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SCIENTIFIC AMERICAN SUPPLEMENT

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For the Week Ending June 16, 1888.

Price 10 cents. For sale by all newsdealers.

Water Gas in Massachusetts.

For a number of years the Massachusetts law prohibited the manufacture of gas containing more than a defined percentage of carbonic oxide. As water gas under existing processes always contained more than this amount, the law amounted to a prohibition of all companies who would manufacture the new gas. A new bill has been recently passed by the legislature and signed by the governor, which places the matter in the hands of the gas commissioners of the State. They are permitted to license any existing company to make and sell water gas under such restrictions as to carbonic oxide as the commissioners may make.

A good story is told of one of the leading representatives of the coal gas interest. When the old law was in force, he appealed to the legislature to stop a new gas enterprise on the ground that it proposed to make water gas containing more than the legal percentage of carbonic oxide. The new company, however, had a process by which the carbonic oxide could be reduced to a very low limit. They at once met the issue raised by proposing to the legislature that it should enact a new law, placing the limit of carbonic oxide to be allowed at three per cent. As coal gas always contains more than this, the effect of such a law would be to close every gas works of any size in the State. This course was not followed, but the coal gas representative saw the point and was obliged to fight for the toleration of some reasonable amount of the obnoxious gas.

Devastation by Crickets.

Accounts are published of the devastation caused by crickets in Algeria. The insects resemble but are not identical with either locusts or grasshoppers. Last year swarms of grasshoppers ravaged the colony. This year the crickets have taken their place. They spring like grasshoppers, but have a more rapid and sustained flight. They form clouds, which shut out the light of the sun. When they alight on the ground, they destroy every trace of vegetation. They sometimes fall exhausted on the ground in such numbers as to cover it with a layer of dead bodies, from which pestilential exhalations arise. The correspondent of a Paris newspaper, in a letter from Algeria, published lately, says that the railway trains have been stopped by the insects between Constantine and Batna.

The method still employed to check the evil in the African possessions of France is the old and expensive one of digging long trenches at a right angle to the advancing swarms, and placing on the most distant side a sort of fence, formed by a web of cloth. The advancing insects strike against the cloth, fall into the pit, and are there covered with lime or mould. The Algerian authorities have spent 700,000f. in destroying them, and now contemplate a further expenditure of 1,000,000f. to complete the work.

It was recently stated that the English authorities in Cyprus had traced the locusts in that island to their breeding places, and had there to a great extent succeeded in destoying them in germ, before they became developed into the destructive swarms which periodically devastated that island. As yet the French do not appear to have introduced this method into Algeria.

Age of Progress.

The *Indian Spectator*, published at Bombay, repeats what is so often referred to in our newspapers, that this is a wonderful age as regards scientific discoveries. The telephone has become an old story, the microphone may soon be so. Recently we have had a number of important inventions. First, there is the happy method hit upon of so storing and shutting up water that it forces its way out at the exact moment it is most wanted. The especial merit of the mechanical arrangement here adopted is, that the fire which is to be extinguished itself liberates, as from a prison where it lay inert, the water that is needed to overpower it. One may well wonder how such a simple plan did not for so many generations suggest itself to the human mind.

There have been of late two notable inventions in connection with railways. One of them is destined to be of great practical good. When a train is in motion, a wagon or carriage is put in front a hundred yards or more in advance of the carriages. It is connected by wires with the carriages behind. If any accident happens on the way, this carriage in front, which is empty, bears the brunt, and at the same time communicates at once the danger to the train behind, and sets to work powerful brakes which check its speed. Only a few years ago nearly the whole of a railway train was precipitated headlong into a river from a bridge. The bridge was broken, but it was not known, hence the catastrophe. Similar calamities we have now the means of escaping. The other invention promises to enable us to send telegraphic messages while the train is in motion.

The art of photography is not at a standstill. Modes are discovered of reproducing one color after another of the original. Then, it may be so contrived now that the whole photographic apparatus can be carried in the pocket.

Indeed, this is an age of discoveries. It is not easy to say how the face of the earth may be transformed in a few generations by virtue of the advances made in science and art. "How much to do, how little done," comes home to our hearts when we contemplate the slow, the extremely slow, rate at which we in this country (India) are borrowing—let alone originating—new ideas.

