fancy, is a clergyman and merely an amateur naturalist. However that may be, his *guesses* are shrewd, and the way of putting them is taking. Considering the great number and variety of the facts he has collected, — the greater part from books, — he has fallen into few mistakes; so that the volume has more scientific value than is usual in such treatises.

An outline of qualitative analysis for beginners. By John T. Stoddard, Ph.D, professor of chemistry in Smith college. Northampton, *Gazette printing company*, 1883. 4+54 p. 16°.

The general plan of this work will doubtless be recognized as one which gives the best results in teaching qualitative analysis. To a certain extent it is faulty in detail, both as regards convenience of arrangement and the selection of methods. Although this criticism applies more especially to the course of basic analysis, if advantage were taken of differences in solubility of certain barium, calcium, and silver salts of the acids, it would save the student much time and labor in general analysis. An appended list of the names and symbols of the more common reagents will be found useful.

A short course on quantitative analysis. By John Howard Appleton, A.M., Brown university. Philadelphia, *Cowperthwait & Co.*, 1881. 183 p., cuts. 12°.

The course of analysis presented in this work consists, with few exceptions, of a judicious selection of methods and determinations. The descriptions of processes and apparatus will undoubtedly be of much service in the laboratory, although considerable descriptive chemistry is introduced with which the student is supposed to be familiar before undertaking quantitative analysis. An exception will probably be taken to the completeness of the notes and explanations, which leave little opportunity for thought or study on the part of the student.

WEEKLY SUMMARY OF THE PROGRESS OF SCIENCE.

MATHEMATICS.

Alignment curves on the ellipsoid. — Mr. C. H. Kummell describes several curves that represent the straight line, all of which, on the sphere, reduce to the great circle. The *vertical section* is traced by the surveyor at one end, who fixes points in range with the other end. The *proörthode* (*πρό, ὀρθός, ὁδός*) results, if the alignment at each point is determined at a point previously fixed, the distance between the two being infinitesimal. It is followed in chaining, or more roughly by the pedestrian in moving toward an object. In these two curves no back-sight is taken: they are differently related to the two ends, and do not return upon themselves. The *diorthode* (*διά*) is the locus of all points at which the vertical plane through one terminal point also includes the other. It is used in laying out primary base-lines, the points of which are determined by making fore-sights and back-sights differ always by 180°. This curve has been confounded with the preceding by Dr. Bremiker (*Studien über höhere geodäsie*, 1869) and others; but the proörthode is everywhere tangent to the vertical plane passing through one terminal point, while the diorthode, except at the ends, is not. The curve of shortest distance between two points, often called the 'geodetic line,' would more properly be called the *brachisthode* (*βράχιστος*). These names were suggested by Mr. W. R. Galt of Norfolk, Va.

Mr. Kummell shows the diorthode to be the intersection of the ellipsoid with a hyperboloid of one sheet. In the case of an ellipsoid of revolution, this is the parabolic hyperboloid. Taking the three principal axes, a, b, c, as axes of x, y, and z, he represents the points where the chord connecting the two termini of the proposed alignment pierces the planes xy, xz, yz, by $(x_z, y_z, 0)$, $(x_y, 0, z_y)$, and $(0, y_x, z_x)$, respectively, and introduces quantities, —

$$a_b{}^2 = 1 - \frac{a^2}{b^2}, \quad a_c{}^2 = 1 - \frac{a^2}{c^2},$$

and so, by cyclic permutation of letters, $\beta_c{}^2$ and $\beta_a{}^2$, $\gamma_a{}^2$ and $\gamma_b{}^2$; where the ratio of each of his first set of auxiliary quantities to one of his last gives one of the co-ordinates of position of those generatrices of the hyperboloid which are perpendicular to the co-ordinate planes. The equation of the hyperboloid is, —

$$\left(x - \frac{x_y}{\beta_a{}^2}\right)\left(y - \frac{y_z}{\gamma_b{}^2}\right)\left(z - \frac{z_x}{a_c{}^2}\right) = \left(x - \frac{x_z}{\gamma_a{}^2}\right)\left(y - \frac{y_x}{a_b{}^2}\right)\left(z - \frac{z_y}{\beta_c{}^2}\right),$$

and it passes though the centre of the ellipsoid.

The diorthode cannot be traced practically, because of the curvature of the earth. Mr. Kummell has investigated the locus of all points through which one tangent line meets the normals drawn at the two extremities, and finds its intersecting surface to be of

the fourth degree. — (*Phil. soc. Wash., math. sect.; meeting* April 26.) [811

PHYSICS.

Electricity.

Testing insulation of electric-light wires. — Mr. C. J. H. Woodbury described a compact piece of apparatus, consisting of a magneto-electric machine and a pair of electric bells. The machine will produce a current strong enough to ring the bells through a resistance of seven thousand ohms. By connecting one pole with the electric-light system, and the other with the ground, the insulation of the system may be shown to be more or less than about seven thousand ohms, according as the bells ring or not. The method has been found useful in the inspections now made in the interest of fire-insurance companies. — (*Frankl. inst., meeting* April 18.) [812

Electrical transmission of power. — Dr. C. W. Siemens, in the course of an address at the Institution of civil engineers on March 15, after describing the well-known experimental electrical railways of the Berlin and Paris exhibitions, stated that an electrical railway six miles in length had just been completed in the north of Ireland. In this instance the two rails, three feet apart, were not insulated from the ground, but were joined electrically by means of copper staples, and formed the return circuit, the current being conveyed to the car through a T iron, placed upon short standards, and insulated by means of insulite caps. For the present the power was produced by a steam-engine at Portrush, giving motion to a shunt-wound dynamo of 15,000 Watts, or 20-horse power. The working-speed of this line was restricted by the board of trade to ten miles an hour, which was readily obtained, although the gradients of the line were decidedly unfavorable, including an incline of two miles in length at a gradient of 1 in 38. It was intended to extend the line six miles farther, in order to join another railway system. The electric system of propulsion was, in the lecturer's opinion, sufficiently advanced to assure practical success under suitable circumstances; such as for suburban tramways, elevated lines, and, above all, lines through tunnels. The lecturer, however, did not advocate its prospective application in competition with the locomotive engine for main lines of railway. — (*Nature*, March 29.) E. H. H. [813

ENGINEERING.

