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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 516,

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THE NATIONAL ACADEMY OF SCIENCES.

The National Academy of Sciences met at Albany, N. Y., on Nov. 10, and enjoyed a large and distinguished attendance. During the four days of the session a large number of papers were presented; many of them were of more than ordinary interest. Prof. Young gave a *resume* of the history of that erratic star in Andromeda, and quoted Monck's hypothesis accounting for its luminosity on the ground that it may be a dark star passing through the nebula. Prof. Pickering's paper on "Stellar Photography" attracted marked attention. After pointing out the great progress which has been made in this department of late years, he cited a recent victory in gaining the impression of stars so distant or so minute as to be beyond the discovery of the most powerful telescope yet constructed. Major Powell's description of the stone ruins on the Colorado and Rio Grande pointed to the conclusion that the arid regions now so characteristic of the interior of the continent were once fertile and well watered. His paper was full of interest. Prof. Graham Bell made a preliminary report on hereditary deafness, having made a careful study of three out of the six branches of the Lovejoy family, in which there are numerous deaf mutes. Other papers by Prof. Hall, Prof. Newberry, and other well known members made the session one of much interest.

Durability of Cross Tie Timber.

In an investigation of this subject made by Mr. F. B. Hough for the Department of Agriculture, some interesting facts are brought out. The relative importance of the various kinds of timber for railway purposes are reported in the following order: Oaks, pines, chestnut, hemlock, cedars, tamarack, cypress, elms, ash, cherry, black walnut, firs, spruce, beech, locust, redwood, maple, butternut, coffeenut, mulberry, and mesquite.

The average durability of oak, as reported in 32 cases, is 7·4 years, while the average price of each cross tie is 41·2 cents. The kind of oak is not specified. For white oak the average durability in 152 reported cases is 7·3 years, and the average price in 173 cases is 40·6 cents. The average duration of a post oak tie is 7 years, and the average price 33 cents. For burr oak, durability, 7·4 years; price, 37·3 cents. Rock oak showed an average durability in 18 cases of 7 years; price, 42 cents. In the case of red oak 5 years is the average durability, with an average cost of 27 cents. Chestnut oak is more durable, showing an average lifetime as a tie of 7·1 years; cost, 28 cents per tie. Black oak shows an average durability of 4½ years; average price, 43 cents.

Long leaf or southern pine will last on an average 6½ years; average cost per tie, 37 cents. White pine has about the same durability with less cost, the latter showing an average of 31½ cents per tie.

Cedar shows the greatest average durability, being 11·8 years, with average cost of 34 cents, but it is too soft to bear heavy freightage, and for that reason is not much employed in railway construction. Red cedar is more durable than white cedar, being in the proportion of 11 to 7. Cypress shows greater durability than white oak, the former showing an average of 8·7 years. White ash and black ash rot very quickly, the former in 4·3 years, and the latter in 3·8 years. Cherry is a durable timber when used as cross ties, running from six to ten years. All woods are much more lasting when hewn than when sawn.

The redwood of California makes very durable ties, lasting over eleven years, but allowance must be made for the fact that they are used on the Pacific roads, in a dry climate, where the causes inducing decay are not so great as in the States east of the Rocky Mountains. The growth of the redwood is very slow. Trees fifteen years old have a diameter of only ten or twelve inches, and will make about three ties. When younger than this, the wood in not durable. The redwood of the Santa Cruz Mountains furnishes the best ties, it being much heavier and denser than when grown further north. The average cost of redwood ties is 40 cents. The total length of railway track in the United States is approximated at 150,000 miles. Assuming that the average durability of ties is seven years, and the distance apart is three feet, there will be 2,640 to the mile, which is rather under than over the actual number employed, making the total number in use 396,000,000. Estimating one-seventh to be replaced every year, the annual demand to keep up the present railways will reach 56,571,428. Supposing that an acre will supply 100 ties, which is a liberal estimate, it will require 565,714 acres annually to furnish the ties required by the existing lines of railways. For each mile of railway there will be an annual demand for 377 ties, requiring the cutting off of 3·77 miles. It will require thirty years on an average for trees to grow large enough for making cross ties. The acres that must be kept in timber and growing will be 16,971,420 for supplying ties to the railway lines now in existence.

