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SCIENTIFIC AMERICAN SUPPLEMENT

No. 978.

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MAN AND VEGETATION.

While invention has produced many substances which in part replace wood and other organic materials, the fact remains that man is to-day almost as dependent for his comfort and very life on the vegetable world as were his ancestors in more primitive times. The anatomists have had long disputes as to man's place in the scale of food consumption, whether he is properly omnivorous or not. Whether carnivorous or vegetarian, his food derives its ultimate origin in the wonderful chemical decompositions and syntheses effected by the vegetable kingdom. The highest triumphs of synthetic chemistry have not yet succeeded in producing his food from the chemical elements.

The production of self-supporting aquaria, consisting of tanks of water in which plant life and fish life are so exactly balanced that there is a miniature self-supporting world within the four glass plates, has been a favorite scientific amusement with many. On our globe we see a similar thing in the relations of the animal and vegetable kingdoms. Unfortunately, man is not content with exterminating wild animals; he is not satisfied with utilizing for himself all vegetable nature, but he exterminates most recklessly the forests whose leaves are taking care of his own vitiated respiratory products.

The earth contains plant and animal life, each one taking care of the products of the life of the other kind. The animal expires carbon dioxide gas, the product of the combination of oxygen of the air with the carbon of the body. In a plantless globe this gas would constantly increase in the atmosphere, to the eventual deterioration of the air; but the plant life disposes of this product, separates the carbon from the oxygen, and still more wonderful, effects one of the most difficult of syntheses, and unites the carbon with hydrogen, producing vegetable substance of different kinds. The purification of the air by plants, owing to the enormous volume of the atmosphere and its relatively slow contamination, is of secondary importance to the production of plant substance. On the products of vegetation man depends for nearly everything, for food, raiment, and heat. Not content with reckless deforestation, he draws upon the accumulated stores of the preceding geological eras, and in burning coal, probably petroleum and natural gas, is drawing upon the remains of the vegetation of the carboniferous and other ages.

Plants by their vital power effect two specially difficult chemical actions—the decomposition of carbon dioxide gas, and then combine the separated carbon with hydrogen. Absolutely no practical way of doing these things has been as yet found by man. It is only by a laboratory experiment that either of these two reactions is carried out. It may be said that every steam engine depends for its fuel on decomposed carbon dioxide gas and every petroleum lamp represents the utilization of the decomposition and subsequent synthesis which we have spoken of. In the matter of food, man is still more dependent on the vegetable world. Very few artificially produced food products have ever been made, and these few may have their origin traced to some vegetable product. The glucose factories use a product of vegetation as the base of their operations. Until we succeed in bringing chemistry to a point of perfection hardly dreamed of by the most visionary, man will continue to depend upon the soil for his very life. He may selfishly feel that all this is of interest only for subsequent generations, but to every enlightened mind the reckless waste of vegetable resources, among which may be included coal, petroleum, and natural gas, is highly repugnant.

Science Notes.

Decoration of Aluminum.—Mr. W. Greune, according to Annales Industrielles, has invented a process of decorating aluminum, based upon the metal's property of uniting when hot with very finely divided carbon in order to form very durable and adhesive coatings. In order to apply the carbon to the surface of the metal, the most convenient method consists in spreading, with a brush, over the surface to be decorated, alcoholic or benzinic solutions of organic compounds, such as fats, oils, resins, etc., which are not very volatile and which are destroyed by heat and leave a deposit of very finely divided carbon. The objects thus prepared are heated to a dark red. They thus become covered with a layer of carbon intimately connected with the metal, and the shade of which varies with the mixture employed and the temperature to which the piece has been submitted. To the carbon composition may be added metallic salts that favor the decomposition and permit of varying the shade of the coating to infinity.

Preparation of Chromium.—From some new researches of Mr. Henri Moissan upon chromium, it results that, through the use of the intense heat produced by the electric arc, it is possible to prepare fused chromium in very large quantities. The product may be refined either by fused lime or by the double oxide of calcium and chromium.

The metal obtained under such circumstances is less fusible than platinum. It may be filed, it takes a beautiful polish, and is not attacked by atmospheric agents. It is attacked but slightly by acids and resists aqua regia and alkalies in fusion.