Stadia reductions. — Mr. Arthur Winslow presented, and described the derivation of, tables for stadia reductions, which furnish expressions for horizontal distances and differences of elevation, corresponding to 100-foot stadia readings for 2″ up to 30°, on the supposition that the rod be held vertically, and the stadia wires be equidistant from the centre wire. They are not mere reductions of inclined distances to their horizontal and vertical components, but embody certain corrections necessary from the facts, 1°, that with horizontal sights the length cut off by the stadia wires on the rod is not directly proportional to its distance from the centre of the instrument, but from a point at a distance in front of the object-glass equal to its principal focal length; and, 2°, that with inclined sights a correction has to be made for the oblique view of the rod. Both the distances and elevations in these tables are given in feet. They are adapted to use with a telescope whose object-glass has any focal length, and with a rod which is so graduated that the spaces cut off on it by the stadia wires are directly proportional to its distance from a point at a distance in front of the object-glass equal to its principal focal length, differing in these respects from the tables issued by the engineer department, U.S.A. — (*Eng. club Phil-ad.; meeting* April 7.) [814

CHEMISTRY.

(*Organic.*)

Constitution of atropine. — A. Ladenburg proved that tropine is a tertiary base, since it would not unite with more than one molecule of ethyl iodide, and it was not affected by nitrous acid. By the action of chlorhydropasic acid upon it, a tropasate of tropine was formed; and, when treated with dilute hydrochloric acid, the latter substance was converted into atropine, which separated in beautiful crystals on evaporating the solution.

This product proved to be identical, in its chemical as well as in its physiological characters, with natural atropine prepared from belladonna. A series of derivatives, called by the author *tropeines*, results from the action of various organic acids with hydrochloric acid upon tropine. To establish the constitution of tropasic acid, it was prepared by the action of potassic cyanide in alcoholic solution upon chloracetophenon, and treating the product with baric hydrate. The resulting atrolactinic (or tropasic) acid was also made from hydropasic, and it was converted into atropasic acid. Since, furthermore, atropasic was converted into tropasic acid, the formula of the latter must be $C_6H_5CH\begin{matrix}CH_2OH\\COOH\end{matrix}$. When distilled with soda-lime, tropine is decomposed, giving methylamine and tropilidine (C_7H_8); and, when treated with fuming hydrochloric acid, a volatile base, tropidine ($C_8H_{13}N$), is formed. By the action of hydriodic acid and red phosphorus, hydrotropine iodide ($C_8H_{17}NI$) results. Tropine is thus shown to contain an hydroxyl group; and the above-mentioned synthesis of atropine, and the formation of the tropeines, are explained: —

$C_8H_{14}NOH$	$C_8H_{14}NO(C_9H_9O_2)$	$C_8H_{14}NO(C_8H_7O_2)$
Tropine.	Atropine.	Homatropine.

The tropeines are therefore ethers of tropine, which is a nitrogen-containing alcohol. When heated with bromine, tropidine is decomposed, with the formation of ethylen bromide and dibrompyridine ($C_4H_5Br_2N$). The author is at present engaged upon the synthesis of tropine from pyridine. — (*Ann. chem.*, ccxvii. 74.) C. F. M. [815

Protocattannic acid and anhydrides of the aromatic oxy-acids. — Hugo Schiff states, that, when protocatechuic acid in aqueous solution is boiled with arsenic acid, a substance is formed, with the formula of diprotocatechuic, or protocattannic acid ($2\,C_7H_6O_4 - H_2O = C_{14}H_{10}O_7$). The solution possesses the general reactions characteristic of tannin; and mineral acids reprecipitate protocatechuic acid. When protocatechuic acid in etherial solution is acted upon by phosphorous oxychloride, tetraprotocatechuic acid is formed ($4\,C_7H_6O_4 - 3\,H_2O = C_{28}H_{18}O_{13}$). The solution fluoresces, and its reactions in general are characteristic of tannin. If an intimate mixture of protocatechuic acid and dry arsenic acid is heated to 160°, a catelagic acid corresponding to elagic is produced ($2\,C_7H_6O_4 - (H_2O + H_2) = C_{14}H_{10}O_7$). — (*Gaz. chim. ital.*, 1883, 90; *Berichte deutsch. chem. gesellsch.*, xv. 2588.) C. F. M. [816

Action of cyanogen chloride on pyrrol-potassium. — By the action of dry gaseous cyanogen chloride on pyrrol-potassium, Ciamician and Dennstedt find that the cyanogen molecule is introduced, forming cyanpyrrol or *tetrolcyanamide*. This substance polymerizes at the point of fusion, with the formation, probably, of tetrolcyanuramide or tetrolmelamine,

$3(C_5H_4N_2)$. The latter substance is not attacked by hydrochloric or nitric acid, nor by aqueous potassic hydrate. Sulphuric acid produces a brown color, which changes to black when the substance dissolves. Boiling alcoholic potassic hydrate gives pyrrol and an acid, probably cyanuric. Tetrolcyanuramide is analogous in structure to diphenylcyanamide, —

$CN-N=C_4H_4$	$CN-N=(C_6H_5)_2$
Tetrolcyanamide.	Diphenylcyanamide.

— (*Gaz. chim. ital.*, xxii. 102.) C. F. M. [817

METALLURGY.

Delta metal. — An alloy has been perfected by Mr. Alexander Dick of London, which is composed of copper, zinc, and iron. If ordinary wrought-iron is introduced into molten zinc, it will be taken up by the zinc to about five per cent of the quantity of zinc. This product is then added to copper, or to copper and zinc, in the desired proportions. The resulting alloy is said to be as much superior to brass as phosphor-bronze is to gun-metal. It has great strength and toughness. When cast in sand, its tensile strength is 21 to 22 tons per square inch. When drawn into wire of 22 W. G., its tensile strength is 62 tons to the square inch. — (*Iron*, Feb. 23.) R. H. R. [818

Metallurgy of the Incas. — At the meeting of the French academy on Feb. 6, M. Boussingault exhibited a bronze chisel harder than copper, but not so hard as iron, which was composed of 95 per cent copper, 4.5 per cent of tin, with traces of lead and silver. This tool is of a period previous to the conquest of the Incas by Spain. — (*Iron*, March 16.) R. H. R. [819

Soaking-pits. — At the meeting of the Society of engineers, Feb. 5, Mr. Church, in his inaugural address, referred to the device of Mr. John Gjers, which consists in placing ingots of steel directly in so-called soaking-pits. The ingot being thus surrounded by hot walls, the surface-heat is increased, and it is rolled by its own initial heat. This not only saves fuel, but avoids all danger of burning in reheating. — (*Iron*, Feb. 9.) R. H. R. [820

Equalizers. — The Pittsburg steel-casting company places the ingots in square-shaped pits of firebrick, six feet deep, three feet six inches square at the top, three feet at the bottom. On each side of the row of holes is a pair of Siemens regenerators for gas and air. The holes are heated to 2,000° F., and are filled with gas as a non-oxidizing atmosphere; and four ingots, weighing about a ton, are placed in each pit. The ingots being dark red or medium red outside and fluid inside, it is but a few minutes before they are equalized to a soft yellow, and are then in the best condition to roll to small billets, or to flanged rails. — (*Iron*, March 2.) R. H. R. [821

AGRICULTURE.