Filtration by Machinery.

At the meeting of the Society of Engineers on Monday, May 7—Mr. A. T. Walmisley (president) in the chair—a paper was read on "Filtration by Machinery," by Mr. Edward Perrett, Asso. M. Inst. C.E. The author first compared the processes of straining and filtering, and pointed out that in the latter process the mutual attraction of particles of matter, in addition to the straining action, causes the retention of the suspended material in a liquid passing through the filtering medium.

After describing the early experiments made by him in filtering Thames water through filter bags such as are used for the filtration of sugar, Mr. Perrett called attention to the danger of using animal charcoal for the filtration of drinking water. This material has the power of taking out matter in an infinitely fine state of division, and even in solution, the charcoal becoming so charged with such matter that nothing short of subjecting the charcoal to a red heat is sufficient to thoroughly clean it. An animal charcoal filter with any system of washing will, he said, gradually accumulate the very fine matter, which may germinate, and at length be carried through with the filtered water. A filter with a granular medium (such as crushed retort coke), designed by the author, may be effectually cleaned by an upward stream of compressed air occasionally applied. This causes an agitation of the material, and the attrition loosens the dirt, which a small current of water washes away.

At a water works in South America where these filters are used, 20,000 gallons of river water are filtered per hour, the floor space covered being 37 feet by 7 feet 6 inches, or an average rate of nearly 100 gallons per square foot of filtering surface per hour. The purification of water containing organic matter by contact with iron was mentioned.

The original method of using Professor Bischof's "spongy iron" on a large scale was to mix the spongy iron with gravel, and to use this mixture as a filter bed, but it was found that the top surface became hard and impervious after a short time, and Mr. William Anderson introduced a machine to supersede these spongy iron filter beds. His revolving purifier causes ordinary iron borings to be mixed with the water as it passes through the machine, the water being afterward filtered through ordinary sand beds.

For the filtration of very muddy water for manufacturing purposes, sponge is used by the author. The machine consists of a cylindrical casing, in which sponge is compressed between two diaphragms, the lower diaphragm being movable, and attached to a piston rod, which passes through the top cover. To clean the sponge an up and down motion is given to the lower diaphragm or piston, thus alternately compressing and releasing the sponge. These filters will render Thames water in London clean enough for boiler feeding or other manufacturing purposes, at the rate of about 100 gallons per square foot of surface per hour. The precipitate resulting from the processes known as "softening" water is now generally extracted by filtration.

The material used for this purpose is the filter cloth referred to at the commencement of the paper, as the chalk deposit may accumulate to a considerable thickness before it becomes impervious. In this case the deposit is easily removed, and the author finds that simple external jets of water are sufficient for the purpose.

Condensed Literature.

The tendency of the times, remarks the Norwich *Courier*, is toward condensation. We have condensed beef, a small portion of which, dissolved in hot water, gives one a draught containing as much nourishment as a whole beefsteak. We also have condensed milk, and condensed food of other kinds, which contain a maximum amount of the essential quality within a minimum amount of space. How far this tendency toward condensation will eventually carry men in the matter of food, it is difficult to predict. Perhaps the time will come when the art of extracting and condensing the active principle or essence of comestibles will be so advanced that one may be able to obtain in a small pellet as much refreshment and nourishment as he now obtains in a whole meal. Then, all the time now consumed by the good housewives in preparing breakfast, dinner, and supper, and by the business members of the family in going to and from and eating their meals, will be saved. There will be no roasting over the kitchen stove, no trouble washing dishes, no worry over a varied bill of fare, no agitation over broken china, etc. A person will carry a few food pills in his pocket, and when he grows hungry he will take one and swallow his whole meal at once. Perhaps.

The Geographical Distribution of our Birds.

BY E. M. HASBROUCK.

The subject of geographical distribution is at present one of considerable interest to ornithologists, inasmuch as there has been comparatively little accomplished, although much work has been done. We are able to tell with a certain degree of accuracy in what part of North America each species may be found, and with most of our Eastern birds in just what localities they occur; but with a large part of the Western species the exact section or sections of country which they inhabit are still a matter of query. This is due to the fact that by far the larger part of the ornithological world is confined to eastern United States, and the birds of the West in consequence have received less attention.