This preparation of chromium will permit of efficaciously studying the alloys of the metal. United either with aluminum or copper, it gives, in fact, some very interesting results.

Pure copper, alloyed with 0·5 of chromium, has its toughness nearly doubled, and the alloy, which is capable of taking a beautiful polish, alters less than copper does in contact with moist air.

Commercial Products Obtained from Sharks.—Sharks, says a writer in the Revue Scientifique, furnish quite a number of valuable products. Thus, the liver of the shark contains an oil of a beautiful color, that never becomes turbid, and that possesses medicinal qualities equal to those of cod liver oil. The skin, after being dried, takes the polish and hardness of mother of pearl. It is marbled and bears a resemblance to fossil coral. It is used by jewelers for the manufacture of fancy objects, by binders for making shagreen, and by cabinet makers for polishing wood. The fins are highly prized by the Chinese, who pickle them and serve them at the end of a dinner as a most delicate hors d'œuvre. A ton of fins usually brings (at Sydney) $140.

The Europeans, who do not yet appreciate the fins of the shark as a food product, are content to convert them into fish glue, which competes with the sturgeon glue prepared in Russia. This glue is employed for clarifying beer, wine, and other liquors. It is used also for the preparation of English taffetas, as a reagent in chemistry, etc. The teeth of the shark are used by the inhabitants of the Ellis Islands for the manufacture of weapons of war. As for the flesh of the shark, that, despite its oily taste, is eaten in certain countries. It is employed, also, along with the bones, in the preparation of a fertilizer. The Icelanders, who do a large business in sharks' oil, send out annually a fleet of a hundred vessels for the capture of the animal.

The Structure of Clouds.—Mr. Van der Mensbrugghe recently read before the Scientific Society of Brussels an interesting paper upon the structure of clouds, and of which Ciel et Terre gives the following abstract:

Much has been written, says the author, upon the question as to whether clouds are formed of hollow vesicles or small solid globules; but we now know various facts that dispel every sort of doubt upon the subject. Let us, in the first place, mention the most direct of these. It was announced in 1851 by Mr. Joseph Plateau, who had recourse to the process of F. Duprez for keeping a column of water suspended in a glass tube closed at the top, open at the bottom and of an internal diameter of fifteen or sixteen millimeters. Beneath the free surface of the liquid there was a vessel containing boiling water, whence continually arose a current of visible vapor. Under such circumstances the suspended liquid never lost its perfect transparency, despite the multitude of spherules of visible vapor that struck its free under surface, provided care was taken to wipe the external surface of the tube. Is this not a proof that the condensed vapor did not contain spherules filled with air, and that it was indeed formed of solid globules? In my opinion, says Mr. Van der Mensbrugghe, this experiment constitutes a very serious argument against the theory so often invoked of vesicles in the clouds.

Here, now, are some considerations, which are theoretical, it is true, but yet very plausible, that plead likewise in favor of the globular shape of the spherules that form the clouds. Although these spherules are extremely small, they sustain themselves in the air with so much the more facility in that they are surrounded by a very thick stratum in which the density continues diminishing toward the exterior, and that, according to the principle of Lord Kelvin, they evaporate so much the more rapidly in proportion as they are more tenuous.

If, on the contrary, the globules of the cloud are relatively large, they obey their weight; but, in falling, they traverse warmer and warmer strata of air, and consequently evaporate more and more quickly until they reach a diameter starting from which the resistance of the air prevents their ulterior fall.

We have, therefore, no need of supposing the larger or smaller globules to be filled with air in order to explain the suspension of the clouds in the atmosphere. Moreover, such suspension is merely relative, for the clouds change their form almost constantly, and this well proves either an evaporation or a fall of certain portions that constitute them.

Spontaneous Combustion of Cargoes of Coal and Cotton.—According to Mr. L. Hoepke, it is to a slow oxidation and to the resulting disengagement of heat that must be attributed the spontaneous combustion of cargoes of coal. The danger is so much the greater in proportion as the surface exposed to the air is wider. It is maximum with coal dust. The loading and trimming should, therefore, be so done as to avoid as much as possible the crumbling of the coal under

the influence of the ship's motion. The smallest vessels are preferable for the carriage of coal.