Materials for manuring moors. — A paper by Fleischer describes the utilization of the sewage and garbage of the cities of Groningen and part of Bremen, for the reclamation and manuring of the surrounding moors. The materials are made into a compost, said to be comparatively inoffensive, and shown by analysis to have considerable value as manure, and sold, to be transported by water to the place of use. The paper is specially interesting in its bearings on the question of the utilization of city sewage. — (*Landw. jahrb.*, xii. 203.) H. P. A. [822

Sewage irrigation. — Gersen discusses at considerable length the various systems of sewage irrigation, and the reasons of their failures, and proposes a new method, in which the sewage is distributed over the surface to be irrigated in underground iron pipes under pressure, from which it is distributed by means of portable pipes. The ground may be flowed, or the sewage may be sprinkled upon it in regulated quantities. No levelling, and but little preparation of the surface, is required, and all open ditches or settling-basins are avoided. — (*Landw. jahrb.*, xii. 227.) H. P. A. [823

Determination of available phosphoric acid. — Ollech and Tollens have continued the experiments by Grupe and Tollens on the use of citric acid as a reagent for the determination of available phosphoric acid. They recommend the use of a $1\frac{1}{4}$-per-cent solution of citric acid, 5 grams of phosphate, and 500 cc. water, and show that the phosphoric acid in the resulting solution can be precipitated directly with molybdic solution. — (*Journ. landw.*, xxx. 519.) H. P. A. [824

'Reversion' of superphosphates. — According to Post, the process of reversion takes place as follows: the free phosphoric acid acts first on undissolved tricalcic phosphate, forming monocalcic phosphate, and on iron and alumina, forming phosphates soluble in ammonium citrate. Later a double phosphate of iron and calcium or aluminum and calcium is formed, which is insoluble in ammonium-citrate solution. — (*Journ. landw.*, xxx. 573.) H. P. A. [825

GEOLOGY.

Cape Hatteras. — Professor W. C. Kerr's studies in North Carolina have led to some interesting conclusions in regard to the geologic history of Cape Hatteras. The modern cape is a tract of low land which is, on one hand, losing altitude by subsidence, and, on the other, gaining it by accretion. The accretion is three-fold: first, sediment from local rivers; second, vegetable accumulation in a system of peat-forming swamps which occupy the divides between the streams; third, shore-drift, brought by the waves and currents of the Atlantic from the north and south. The shore-drift is derived from the sediment of the Susquehanna and other rivers, and is deposited in a continuous bank of sand, constituting the sea-front of the cape. The wind throws it up in dunes, which slowly travel landward, and eventually help to fill the lagoon, or sound, caused by the subsidence.

The history of the coast has not always been characterized by subsidence; for at various levels there are lines of shore-dunes and other coast features, which could have attained their present position only by an elevatory movement. One of the best preserved coast-lines has an altitude of less than 20 feet, and another, referred to the glacial epoch, lies at 500 feet.

When the ocean stood at the 20-foot level, the angle of the continental coast was at Cape Lookout, and before that it was at Cape Fear; but, though these great changes in the outline of the coast have occurred in very recent geologic times, the cape itself, considered as a salient of the continental margin, is not a modern phenomenon. It is at least as old as the cretaceous; and since it is an accretionary growth, dependent now on a certain combination of prevailing winds and currents, it affords presumptive evidence that a similar combination has characterized this part of the Atlantic for several geologic periods. — (*Phil. soc. Wash.*, *meeting* April 7.) [826

Lithology.

The Lizard schists and serpentines. — Considerable study has been given to the Lizard district of Cornwall, during recent years, by Prof. T. G. Bonney, who seems now to be the best English petrogra-

pher. In the present paper he divides the schistose rocks into micaceous, hornblendic, and granulitic; and the microscopic characters of each group are given in detail. He endeavors to show the relation of the schistose rocks to the adjacent argillites, with which they have been supposed to be continuous. In the argillite he found a few fragments of the hornblendic rock, together with some felspathic fragments, which, he says, came from a metamorphic series. At another locality he found a fault (?) between the hornblendic rock and the argillite, at which the latter had been greatly broken. He states that the hornblendic rock here resembles a greenstone, but thinks he found in it signs of foliation and bedding. From this evidence he draws the conclusions that the argillites are younger than the metamorphic rocks 'by an enormous interval of time,' and that, while the former are devonian or older, the latter are azoic (archean).

Without objecting at all to his conclusions, one may point out the requirements to prove them, which he has failed to give. He has not proved the schistose series to be sedimentary, but admits that part may be eruptive, and that some of the series, at least, may be formed from volcanic ash. Until the series is proved to be sedimentary, the finding of supposed fragments of it in the argillites is no proof of difference in age; for eruptive materials are always apt to be embedded in the rocks forming at the locality at the time of the eruption. Bonney has further taken foliation as bedding, with which it may or may not correspond, and assumes that a metamorphic is synonymous with a sedimentary rock, when in reality eruptive, especially basic, rocks are more easily metamorphosed than most sedimentary ones; and the former make a large part of the so-called 'metamorphic rocks' in many regions of crystalline schists. Until Bonney gives evidence to prove that his series is sedimentary, his conclusions cannot be regarded as established merely because he considers the rocks sedimentary.

The serpentine rocks of the Lizard district had been discussed in a previous paper, but additional material is given here. Bonney holds that the serpentine is formed from the alteration of an eruptive peridotite. That serpentine is formed by the direct conversion of olivine rocks has been conclusively shown by the work of numerous lithologists; and, in this particular case, Bonney's microscopic observations bear out the general conclusion. That the Lizard peridotite was eruptive was shown by its forming dikes in the adjacent rocks, by its distorting and displacing them, and by its enclosing fragments of them. — (*Quart. journ. geol. soc.*, 1883, 1.) M. E. W. [827

METEOROLOGY.

Thermometer-shelters. — There have recently been worked up and published the results of experiments, on a large scale, which were undertaken in 1869, by the Royal society of London, for the purpose of testing various thermometer-shelters. The experiments were made in a large open field at Strathfield Turgiss. Ten varieties of shelters were tried, eight of these being open, and two (Stevenson's and the Kew pattern) closed. It was found that all the open stands were subject to serious objections, as they gave varying results in different weathers. On the whole, the closed shelters were regarded as the better; and Stevenson's was preferred to the Kew, as the smaller and more easily handled. It is still thought, that, in dull weather, and for hygrometrical observations, this screen has not sufficient ventilation for the most accurate results. All the screens gave nearly uniform results for the mean temperature. Experiments are now in progress for comparing wooden with Wild's metallic shelters. — (*English quart. weath. rep.*, 1879.) H. A. H. [828

Terrestrial radiation. — Professor Tyndall placed a thermometer upon cotton-wool which lay on the ground, and suspended another four feet above it. On Nov. 11, 1882, at 6 P.M., the readings were: wool, 26° F.; air, 36°. There was nearly a dead calm, — sky clear, and stars shining. The observations were repeated on Dec. 10, when, at 8.20 A.M., wool read 12°, and air 27°, with a clear sky, and very light wind. In both instances snow covered the ground. On many other days readings were made, and several of these with the sky perfectly clear, and with no visible impediment to terrestrial radiation; yet not one-fourth of the difference was observed that occurred on Dec. 10. Prof. Tyndall seeks to explain these results by the hypothesis, long since advanced by him, that the invisible aqueous vapor of the atmosphere in the latter cases interposes an effectual barrier to radiation, and hence the difference. It would seem as though a few observations of the amount of vapor would have assisted in establishing or overthrowing this supposition.