To illustrate, take the A. O. U. check list, and open to any of the Western species, *i. e.*, Strickland's woodpecker (*Dryobates stricklandi*); the habitat given is: "Southern Arizona, south into New Mexico." This, as may be seen, is very vague and incomplete data. On going to Arizona or New Mexico for collecting purposes, one would have nothing whatever by which to be guided, as the species desired might be anywhere within a given area, or perhaps no nearer than fifty or a hundred miles, and still answer the description given in the check list. Or take the case of the violet-green swallow (*Tachycineta thalassina*); on consulting the "list" again, we shall find: "Western United States, from the eastern base of the Rocky Mountains to the Pacific, south to Guatemala."

It is in such cases as these that the so-called "local lists" are of such value, as with these arranged in proper order, one may turn at once to the locality he intends visiting, or the one nearest, and learn what species he may expect to find; or if desirous of securing some particular bird, can with a few moments' search find a locality in which that species is to be found. These local lists are being constantly published, nearly every issue of the various papers devoted to the study of birds contains one or more, but still more are wanted, and will be for a long time to come. It would hardly be safe to say just how many from each State would be needed to compile a good ornithological directory. One from each county at least would be indispensable, and in some cases, where the counties are extremely large and embrace varied portions of territory, two or even more might be needed to complete the data.

There are to-day in North America some hundreds of ornithologists, both professional and amateur, but the combined efforts of these and many more are needed before anything like such a work could be compiled. The same ignorance, only to a greater extent, prevails as to the distribution during the breeding season. A large part of the fauna retires to the Canadian provinces to rear its young, and here, owing to the scarcity of men with scientific training, very little work is done. Several competent scientists, prominent among whom is Mr. Montague Chamberlain, of St. John, N. B., are doing what they can to work up the Canadian fauna, but in a territory of such vastness and so thinly settled, it is evident that this part of the country at least will for a long time to come remain comparatively unworked.

It is in this work that the amateur can be of so much assistance, and can do so much effective work. Let each person interested in the study of birds make a list of those passing through that locality each spring and fall, and of those remaining there to breed, retaining it for several years for the purpose of making additions and corrections, and then, when he thinks he has compiled a pretty thorough list, send it to some good medium for publication. Such records, if carefully compiled, will, as I have said, greatly aid in the compilation of ornithological charts.

It may be of interest to some to know that the North American fauna is divided and subdivided into several groups, many of which, if not all, overlap each other to an appreciable extent, and just where and how far this conflict occurs is one of the most important and interesting subjects in the whole study of distribution.

These divisions are as follows:

- North American fauna.
  - * Sub-tropical fauna.
    - Mexican.
    - Central American.
  - United States fauna.
    - Pacific.
    - Rocky Mountain.
    - Mississippi Valley.
    - † Eastern.
  - ‡ Canadian fauna.
    - Pacific.
    - Mississippi Valley (?).
    - Eastern.
  - Arctic fauna.

These are the main divisions; they of course can be, and are, divided further for the sake of convenience into local faunas, such as the New England fauna, fauna of Long Island, fauna of the Gulf States, etc., but these are purely optional, and made only for describing the species found in certain localities. It will be readily seen that adjoining each other as they do, many species of each will, as I have said, encroach upon the territory of the other; and while this is noticeable in every case, it is astonishingly prominent with some.

For instance, it may be a source of surprise to know that the Canadian fauna is found in the Alleghany Mountains as far south as the Carolinas, while the Eastern fauna of the United States extends in turn into that of the Canadian, only not to so great a distance.

The Mississippi Valley fauna follows up the Ohio and Susquehanna rivers, and infringes on the Eastern fauna, while a number of rare semi-tropical birds have been taken in Texas and the Gulf States.

It will thus be seen how important and indispensable a large army of workers in this field is; no one, two, three, or hundred men can ever accomplish it, and unless all are willing to strive and contribute their mite, it practically never will be completed.