Mr. Hoepke does not believe in the possibility of the spontaneous combustion of cargoes of damp cotton. But it is possible that a spark falling accidentally upon a bale may remain ignited for weeks and afterward set fire to the mass. Greasy cotton, on the contrary, very easily takes fire spontaneously. The same is the case with flax, jute and tow. Stacks of hay, and bales of tobacco and hops are likewise liable to spontaneous combustion.

Electrolysis of Sulphate of Copper.—In a note recently presented to the French Academy of Sciences, Mr. A. Chassy states that if sulphate of copper in a hot state be electrolyzed, there will be obtained in a large number of cases a remarkable violet red deposit. At 100°, for example, with a current density of one hundredth of an ampere per square centimeter, a saturated solution of pure sulphate of copper gives upon a platinum electrode a beautiful deposit, which, examined under the microscope, exhibits magnificent crystals of a bright red, whose forms are derived from the cube and octahedron.

The deposit is not always homogeneous. If the temperature of decomposition be diminished, there will be obtained small reddish yellow crystalline masses of copper disseminated through the red crystals. The lower the temperature is, the greater will be the proportion of metallic copper. Thus, toward 40°, we obtain only a few isolated red crystals. An increase of the density of the current or a diminution of the concentration produces the same effect as a lowering of the temperature of the experiment. In all cases, in order to obtain the red crystals, a nearly neutral solution is requisite. The experiment succeeds as well with a liquid deprived of air through a prolonged ebullition.

Notes from the Antwerp Exhibition.

The Room of Honor, where their Majesties the King and Queen and other distinguished personages are received, was furnished by the French Chamber of Commerce in Brussels from the manufactories of France. It is not large, but is well lighted and handsome. The walls are hung with beautiful tapestry from the Gobelin works, and some more delicate in color and design from Beauvais. The upholstery is rich and of antique looking patterns. Fine Sevres vases stand about the room. A green one, adorned with enamel of gold, blue, green, and red in elaborate design, which ornaments the center table, has been presented to the Queen of Belgium. A very large vase of dark red marble, bronze, and gilt, was made at Barbedienne. A small crucifix formed of a gilt cross with the Christ cut from a piece of Indian jade hangs on the wall under glass. It cost $1,200. One of the gems of the room is a screen composed of two photographs on white silk. One has a purplish blue tint, the other a soft greenish-gray tone; both represent a youth and maiden with the possibilities of a romance within their grasp.

England makes very little attempt at an exhibition; but the case of platinum apparatus patented by Johnson Matthey & Co., of London, and the specimens of metals separated by its use, is valued at $100,000. A nugget of platinum weighs 157·5 ounces. An ingot of palladium, containing 1,000 ounces, was extracted from gold and platinum valued at $11,250,000. Besides these specimens there are glasses containing considerable quantities of the rare elements, silicon in steel gray crystals, osmium in pale blue grains, and a mass of iridium weighing 240 ounces. The standard meter rule and kilo weight adopted by the International Commission of Weights and Measures, composed of pure iridio-platinum, are in the case. The large platinum gold lined vessels for the concentration of sulphuric acid are valued at $18,800. This is the same exhibit shown in Chicago.

Across the Central Gallery hangs the word "Navigation," and below and far beyond it extends the fine display made by the principal great steamer lines. There are many models of their boats, each in its own glass case. The North German Lloyd's section is particularly interesting, and though more complete than some, may be given to illustrate the whole. It occupies two rooms; in one is a large map of the world placed in a horizontal position. On it all the company's routes are indicated by heavy lines, and on each little vessels are placed to show where their entire fleet is at a given time. They are all numbered and a key is given. In this room and the other there are beautiful models of twelve of their vessels. The upper part of the walls is decorated with views of the harbors which they enter, Rio Janeiro, Genoa, Bremen, Sydney, etc. On the wall there are also interesting statistics, among them these: The whole number of passengers carried by the line from 1858 to 1893 is 2,956,849. The corners of the room are filled with a promiscuous mass of wheels, lanterns, buoys, life preservers, etc. Relief representations of the shipyard at Bredow, near Stettin, of the Southampton Harbor and the docks there, and a similar one of Dunkerque are only second in interest to a visit in all three places.