In a later number Prof. Woeikof discusses these observations, and suggests that the snow had a marked effect in reducing the temperature of the air just above it. He thinks that aqueous vapor has only a slight effect in checking radiation; not, however, in its gaseous state, but when condensed in small ice-crystals or water-droplets, even if, which is sometimes the case, it is invisible to the eye. He also suggests, that, in order to determine the real effect of aqueous vapor in terrestrial radiation, observations should be conducted in a climate, where, with a relatively great tension of vapor, the relative humidity is so small that there is no dew on clear nights, or, at least, it appears very late. Three thermometers, on cotton-wool, should be placed, one on the ground, and the others at heights from ten to a hundred feet above. If Prof. Tyndall's views be correct, the highest thermometer should show the lowest reading, as the aqueous vapor would impede radiation least from that one. He thinks there would be very little difference between the three thermometers. The matter is certainly worthy of careful experiment. — (*Nature*, Feb. 15, March 15.) H. A. H. [829

PHYSICAL GEOGRAPHY.

Effects of deforesting in the Alps. — P. Demontzey describes, in a very well illustrated article, the injurious results following the cutting down of forests in the French Alps; these being chiefly the washing of great quantities of detritus down from the slopes, the rapid formation of gulleys and ravines, especially in the softer formations, and the inundation of good valley-land with sand and gravel. The extension of the torrential cone of the Rioubourdoux (Basses Alpes), where the mountain stream enters a broad valley, and several deep ravines, formed since 1830, on the branches of the Bourget, are excellently shown. The remedy adopted against further growth of the gulleys is to build numerous small dams across the side streams, and thus force the waters to drop their sediments, and build up their channels, instead of deepening them. Planting trees is to go on with this as fast as possible, to prevent the wearing of the bare hillsides. — (*La Nature*, 1882, 151, 183, 215.) W. M. D. [830

Glacial erosion and lakes. — Rev. A. Irving has recently read two papers before the London geological society, — On the mechanics of glaciers, with special reference to their supposed power of excavation,

and On the origin of valley lakes, with especial reference to the lakes of the northern Alps, — coming to the conclusion that glaciers have not, and can not, cut out deep lake basins, although they may effect considerable general surface-erosion. Differential motions within the ice are regarded as consuming nearly all the gravitative and other force applied to the mass; so that an effective erosive motion of ice on bed-rock is small, and especially so in hollows where the motion is much retarded. The ice rather than the rock will yield when a stone is held between the two. Much rock-flour, washed away by the subglacial streams, may come from material carried down from surface-moraines. The author denies the force of Ramsay's argument that certain lakes cannot be explained save by ice-action, and thinks that certain possible causes were not sufficiently considered. Many alpine lakes are not at all where they should be, if formed by glaciers; and among the causes that may aid their formation are subsidence from underground solution, which recalls Playfair's old suggestion to account for Lake Geneva. This may be further aided by the simple weight of the ancient ice aiding to break down such undermined districts. Dislocations and folds, moraines, land-slides, and diluvial barriers, are also considered. Several special cases are referred to with some detail. — (*Quart. journ. geol. soc.*, 1883, 62, 73.) W. M. D. [831

Changes in the Mediterranean climate. — Dr. Th. Fischer, already known for his original studies in this direction, presents a brief statement of further work as supplementary to Tchihatcheff's entertaining lecture before the British association last August (v. *Proc. roy. geogr. soc.*, 1882). His argument is based on the decline of population, shown by the numerous ruins in now desert regions of the northern Sahara, as well as in Asia Minor and farther east; on the barrenness of districts formerly cultivated, as is shown by the remains of irrigation-dams stretching across dry river-channels (*wadis*); on the occurrence in the Algerian desert of flint chippings covered by a thin gypsum layer, evidently the deposit of a spring, though the region is now wholly dry; and on the frequent occurrence of lightning-tubes in the dry sands, implying former frequent thunder-storms. In Algeria, the recorded annual rainfall from 1838 to 1849 averaged 800 mm.; from 1850 to 1862, 770 mm.; from 1863 to 1876, only 639 mm. The deforesting of the country is regarded as having aided this decrease. Furthermore, the absence of camels from old monuments in Egypt, the former occurrence of elephants in the northern Sahara, and use of horses and oxen in crossing the now desert region, — all bear witness to the same general decrease of rainfall. — (*Peterm. mitth.*, 1883, 1.) W. M. D. [832

GEOGRAPHY.

(*Arctic.*)

Aboriginal population of northern America. — A recently issued report on the Indians of the Dominion of Canada, together with the information collected by the tenth census of the United States relating to Alaska, affords the means of approximating to the aboriginal population of that part of North America, north of the boundary-line of the United States, as it existed in 1860. The Indian population of British Columbia, Manitoba (including the Northwest Territory), Athabaska, and Rupert's Land, being the regions where governmental supervision is nonexistent or comparatively recent, is put at 78,264. Athabaska and Rupert's Land contain about 6,000, the remainder being nearly equally divided between the other two districts. In the older provinces, where the whites and aborigines have long been in contact, there are 32,241 Indians. Ontario has 17,126; Quebec, 11,089; Nova Scotia, New Brunswick, and Prince Edward's Island divide the remainder. There is an increase, in the total number, of 2,783 over that of last year. There are, of the total Indian population, 81,634 reported as living on reservations or under supervision.

In south-eastern Alaska, 6,725 Indians are reported; Cook's Inlet, Kadiak, and Prince William Sound are estimated to contain 1,028. The Kuskokwim valley is alloted 147; and the Yukon basin, 2,226. These latter figures are probably under-estimates; but the total arrived at is 10,126.