The increase in railway mileage, estimated by two decades, is about 4,150 miles annually. To construct the railways that will probably be built in the next ten years, 109,560,000 ties will be demanded, the product of 1,095,600 acres of woodland. Allowing thirty years as the period of growth for ties, this would add 3,286,801 acres to the timber reserve for railways alone, making a total of 18,996,570 acres as the needful reserve. Evidently this question is one demanding reach of statesmanship and a careful preservation of our present timber supply. The time is not far distant when one of the largest items in the construction expenses of our railways will be the one for cross ties.

Return of the Alert from Hudson's Bay.

The Arctic steamer Alert, whose name is so familiar to everybody from her connection with the Greely Relief Expedition, returned to Halfax on October 18, after an eventful cruise in Hudson's Bay. Some of our readers will perhaps remember that in the summer of 1884, a staff of observers was sent out by the Canadian Government to establish stations at various points on Hudson's Bay, and to decide if possible upon the practicability of the much talked of Northwest Passage. Their observations were to include temperature, tides, ice movements, and mineral resources, besides questions of abstract science, and were to extend over a period of one year. They were to have been relieved this summer, but the Alert was several weeks late in keeping her engagement. She started on her cruise in good season, but was caught in the ice, and drifted hopelessly about for over three weeks. When free, she was obliged to put back to St. Johns for repairs. Her commander, Lieut. Gordon, ascribed this misfortune to the bad weather, the season this year being at least a month later than usual. The second attempt was more successful. The main passage was comparatively free from ice, though the Alert encountered large floes from having to visit the different stations. In Hudson's Bay no ice was encountered, but a series of very heavy gales, accompanied by sleet and snow, followed each other at short intervals. Stupart's Bay Station was found to have been abandoned the day before the arrival of the relief party. Stupart and his companions, fearing the approach of a second winter, had started out in an open whaling boat for Chizno Bay, 300 miles distant. After much suffering, they were finally rescued by the steamer Labrador. All of the other explorers, except Andrew Inglis, who had died of scurvy, were brought home safely by the Alert. The expedition cannot be said to have accomplished very much. The ice movements were shown to be so variable that every voyage must be regarded as an experiment. The possible navigation is limited to three or four months, and even then is hazardous in the extreme. The experience of the Alert may be said to have confirmed the worst that has been said against the project. The temperature was less severe than anticipated, an average of only 30° below zero during the cold weather having been experienced. The rough frame cabins were easily kept at 60°. The tides were sometimes excessive, amounting to differences of 32 and 35 feet. The currents were also very pronounced. Dr. Bell, of the Geological Survey, who accompanied Lieut. Gordon, found evidences of considerable mineral wealth, and expresses himself in favor of continuing the experiments. Rich fur-bearing animals were found in some abundance, and the fisheries are stated to be of value, but the general results of the expedition were negative. They may not be less valuable on that account, for they seem conclusively to disprove the possibilities of successful navigation and commerce.

To Glue Leather to Iron.

There is a constant inquiry as to the best plan for fastening leather to iron, and there are many recipes for doing it. But probably the simplest mode, and one that will answer in a majority of cases, is the following: To glue leather to iron, paint the iron with some kind of lead color, say white lead and lamp black. When dry, cover with a cement made as follows: Take the best glue, soak it in cold water till soft, then dissolve it in vinegar with a moderate heat, then add one-third of the bulk of white pine turpentine, thoroughly mix, and by means of the vinegar make it of the proper consistency to be spread with a brush, and apply it while hot; draw the leather on quickly, and press it tightly in place. If a pulley, draw the leather around tightly, lap, and clamp.

Natural Gas for Eastern Cities.

An enterprise which contemplates the construction of the proper conduits for conveying natural gas from Western Pennsylvania to both New York and Philadelphia is now under consideration. The pipes for so long a line will necessarily be much larger than those now in use, both on account of the increased volume of gas desired to be transferred through one conduit, and the large frictional losses in the velocity due to the distance. The first cost of the plant will naturally be very large, but the importance of possessing such a fuel and illuminant in the two metropolitan cities of the country will warrant the outlay, and once in operation, the cost of maintenance will be but nominal.