A half section of a model of the man-of-war Victoria, perhaps ten feet long, is placed against a mirror, high above the floor, and has a raised platform beside it, from which a number of spectators are generally to be seen studying her complicated appointments.

The most ambitious industrial work shown in the small section devoted to educational exhibits consists of a pretty, well finished road cart and harness made at a reform school at Logne Pointe, Canada.

The Utrecht Life Insurance Company exhibits a library of 2,009 volumes concerning life insurance and the accessory sciences. They are in the Italian, Dutch, German, French, Latin, and English languages. The catalogue giving full titles contains some curious summaries of books, particularly of old ones. Here is an example: "Hayes, R. A new method for valuing of annuities upon lives. Shewing at sight, as follows: I. How many years, months, etc., purchase an annuity upon life, for any age, from 30 to 73 years, is worth, when money yields 4, 5, 6, 7, or 8 per cent interest. II. How much a year 100 l. is worth upon life for any of the aforesaid ages, etc. III. The value of the buyers' and sellers' chances. V. The present value of any annuity upon life, from 1,000 l. a year to one pound a year, for any age, from 30 to 73 years, when money is worth 4, 5, 6, 7, or 8 per cent. . . . X. The amount of 100 l. a year, if the payment is forborne for any number of years, under 31, at 5 and 6 per cent. Very useful in settling of accounts between executors and orphans. Together with many useful examples and instructions for valuing of single lives; two or more lives; lives taken in with other lives; reversion of lives; annuities in expectation; estates for any certain term of years, as freeholds, leaseholds, and reversions, without any decimals, etc. The whole being made easy to a common capacity. The second edition, corrected. London. 1746. 4to."

A Tyrolese log hut is an interesting part of the Austrian section. It is furnished in a quaint, primitive way, and has some old armor on the walls. But its chief object is to show the scenery of the Austrian Alps; this is done by three large pictures arranged in somewhat the same way that the so-called cycloramas are, though on a smaller scale. The views of glaciers, lofty peaks, with glorious clouds hanging about them, picturesque huts clinging to their sides, and lovely lakes at the foot, will hardly fail of sending some travelers thitherward.

Hungary makes her bid, too, to lovers of fine scenery by the attrative frescoes on the walls of her department. Her display of substances used in the tanning of leather occupies one side of the room. They come from long distances; there are oak bark, sumac, and acorns from Greece and Australia, and nutgalls from the Argentine Republic. The exquisite glass from Vienna is so delicate that in comparison with it that shown by other countries looks coarse.

Bulgaria has done well to send so large a collection of photographs of her scenery. It is so wild and beautiful that, in time, I believe it will be an important rival of Switzerland. She makes no mean display of her products—maize, rice, wheat, etc.—in this exhibition where the cereals are conspicuous for their absence. It has a great variety of useful minerals, too, including marbles, coal, gypsum, iron, copper, and salt. Carpets and furniture strong in texture and barbaric in color, and soft, delicate silk fabrics show the progress in manufactures.

A case of costumes overloaded with gilt and embroidery suggests that some of the people must be very fond of display.

The United States make a most humiliating exhibition. They occupy, the guide book says, 10,000 square yards of space, as much as Germany; but it does not seem to me that the pitiful little array of tobacco, varnishes, musical instruments from Lyon & Healy, in Chicago, the case of pills, the caligraph, steam radiators, some bathtubs, a few easy chairs, some bottles of whisky, alarm clocks, the bags of flour from Duluth, the drills from a Cleveland firm, and car wheels from Buffalo can possibly occupy most of that space, and yet this is a careful list of what is to be found under the American flag, though it does not include a large collection of cash registers of various patterns and sizes. They attract crowds, and probably will not go far to change the belief that the dollar is almighty in America—a belief, by the way, which intelligent Europeans hold with considerable tenacity.