Of the Orarian or Eskimo population of the shores of arctic British America no enumeration is yet possible. From Labrador to the Mackenzie mouth, probably not less than 6,000 are scattered in various localities. In Alaska there are 2,214 Aleuts. Of Innuit, properly so-called, there are estimated to be 17,488, which is likely to prove excessive, and thus in the total to correct the supposed under-estimate of the Indian population. Of these, about 3,000 are assigned to the Arctic coast; about 2,000 to Cook's Inlet and Kadiak; 7,500 to Bristol Bay and the Kuskokwim delta; and 3,300 to the Yukon delta. Taken together, this would give 25,702 Orarians, and 120,631 Indians; or 146,333 aborigines for the whole area. As estimation enters into the figures in several places, it may be said in round numbers, that the region probably contains about 150,000 aboriginal inhabitants, or 1 to 65 □ kilometres. — W. H. D. [833

(*Asia.*)

Eastern Turkestan. — K. Himly's translation of the Si yü shui tao ki (Notes on the water-courses of the western district), a Chinese work written in 1824, is continued, but not yet concluded. The present number gives statistical description of the course and length of the Kyzyl, Yarkand, and other rivers, and numerous general and etymological notes. — (*Zeitschr. f. erdk. Berlin*, xvii. 401.) W. M. D. [834

BOTANY.

(*Physiological.*)

Holdfasts in Podostemaceae. — It is well known that the river-weeds possess organs by which they cling to loose stones much as Fuci do. Warming calls attention to the presence of root-hairs on these and many other kinds of holdfasts, and he proposes to bring the various sorts under a single designation, namely, Haptera. While the term may prove useful, it must be remembered that under it are comprised at least two unlike plant-members. As they fulfil the same office, namely, clinging, they are physiologically similar, although morphologically unlike. — (*Botan. zeit.*, March 22.) G. L. G. [835

Chemical constitution of certain protoplasmic bodies. — Zacharias, who has shown the curious chemical relations between the nucleus in plants and animals, and has pointed out the presence of phosphorus in the nuclei, has just given an interesting account of his studies in regard to the various contents of the cell in plants. Albumen, nuclein, and plastin are found in very different proportions in the different albuminoidal bodies in the cell. — (*Botan. zeit.*, March 30.) G. L. G. [836

(*Systematic.*)

Chapman's Flora. — The re-issue of Dr. Chapman's Flora of the southern United States, which has long been out of print, is accompanied by a supplement of seventy-four pages, giving all the addi-

tional species that have been detected since 1860, the date of original publication. These additions comprise 64 genera and 383 species, besides 46 species and 19 genera that are certainly introduced plants. Rather more than half of these species are from Florida. No changes of any kind are made in the original text, a revision of which must probably await the completion of the Flora of North America. — S. W. [837

Fern distribution in the United States. — The ferns of the United States now number 164 species (representing 32 genera), an increase of 39 in the last eight years. It is probable that the number is still by no means complete, and that others may be expected especially from the mountains bordering the Mexican boundary, and from the peninsula of Florida. Mr. Davenport gives a list of the known species, and their distribution among the states and territories. From his tables it appears that New York takes the lead in the number of species (52) that are credited to it, followed by California (48, with 4 others in doubt), Arizona (47, and 3 in doubt), Florida (47, and 2 doubtful), Michigan (47), Vermont (45), Pennsylvania (42, and 2 doubtful), Massachusetts (42), Kentucky (41, and 2 doubtful), Arkansas and Connecticut (41), etc. Six of the genera and twenty-four species are found only in Florida; one genus (Schizaea) is represented within the United States only in New Jersey; and, on the other hand, Pteris aquilina occurs in at least thirty-nine, and Asplenium Trichomanes and Adiantum pedatum in thirty-five out of the forty-eight states and territories. — (*Journ. Amer. phil. soc.*, Feb., 1883.) S. W. [838

Araceae. — Dr. Engler continues his contributions supplementary to his monograph of the Araceae in De Candolle's Monographia, proposing two new monotypic genera, — Synandrospadix, from the Argentine Republic; and Oligogynium, from tropical Africa. He approves of Baillon's adoption of Richardia as the older name of the Rubiaceous genus now generally known as Richardsonia, and follows him in the consequent restoration of Sprengel's name, Zantedeschia, for the 'Calla lily' (Richardia Aethiopica) and its congeners. — (*Engler's bot. jahrb.*, March, 1883.) S. W. [839

(*Fossil plants.*)

Relations of Lepidodendron, Sigillaria, and Stigmaria. — A new memoir by M. Renault answers the critical remarks of Prof. Williamson and Dr. Hartog of Manchester, against the conclusions reached in his *Cours de botanique fossile* (see p. 397). The English anatomists find no marked difference in the composition of the wood of Sigillaria and Lepidodendron, which is, in both, of a single centripetal zone of tissue. Both are, therefore, true lycopodiaceous or cryptogamous plants. M. Renault considers the wood of Sigillaria as composed of two distinct zones; — an internal, of centripetal growth; an external, centrifugal, with distinct agglomeration of tracheae of the woody cords of the leaves, — centripetal in traversing the inner zone of the wood, centrifugal in passing through the secondary, which covers the trachean mass. This double woody zone relates Sigillaria to the Cycadeae or to the dicotyledonous gymnosperms. This last opinion has been already sustained by Brongniart. — (*Consid. rapp. Lepid. Sigill. et Stigm.*, Paris, *Masson*, 1883.) L. L. [840

Tertiary flora of Australia. — From observations made at Dalton, New South Wales (eocene horizon), and in the Travertine of Hobart Town, Tasmania (miocene), Baron von Ettingshausen finds that the tertiary flora of Australia is far more nearly allied to the tertiary floras of the other continents than to the living flora of Australia. It appears not improbable, therefore, that the numerous forms which characterize the latter have been developed out of pliocene or post-tertiary forms of plants, thus far unknown to geologists. The existence at the present time of characteristic non-Australian genera in the flora of the continent is traced back to the tertiary period, in whose deposits remains of such forms as Fagus, Tabernaemontana, and Elaeocarpus, have been discovered. — (*Geol. mag.*, April, 1883.) A. H. [841

ZOÖLOGY.

Protozoa.