The Soaring Birds.

In a short paper under this title put forward by Mr. I. Lancaster, of Chicago, an attempt is made to explain the equilibrium of soaring birds by the mechanical action of currents of air ou inclined planes. A horizontal air current, meeting the inclined plane of the bird's wings, is resolved into two forces, one in the direction of the inclined plane and one at right angles to it, so that the creature when poised in mid-air may be said to be continually sliding down an upward current of air. In test of this theory, practical observations were made on the southwestern coast of Florida, where soaring birds are somewhat abundant. On one occasion, a score of light gray pelicans rose in the air and floated in the vicinity for several hours, offering an excellent opportunity for studying their motions. One of the birds had at first some difficulty in obtaining a position, but in the end maintained a steadier poise than any of the others. The flock was about thirty feet distant from the observer, and their wings were apparently perfectly rigid. Finally, one of the birds rose steadily in the air at the rate of about ten feet per second until a mile or more above the sea. A study of the conditions under which this equilibrium and ascent were accomplished leads Mr. Lancaster to give the following quantitative analysis of the forces involved:

Taking for instance a bird of eight pounds weight and a breeze blowing in a horizontal plane at the rate of twenty miles an hour, or about thirty feet a second, the direction of the wind will be changed by the inclination of the lower surface of the wings from horizontal to vertical. There will then be eight pounds falling thirty feet per second, or 240 foot-pounds as the motive power. This is supposed to raise the bird ten feet per second against gravity, which will require a force of eighty foot-pounds. Subtracting this amount from the available energy, the 160 foot-pounds left over are to hold the bird against the wind and compensate for lost work. The problem is one of considerable interest, and particularly if its solution, as seems not unlikely, has any bearing upon the question of aerial navigation. The explanation offered is not satisfactory in several particulars, for the assumption that the entire force of an air current is changed by the bird's surface from horizontal to vertical is not warranted, nor does it account for the motion or poise of soaring birds during a period of calm.

Ostrich Farming in California.

During the Transvaal war, the South African ostrich ranch of Dr. Sketchly was devastated by Boers and Zulus, and it is to this circumstance that the now flourishing ostrich ranch near the town of Norwalk, 21 miles south of Los Angeles, owes its origin. Dr. Sketchly concluded that southern California might afford both the climatic and law-abiding qualifications necessary for successful ostrich farming, and something less than three years ago started his enterprise with twenty-two birds, ten males and twelve hens, brought from the Cape. He has raised forty birds on the new ranch, and has succeeded so well that he feels the industry to be well established.

The novelty of the culture brought so many visitors to the ranch that it was found necessary to charge an admittance feet of fifty cents to prevent too great an interruption. All dogs are rigorously excluded, or, if they find entrance, are speedily put out of the way; for even rotten ostrich eggs are valued at $2, and good ones from $50 to $100 apiece, so that egg sucking is very undesirable. Of the two hundred acres included in the ranch, eighty are sown to alfalfa, thirty are in corn, and the remainder devoted to the pens, corrals, and other purposes. The sixteen months old birds are kept by themselves in a separate corral. They are six feet high, quite timid, and regain an abundant and glossy plumage three months after being plucked. A little over a year old these chicks produced feathers two feet long—a record unequaled even in Africa. It requires seven months for the new plumage fully to mature.

The adult birds are kept in pairs. The hens are of a speckled brownish color, while the males are a glossy black, with one row of magnificent white feathers on wing and tail. When wild, the birds depend upon their speed for protection, as they can readily outrun the fastest racehorse; and when cornered, their silly habit of hiding the head to escape danger is well known, and furnishes the object of many a disparaging comparison. In captivity, however, they are ferocious and dangerous. Their mode of attack is invariably by kicking, and the immense claw at the end of one of the two toes is an ugly weapon at the command of such muscular legs. When enraged, they make no attempt to jump over the fences surrounding their quarters, but are able to brush them away with little effort. The wings seem to be used only as a steering apparatus, to carry the bird around corners and sharp curves.