The picturesque costumes that a few years ago added to the interest of a visit on the Continent of Europe have well nigh passed out of use, and, on the whole, there is greater sameness in the general aspect of the crowds here than there was in Chicago. The older Flemish women in lace caps with large ear-shaped flaps over the ears do their share in relieving the monotony, and some of the Dutch peasants are really quaint. Occasionally a party of them may be seen going about together; the men wearing loose black velvet trousers, short jackets, their hair cut square in the neck, and an indescribable expression of simplicity and unsophistication on their faces. The women look as if they had seen more of the world, and were out for a good time. Tightness is apparently with them a very essential element of beauty. The white embroidered cap, with high projecting crown, is drawn closely over the smooth hair; the six or eight rows of pink coral beads are tight enough about the neck to give a choking sensation. The short velvet sleeves fit tight enough above the elbows to make a little puff, and the bare arms are as red as impeded circulation and exposure to sun and air can well make them. A little shoulder shawl, laid in tight little folds, is fastened over their backs, and very ample petticoats complete the costume. This has, at least, the beauty of being old-fashioned in every particular; but some Dutch women combine the old and new, to the great disadvantage of both. This remark applies to those who wear the close-fitting gold helmet over the head, over that a lace cap with a deep, fluted ruffle at the back of the neck, and on top of all a modern bonnet with flowers and feathers.

A serious mistake, in my opinion, is made by many exhibitors in having no one in charge of their exhibits. Among the machinery, where most explanation is needed, scarcely any is to be had, except for a short time in the afternoon. Where there is anything for sale, and those places are numberless, there is no lack of service. During the last few days, lottery tickets are offered at every turn, and the quantity of money to be seen at every stand where they are sold indicates that there is no lack of purchasers. A. D.

The Precipitation of Metals from Solution by an Electric Current.

A searching investigation into the separation of metals from their dilute solutions has recently been concluded by F. Mylius and O. Fromm. The experiments concerned the phenomena occurring in the precipitation of one metal by another, as well as in the electrolysis of solutions. For the work as a whole we must refer our readers to the Berichte der Deutschen Chemischen Gesellschaft, xxvii., 1894, pp. 630-651. The London Electrical Review, however, gives the conclusions arrived at as regards precipitation by the electric current. They are as follows: 1. The heavy metals may be separated more or less easily from their dilute solutions in the form of black, porous, and apparently non-crystalline precipitates. 2. Silver and copper precipitated in this way may absorb or occlude hydrogen during the passage of the current, but the greater part of this gas escapes when the circuit is opened. 3. Silver and copper precipitates exhibit spontaneous change into the crystalline state, frequently accompanied by the evolution of hydrogen. 4. The conversion of the black into the crystalline modification is hastened by the action of metallic salts, acids, and oxidizing agents, the metals in this respect being analogous to the alloys. 5. The black variety of copper containing hydrogen is essentially different from Wurtz's copper hydride. 6. An electrolytic method of formation of copper hydride no more exists than does a process of preparing the same body by means of zinc. 7. The black precipitate frequently observed on the zinc of a Daniell's cell consists of a copper-zinc alloy. The same substance separates and is deposited on the copper plate when the cell is exhausted.

The Bowery Young Men's Institute.

This institution, located in a thickly populated section of New York at No. 222 Bowery, has for its motto "Aids to Self-Improvement," and aims especially to assist in the business education of young men between the ages of 17 and 35.

Instruction is given in the following subjects: Steam engineering, practical electricity, sanitary plumbing, carriage draughting, mechanical drawing, architectural drawing, freehand drawing, arithmetic, bookkeeping, penmanship, shorthand, typewriting, English grammar and composition, vocal music and glee club, and first aid to the injured.

A distinctive feature of this educational work is that the theory is taught to those who are getting the practical part of the subject in their daily work. Firemen are taught all the theory necessary for becoming engineers. Engineers are prepared to take charge of higher grade engines. Machinists are taught the mechanical drawing which they need in their work. Young men in offices are taught the commercial subjects. In this way the efficiency and commercial value of each student is increased for his present employer.

Connected with the institute is an excellent gymnasium and also a commodious hall, where lectures on practical topics are given.

Waterproof Cloth.

A textile fabric or cloth, of close texture, is subjected to the action of sulphuric acid of about 115° T., so as to partly parchmentize the fibers and more or less completely close the interstices without destroying the texture of the cloth. The excess of acid is removed by washing, with or without previous treatment with alkali, and the washed material is subjected to pressure between calendering rolls, whereby a finished appearance is imparted, and the closing of the interstices completed. The material may be suitably dyed.