Development of Volvox. — Miss S. G. Foulke presented a communication upon the development of Volvox globator and its separated gonidia or reproductive spores. It was stated that in one case some of the gonidia freed themselves from the protoplasmic envelope, breaking the connecting filaments, and swam away. In some instances these free gonidia passed into an encysted state; in others, attached themselves by the remains of the filament to other substances, thus using it as a footstalk, and presented the appearance of Vorticella. Many of the free gonidia remained in a free swimming state. Others remained in the Volvox, developed in Amoebae, and emerged, after enveloping and digesting some of the neighboring gonidia. These Amoebae afterwards took the form of Amoeba radiosa, and then returned to their former state, seeming to have the power of using either shape at pleasure. As the parent Volvox belongs to the microscopic Algae, or water-plants, the change of its spores to a form in all respects apparently identical with an animalcule furnishes another interesting illustration of the approximation of the lowest animal and vegetable organisms. — (*Acad. nat. sc. Philad.; meeting* Feb. 20.) [842

Dimorphism in fossil Foraminifera. — MM. Schlumberger and Munier-Chalmas find that certain foraminiferal forms — otherwise undistinguishable from each other, except in the matter of size, and therefore specifically identical, as far as external characters alone would indicate — exhibit in the disposition of the central chambers some well-marked differences of structure, hitherto recognized as being of specific or even subgeneric value, but which appear to be entirely dependent upon the ages of the individuals concerned. In young individuals, as indicated by tests of small size, a relatively very large central initial chamber is distinctly visible; whereas, in the older or larger specimens, this chamber can only be determined by means of a powerful magnifier. This so-called dimorphism was found to obtain in both the perforate and imperforate groups, — in Nummulina, Assilina, Biloculina, Dillina, Fabularia, Lacazina, Triloculina, Trillina, Quinqueloculina, Pantallina, Heterillina. — (*Rev. scient.*, March 31.) A. H. [843

Worms.

Anatomy of Terebellides. — The anatomy and histology of T. Stroemii M. Sars has been investigated by Steen at Kiel. The drawings on the three plates are too schematic in character to inspire absolute confidence. The published article takes the form of a complete monograph, but consists substantially of a detailed description of the external form and appendages, and of the internal anatomy and histology. The various organs are taken up in succession, and excellently treated; but the details are hardly adapted for a brief abstract, although they will be valuable in compiling a comparative histology. — (*Jena. zeitschr. naturw.*, xvi. 201.) C. S. M. [844

Multiplication of worms by division. — Dr. C. Bülow has investigated the processes of transverse division in Lumbriculus variegatus, and the regeneration of parts to complete a new individual out of the pieces of the parent body. His article is prefaced by a valuable *résumé* of previous investigations. In Lumbriculus, besides the sexual there is a natural asexual propagation, by simple transverse division, occurring spontaneously. Head and tail, both or either, can be re-formed. There is no budding zone formed before division: the process is therefore different from that in Nais and the Syllidae. In both head and tail the segments are apparently newly developed from before backwards (*contra* Bonnet). The head and tail buds are formed within 48 hours after division; and, in a few days, defecation through the new tail-end may be observed. The re-development may be produced by artificial division. One individual was cut into fourteen pieces, of which thirteen grew up to complete individuals. (The paper would have been improved by much shortening and more careful arrangement.) — (*Arch. für. naturgesch.*, 1883, 1.) C. S. M. [845

Anatomy of Prorhynchus. — J. von Kennel publishes an article on Prorhynchus, one of those doubtful genera of worms whose systematic position could not hitherto be satisfactorily determined. Kennel shows definitely that it is a rhabdocoelus turbellarian. It has a simple straight intestine, and muscular pharynx. The structure of the integument and parenchyma of the body is like that in other Rhabdocoela, and not like that of nemerteans. The same may be said of the nervous system. The penis lies well forward, and, before its structure and relations were correctly understood, was compared to the proboscis of nemerteans, with which it has no relation. It is armed with a spine, and has a muscular bulb at its base, which is connected by a somewhat tortuous duct with the vesicula, in which the products of the male glands are directly received. It lies ventrally from the pharynx. The stylet is exserted through the mouth. It is a very complicated apparatus, which the author fully describes. There are no separate yolk-glands; but these are united (unlike other plathelminths) in one mass with the ovary. This is the most important difference found between Prorhynchus and other Rhabdocoela. — (*Semper's arbeiten*, vi. 69.) C. S. M. [846

VERTEBRATES.

Equilibration functions of the semicircular canals. — From observations on dogs with one or both auditory nerves divided, Bechterew concludes: 1°. Unilateral section is followed by forced movements of rotation around the long axis of the body, with deviation of the eyes, nystagmus, etc. 2°. The movements, at first constant, occur later in paroxysms separated by periods of rest. During the latter, the animal assumes a constrained position, lying on the opposite side to that of the section. Finally, the rolling movements altogether cease; but the animal has a tendency to exhibit circus movements towards the injured side, and has a deficient power of maintaining its balance on its feet. 3°. All the above symptoms are reflex, since they are still exhibited after removal of the cerebral hemispheres, or in narcosis. They are, however, more marked when the hemispheres are present. 4°. Section of both auditory nerves is accompanied by marked deficiency of the power of maintaining equilibrium. The animal can neither stand nor walk. 5°. When only one nerve is cut, the forced movements are due to a disharmony resulting from the absence on one side of the normal semicircular-canal sensations, and their presence on the other. Hence the cerebellar equilibration-centres act abnormally; also, when the cerebrum is present, the uninjured side sends stimuli to the centres of consciousness, which, being unbalanced by the usual associated stimuli from the other side, lead to vertigo. 6°. The well-known action of auditory impressions in influencing movements (as in dancing and marching) occurs, in all probability, through the semicircular canals. — (*Pflüg. archiv*, xxx. 312.) H. N. M. [847

Influence of the spleen on pancreatic digestion. — Twenty years ago Schiff published researches which led him to believe, that, after removal of the spleen, the pancreatic secretion lost its power of digesting proteids. His final conclusion was that, the spleen did not itself make the proteolytic ferment, but furnished to the blood something essential for its formation in the pancreas. Schiff's statement attracted but few adherents; and Haidenhain, in 1875, proved that a substance (zymogen) capable of yielding proteolytic ferment, accumulated in the pancreas quite independently of the presence or absence of the spleen. This seemed, at first sight, to completely overthrow Schiff's theory of the splenic function in digestion. Herzen now brings forward experiments which reconcile the apparently opposite conclusions. He claims that his researches on dogs prove that after removal of the spleen, the pancreas may still heap up zymogen (*trypsogen*), but that this is not under such circumstances transformed into a proteolytic ferment (*trypsin*), as it is normally when the spleen is present and in physiological activity. Hence, after splenotomy, or in cases of serious splenic disease, the digestion of albuminous substances is greatly impaired. — (*Pflüg. archiv*, xxx. 295.) H. N. M. [848

Mammals.