In rearing the young, the ostrich manifests much affectionate solicitude. Each pair is expected to hatch three broods annually. The hens average fifteen eggs at a sitting, and occasionally have as many as thirty. The period of incubation lasts about six weeks, and the week-old chicks are as large as good sized turkeys. Patent incubators were formerly used, but better results are now obtained by allowing the birds to multiply in the natural manner.

The digestive powers of the bird are proverbial. At the California ranch they are allowed to exercise themselves on nothing more indigestible than an unlimited supply of pebbles. In addition to these, the daily ration of each bird consists of about fifty pounds of cut alfalfa and a little corn. An artesian well supplies them with pure water.

The ranch is operated by a company, which is reticent about its financial affairs. As a second ranch of three hundred acres has been purchased, and Dr. Sketchly is soon to go to the Cape for more birds, the enterprise is believed to pay something beyond its expenses. The Cape Government has become jealous at this transfer of its monopolized industry, and has imposed an export duty of $500 per bird. When this is added to the long carriage and first cost, the average cost of a pair at Los Angeles is at least $1,500 to $2,000. In mentioning the possible profits of the culture, Dr. Sketchly instanced a trio of birds in South Africa which yielded in one year from offspring and feathers a total revenue of $30,000. If the supply does not increase too rapidly for the demands, the profits should not be less than this in California. Labor is probably much higher than in Africa, but the home producers have the advantage of a 35 per cent ad valorem tariff. The artificial treatment of the feathers, such as dressing, curling, and coloring, is carried on chiefly in New York and Paris.

Ensilage of Mulberry Leaves.

During the silkworm rearing season in Northern Italy, a large quantity of mulberry leaves are sent by rail from one place to another, and in many cases the railway administration run special night trains for this purpose. The leaves are packed loosely in sacks, and often arrive at their destination far from fresh, and consequently, if not totally unfit, at all events cannot afford a wholesome food for the nourishment of these insects. An experiment was made during the present season, by a silk producer in Lombardy, in sending the leaves compressed, and for this a bale was made, weighing 116 kilos, by placing the leaves between two round pieces of board (in this case the bottoms of barrels), and compressing them in an ordinary wine press; the bale was then firmly secured with iron wire. By some oversight, this bale of compressed leaves, made on the 23d of May, was not forwarded to Milan, and from thence to Niguarda, until the morning of the 30th, and consequently it did not arrive at its destination until later. On opening the bale, the leaves, with exception of about two inches in thickness round the outside, were found to be perfectly fresh and sweet, and even these were only faded, and found to be not unfit for food. This is a conclusive proof that the nutritive qualities of the leaves can be preserved for some time, if compressed, and the air thus excluded from them; care, however, must be taken not to crush them and injure their tissues by excessive pressure. From that it would appear that a system of ensilage might be adopted with advantage for preserving mulberry leaves in the same way that it is for forage. Another advantage of such a plan would be that the leaves so compressed would be reduced in bulk, and consequently fewer trucks would be required to carry a given quantity of leaves than there is in the ordinary way; and by ensiling the leaves grown on the warmer side of the Apennines, as for instance on the "Riviera" of Genoa, etc., it would be possible to supply the silkworm rearers of Piedmont and Lombardy during backward seasons, or when, from other causes, the leaves are scarce and expensive.

Cocaine a Cure for Seasickness.

Dr. Manasseine, of St. Petersburg, gives an interesting account of the employment of cocainum muriaticum in seasickness (*Berl. klin. Wochenschrift*, August 31, 1885). He argued from its usefulness in the vomiting of pregnancy that it would likewise be of value in this bugbear of ocean travel. He made a voyage himself in order to test the drug, and, finding among his fellow passengers a man and a woman who were especially prone to the malady, made the following observation: Upon embarking, he administered to each every two or three hours a teaspoonful of a solution containing two and a half grains of muriate of cocaine in five ounces of distilled water, with the addition of a sufficient quantity of rectified spirits of wine. In spite of very rough weather for a period of forty-eight hours, both individuals escaped sickness for the first time in their lives. He also treated successfully a six year old child after it had begun to be sick, and a girl eighteen years of age who had been sick for twenty-four hours before the cocaine was given. Her case being severe, she was given a double dose every half hour, and the result is described as being "truly magical." She remained well during the rest of the voyage. Similar results followed in three milder cases. The writer thinks it justifiable to infer that in this drug we have a certain and harmless remedy against seasickness.