Early stages of the guinea-pig ovum. — Spee has published the results of his observations on this subject. Up to the beginning or middle of the fourth day, the ova remain in the oviduct, whence they must be carefully extracted. Eggs of two days have four segmentation-spheres, around and between which a coagulated mass soon appears *post mortem*. On the third day the limits of the cells are unrecognizable; but they may be more or less isolated by bursting the ovum. After the fifth day, the coagulum no longer appears around the segmentation-spheres. In all the early stages *post-mortem* changes are very great and rapid. While still free, after the fourth day, the ova lie in the tip of the uterus, whence they may be driven by forcing with a syringe a current of warm 0.5% salt solution into the vagina, and out of the tip of the uterus (after cutting off the oviduct). By employing this method, Spee has obtained germ-vesicles (keimblasen) agreeing essentially with corresponding stages as found in other mammalia, the principal difference being that the cells are relatively larger, segmentation not having progressed so far. There is an outer wall close against the zona pellucida, and composed of a single layer of cells, spindle shaped when seen in section, polygonal when viewed from the surface. At one pole is an accumulation of cells, the 'keimhügel,' while at the opposite pole the cells at the outer layer are thickened. In a later stage the cells of the latter pole are found to have thrown out branching processes which penetrate the zona pellucida. Apparently these processes increase in size; and it is probable that they make a hole through the zona by which the egg makes its exit. Spee has actually found, in one case,

an empty ruptured zona. This is an important and interesting observation, because the fate of the zona pellucida has not been hitherto determined. Spee adds the suggestion that possibly the same protoplasmic processes which serve to free the egg, also act to fasten it to the wall of the uterus.

As a continuation of Spee's paper, Hensen describes an ovum, soon after attachment to the uterine wall, found six days and twenty-three hours after copulation. The egg (0.13×0.08. mm. in diam.) lay in an open pit of the mucosa. It consists of a vesicle, with a mass of cells on one side, therefore agreeing in structure with the latest stage of the free ovum seen by Spee. Formerly Hensen considered the mass of cells to represent the ovum, and the wall of the vesicle to be an outgrowth of the epithelium of the uterus; but he now withdraws that interpretation, and accepts Schäfer's view that the whole is ovic. "The vesicle is therefore the single-layered primary chorion, which is derived from the ectoderm, and is separated very early from the embryo proper. In other mammals this separation does not occur until after the formation of the amnion." The ectodermal cells of the germ-mass of the embryo come to form a hollow, and this hollow Hensen homologizes with the amniotic cavity of other mammals. Of course, therefore, it is bounded by the ectoderm, and, beyond that, by the entoderm. The apparent reversal of the layers is therefore due to the early development and peculiar position of the amniotic cavity, inside the ovum. In conclusion, Hensen insists upon the importance of showing that the histological value of the germ-layers is really preserved, even in so unusual a form of development as that of the guinea-pig. — (*Arch. anat. physiol., anat. abth.*, 1883, 44, 61.) C. S. M. [849

Germ-layers and gastrula of the mouse. — In some rodents the germ-layers have apparently a position the reverse of that in other animals. This fact has led Selenka to investigate the early stages of white mice in the search for the explanation of the reversal. He has published a preliminary notice of his results. There is a special envelope of covering cells within which the cells of the embryo proper undergo their development. (This is perhaps the stage described by Spee — see 849 — in the guinea-pig, as a vesicle with a clump of cells at one end.) The embryo-cells lie at one end, separate into the two primitive layers, and become united with a support formed by a knob of cells attached to the uterine wall. This knob is not used in the construction of the embryo. The mass of ectoderm-cells becomes hollow, and the cavity increases in size. In the ectodermal cells limiting it, the ectodermal organs of the embryo are developed according to the typical processes in other mammalia. A more detailed report of this interesting research will be given when the full memoir is published. — (*Biol. centralbl.*, ii. 550.) C. S. M. [850

Embryology of mice. — The observations of Selenka and Kupffer on the development of mice have been critically reviewed by Hensen. He does not accept their views as to the gastrulation, or that the formation of the cavity bounded by the ectoderm is the gastrula development. Selenka attributes the reversal of the germ-layers to the proliferation of the ectoderm-cells; but Hensen maintains it to be due to the invagination of the mass of cells forming the embryo-germ. The ectodermal cavity in Arvicula does not correspond, as would seem natural, to the amniotic cavity of the guinea-pig; for an amnion is subsequently developed in its interior. (Does not this rather indicate that Hensen's homologizing the ectodermal cavity in the guinea-pig with the amniotic cavity is erroneous, and that it is really the same as the ectodermal cavity described by Selenka and Kupffer?) Finally Hensen discusses briefly the position of the germinal disk in guinea-pigs, and compares it with that of rabbits. — (*Arch. anat. physiol., anat. abth.*, 1883, 71.) C. S. M. [851

ANTHROPOLOGY.

The Onondaga Indians. — In 1882 the legislature of New York appointed three commissioners to inquire concerning the condition of the Onondaga Indians; and their report has been published. With the feud between the the christian and the pagan parties, we have nothing here to do; but much interesting ethnologic matter appears throughout the pamphlet. On the reservation in Onondaga County are 319 souls, who, with others of their tribe scattered through the state, amounting in all to 500, constitute a nation, recognized as such in treaties and by the courts, holding their lands in perpetuity, not to be sold or in any manner disposed of, and regulating them entirely after their own fashion. The origination of the union of the Six Nations is detailed in Morgan's League of the Iroquois, and a brief sketch of their history is given in the pamphlet now under review. The Onondagas hold their land in common; but certain portions are held by individuals, and these possessions are bought and sold and leased to one another. Some of them are thrifty farmers, owning cattle, oxen, and horses, and they frequently monopolize the best lands. The old custom of frequent divorces has been partly broken up by the new constitution of the tribe; and the law now conforms to that of New York respecting the Indians, — that those who contract marriage shall be considered as lawful husband and wife, and their children shall be legitimate. In practice, however, there is just ground of complaint. The evidence before the commission shows that old practices are kept up in some of the Indian dances that are incompatible with civilization. To the report of the commission are appended the new constitution, and the complaints and charges of the two factions in the tribe. — J. W. P. [852

Philologic science. — Dr. Frederick Müller, of Vienna, published, during the past year, parts 1 and 2 of vol. ii. of his *Grundriss der sprachwissenschaft*, devoted to the languages of the smooth-haired races. Part 1 is devoted to the Australians, the Hyperboreans, and the Americans; part 2, to the Malays and the northern Asiatic (Mongolian) races. Of the subdivisions of the Australian race, it is impossible here to speak. The Hyperboreans are made to embrace the Yenisei-Ostjaks, Yukagirs, Chukchis, Ainos, Aleuts, and Innuits. The American languages discussed are the Athapaskan, Algonkin, Iroquois, Dakotan, Cherokee, Chahta, Kolosh, Selish, Sahaptin, Chinuk, Mutsun, Nahuatl, Sonoran, Otomi, Taraskan, Tototen, Matlatsinka, Mixtek, Zapotek, Maya, Mosquito, Bribri, Arowak, and Carib, in North America; and the Moxos, Muisca, Paeses, Yaruros, Chimu, Inca, Guarani, Kiriri, Chiquitos, Lules, Abipones, Moluches, and Tehuelche, in South America.

Under the high Asian languages in part 2, Prof. Müller includes the Samoyede, Ural-Allaic, Japanese, Corean, Tibetan, Burman, Siamese, Khasian, Anamese, and Chinese.

In no case does the list of languages claim to be exhaustive; and especially is this true of North America. The plan with each tongue is to commence with the sound system, and, proceeding from a discussion of root-forms, to progress through the differentiation

of parts of speech and accidence, so far as this has taken place. [853

Nomenclature of stature. — Dr. R. Fletcher read a note on Zoja's scheme for nomenclature, relative to human stature, of which the following table presents the main features: —

			Centimetres.
Gigantosoma	Hypergigantosoma.	Phenomenal . .	251– supra.
	Gigantosoma . . .	Giants	226–250
	Hypogigantosoma .	Gigantic . . .	201–225
Megasoma	Hypermegasoma .	Near gigantic .	191–200
	Megasoma . . .	Very tall . . .	181–190
	Hypomegasoma .	Tall	171–180
Mesosoma	Hypermesosoma .	Above ordinary.	166–170
	Mesosoma	Medium . . .	165
	Hypomesosoma . .	Below ordinary.	164–160
Microsoma	Hypermicrosoma .	Low	159–150
	Microsoma . . .	Very low . . .	149–140
	Hypomicrosoma .	Lowest normals.	139–125
Nanosoma	Hypernanosoma .	Dwarfish . . .	124–100
	Nanosoma . . .	Absolute dwarf.	99–75
	Hyponanosoma . .	Phenomenal . .	74 et infra.

The observation was made, that the figures given are for Italians, and would have to be modified for each race of men. — (*Anthrop. soc. Wash.; meeting* April 17.) J. W. P. [854

Through Siberia. — This is the title of a work by Henry Lansdell, first appearing in 1881, and issuing in a third edition, in 1882, by Houghton, Mifflin, & Co., Boston. The author's journey was overland through Tobolsk, Tomsk, and the southern part of Siberia, across the head waters of the great north-flowing river-systems of Asiatic Russia, to the mouth of the Amoor River. The chief motive of the trip was a study of prison-life in the countries visited; but works of this kind frequently reveal delicate flowers of aboriginal life and facts that are as welcome to the reader as their great value is unappreciated by the writer. The author gives a list of the stocks mentioned in the Russian map of this territory, as follows: Slavs, Zeryani, Voguls, Votyaks, Tatars, Kirghees, Karakalpaks, Sarto, Usbeks, Turks, Kalmuks, Teleuti, Ostjaks, Samoyedes, Yurakis, Yakuts, Tunguses, Goldi, Gilyaks, Yukagirs, Chukchis, Koriaks, Kamchadales, Ainos, Buriats, Manchus, and Chinese. The manner in which the ethnological information is scattered through the work renders it difficult to refer to that concerning any one tribe. Especial interest will be taken in the mention, on p. 26, of the Tatars, descendants of the followers of Genghis Khan. The ethnography of the Ob-Irtish valley, including Tatars, Russians, Voguls, Ostjaks, and Samoyedes, will be found on pp. 98–106, 124–126; that of the Yenisei, on pp. 205–210; that of the Yakutsk province, on pp. 296–308, with a short vocabulary on p. 305. In chapter xxviii. will be found an account of personal adventures with the Mongolian frontier races; and in chapter xxx., a description of the Burjats. Coming to the Amoor River, the Oronchons, or reindeer Tunguses, and the Manyargs, or horse Tunguses, meet the traveller (see pp. 507–511). Chapter xliii. introduces us to Manchuria and its inhabitants; and chapter xlvi., to the Gilyaks and Goldi at the mouth of the Amoor; and the closing portion, to eastern Siberia, the Kamchatkals, and Sauhalins. The volume closes with a bibliography and a copious index. — J. W. P. [855

EGYPTOLOGY.

Art in Egypt. — The influence of the earlier art of Chaldea and Assyria on art in Egypt, is the subject of a work by L. von Sybel, Kritik des aegyptischen ornaments (Marburg, 1883), in which he takes the position, that, after the eighteenth and nineteenth dynasties, the art of Egypt was largely modified by the influence of Chaldean and Assyrian art. This, he asserts, is shown not only in decoration, but also in statuary of the human form. Perrot, though differing in some respects from the author, bears witness to his extended researches and his excellent taste. — (*Rev. archéol.*, Dec., 1882.) H. O. [856

Color in Egypt. — "Egyptian color must be seen in Egyptian sunlight, which almost blots it out, or in the dim interior of an Egyptian temple, and then the strong contrasts of bright hues are very much sweeter and more musical than they seem to us. There is a gentle harmony in them. . . . It is impossible, without seeing a very fine Epyptian monument under the conditions of light in which the builders meant it to be seen, for us to apprehend their coloring, which certainly, when represented in pictures, or seen in our own generally diffused light, has an aspect of harshness, though the harmony of color is maintained in the use the Egyptians make of it. Take ivory and ebony, gold, lapis lazuli, green and red jasper, and let a great master make a mosaic in Egyptian style, and you would see how really grand it is, and how it has in it that large simplicity which connects it with the expression of durability. I think if you will study Egyptian decoration you will find this to be true." — (R. S. Poole, *in* '*Lect. on art*,' 1883.) H. O. [857

EARLY INSTITUTIONS.

Institutions of early Rome. — M. Alfred Maury sums up the conclusions of Gen. Favé in his *Ancienne Rom* (Paris, 1880, 8°). The city presents itself at first as an aristocracy of free men (*ingenui*) governed by the heads of families (*patres*). It was an aristocracy of landlords and warriors. Below this aristocracy were the plebeians, who were clients of the patricians; at any rate, subject to them, and governed by them. Most of the land was in the hands of the patricians. The plebeians appear to have had only movable property, and not much of that. As in the feudal time, during the middle ages, war was regarded as the school of virtue; but it was a school for every class of free men (which was not the case in feudal times). The freemen went to war at their own cost, each man spending his own money in it. The burden of military service was very heavy for the poorer classes of freemen, and it was a principal cause of the pauperism and indebtedness of the plebeians, of which we read so much. The people were continually called out to war, and had no time left them in which to provide themselves with the necessary means of support. The writer describes the institution of paid forces and standing armies. This gave to Rome a great advantage over the other states of Italy, where the people were still called to war at their individual cost. The result was, that not only Latium, but almost all Italy, was soon subject to Rome. Colonies of Roman citizens were then planted in various parts of Italy, and, what was unprecedented, garrisons of soldiers were established to protect them. The other states of Italy did not protect the colonies which went out from them. The colonies were frequently quite severed from the mother-state. This was not the case with the colonies of Rome. They were the outposts of a military system. The arts of war and defence were constantly cultivated by the Romans. This was not the case in the other states of Italy, and they were easily conquered. Gen. Favé considers the early history of Rome from the military point of view. — (*Journ. des sav.*, Jan., 1883.) D. W. R. [858