PHOTOGRAPHIC NOTES.

Glacéing Gelatine Paper Negatives.—When gelatine paper is used in the making of paper negatives, it is desirable to dry the paper in such a manner that the gelatine surface will present a smooth appearance like glass, in order that the sensitized albumen paper, upon which the positive print is made, may be in perfect contact in the printing frame. Two simple methods are employed. After the manipulation of preparing a paper negative is finished, the latter is slightly drained and laid face down upon a sheet of hard, smooth, vulcanized rubber, and the back pressed over with a rubber squeegee, which carries off the superfluous water. As it dries, the edges will become separated from the rubber, and when peeled or pulled off, which it readily does without sticking, the surface of the negative possesses a brilliant gloss, perfectly even and uniform.

Both sides of the rubber sheet may be utilized in this way. The paper dries quite rapidly in about half an hour.

Glass may be used in place of rubber; but in order to prevent the film from adhering, it is necessary to rub over its surface a drop or two of any kind of oil, and apparently with a piece of cotton cloth, flannel, or paper polish up the glass, as if one were trying to take off every particle of oil.

Enough will remain to answer the intended purpose, and it will be found that the paper will easily strip off, by loosening or raising it at one corner.

The highest gloss will be given if fine plate glass is used. Thin paper, unless dried in this way, will invariably cockle up in creases or patches in the center, and render the obtaining of a sharp positive print somewhat difficult.

Aqua Ammonia in the Fixing Bath.—It has been found that the use of ammonia in the fixing bath for the fixing of silver prints prevents the bleaching out of the picture as much as it would otherwise do; and in the experience of many who have tried it, the following proportions have been ascertained to be the best:

Water	8 ounces.
Hyposulphite soda	1 ounce.
Aqua ammonia	1 drachm.

Chevreul the Centenarian Scientist.

On the last day of August, according to *Nature*, Professor Michel Eugene Chevreul entered upon his 100th year. Apart from the fact, that among men whose lives have been devoted to active scientific research, no one has before attained such an age, Chevreul stands conspicuous for the vast amount of work he has done, and for the great practical effect his work has had on the industries of the world. When Dumas, in 1852, addressed him on the occasion of handing to him the prize of 12,000 francs accorded to him by the Societe d'encouragement pour l'industrie nationale, he said: "Le prix consacre l'opinion de l'Europe sur des travaux servent de modele a tous les chemistes; c'est par centaines des millions qu'il faudrait nombrer les produits, qu'on doit a vos decouvertes."

More recently, in 1873, when the award of the Albert medal was made by the English Society of Arts, the terms in which the council expressed the grounds of the award were: "For his chemical researches, especially in reference to saponification, dyeing, agriculture, and natural history, which for more than half a century have exercised a wide influence on the industrial arts of the world."

His scientific work, apart from its commercial outcome, was recognized by the Royal Society of London as far back as 1826, when he was elected a foreign associate. In 1857 the Copley medal was awarded to him. Other countries have also paid him honor, while the distinctions of his native land have showered upon him. Born in Angers, in 1786, where his father was a physician of note, he was but seventeen when he went to Paris to be "manipulateur" in the laboratory of the celebrated Vauquelin. At the age of twenty he published his first chemical paper, and in the next half dozen years he had published more than a score on different subjects. Then began that series of papers (commencing in 1813), "Recherches chimiques sur plusieurs gras, et particulierement sur leurs combinasions avec les alcalis," which extended for many years.

In 1824 he was appointed Professor of Chemistry at the famed factory of Gobelins; and the energy and untiring industry which was one characteristic of his work soon accumulated stores of knowledge based on experiment. To exact experiment he attached the highest importance. He wrote, in 1823: "Experiment is not chemistry, facts alone do not constitute that science; but we cannot have discoveries without exact experiment." His "Recherches sur la teinture" is an elaborate work; and his "Moyen de definer et nommer les couleurs" occupies the whole of vol. xxxiii. of the Memoires of the Institute. It has often been remarked that it is difficult to believe that the Chevreul of "corps gras" fame and the Chevreul who wrote on colors are one and the same man.