The study of the sea birds is undoubtedly the most difficult department in the whole field, as many of the species so nearly resemble each other that to distinguish them while flying is almost impossible, while to secure them for identification ranks next. Large numbers of the gulls and terns annually pass up the rivers and frequent the inland lakes, thus including themselves in the category of these particular regions, while many of the land birds visit and breed on the islands that are the homes of this race, and as a consequence are classed among the sea island dwellers as well as among the land. Occurrences of interest are never lacking, as one is apt at any time to secure a species new to a locality, possibly extending its range some distance beyond any previous record. One such instance will serve to illustrate. Some time ago a specimen of the evening grosbeak (*Coccothraustes vespertina*) was taken near Elmira, N. Y. Its capture extended the geographical range some hundreds of miles east. A big hue and cry was made by a certain gentleman who termed it useless and wanton slaughter, which, however, was not the case, as it benefited science to the degree I have named.

No one interested in this pursuit can afford to neglect making a list of the birds in their vicinity and comparing it with those from other localities, as not only is an incentive to work thus gained, but valuable information is added to the store of knowledge already acquired.

* The sub-tropical fauna properly has no place in the North American, but in the present article it is included for the purpose of illustration.

† It might be well to add that the southern part of Florida is decidedly tropical in its fauna, and that this tendency is felt along nearly the entire Gulf coast.

‡ By Canadian fauna is meant that of all the British provinces.

Glazes for Porcelain Ware.

MM. Lauth and Dutailly have recently communicated to the French Chemical Society the results of their investigations on the red glazes which are produced on porcelain by means of copper and its salts. The color produced in this manner is of a much more permanent nature and of a far superior tint than that which is obtained when oxide of iron is used for the same purpose. This red color, when used for decorative work on ancient porcelain, is often accompanied with a blue coloring matter beneath the surface of the glaze. It appears that the secret attached to the production of these colors was known only to the Chinese until recently, and that the red, known as Tsi-houng, or *sang de bœuf*, could not be imitated by the French at the porcelain manufactory at Sevres. In 1852 MM. Ebelmen and Salvetat endeavored to reproduce these copper colors in France by making careful analyses of fragments of Chinese porcelain colored in this manner, and then imitating, in the composition of the glaze and clay employed, the Chinese specimens. The results of these earlier experiments are now in the ceramic museum at Sevres, and are the first examples of the kind produced in Europe.

Other French chemists have since then attempted to improve on the first trials, and the problem has also been attacked by H. Seger, of the Berlin Porzellan-Fabrik and by H. Bunzli, of Krumnnus, in Austria. MM. Lauth and Dutailly have established by their experiments that the maximum temperature which the Chinese red glazes can stand without losing their color approaches to that used for baking the new Sevres porcelain. By successively associating all the compounds capable of entering into the formation of a colorless glaze with oxide of copper, they have come to the following conclusions: That in the same series of glazes, those which produce the finest red color with copper compounds have the greatest amount of silica present, and that in a series of glazes of approximately the same degree of acidity, the best results are obtained when there is a large proportion of alkalies and a small percentage of alumina. They have further noticed that if the alkaline metals be increased in relation to the alkaline earths present, a finer red is produced, but at the same time the liability to break is increased. By employing boracic acid or borates this inconvenience may, in some measure, be prevented. Lime, magnesia, various fluorides, and lead and iron oxides have also been tried; but the results obtained by their use have not proved satisfactory.

A very good red glaze can be produced when zinc oxide and baryta are the bases present in the glaze. The copper can be introduced into the glaze in different ways. Oxalate of copper, simply mixed and not fused with the melt, gives good results; but if previously fused with the glaze, very satisfactory colors are produced. The quantity of copper salt employed depends on the time required for baking the porcelain, and also on the temperature of the furnace. Five per cent is the quantity which is recommended as the most suitable to use, and the addition of a small quantity of tin oxide is advantageous. The glaze which has given the best results has the following composition:

Pegmatite	31·17
Sand	36·37
Fused borax	12·98
Dry carbonate of soda	4·76
Barium carbonate	10·39
Zinc oxide	4·33

Corresponding to—

Silica	61·02
Alumina	5·85
Alkaline oxides	10·72
Baryta	8·42
Zinc oxide	4·51
Boric acid	9·48

This glaze has a degree of acidity represented by the number 5·39, that of the French glaze, No. 1, being 5·14. The bases are in the proportion which corresponds to the formula:

$$Al_2O_3, 3\ NaKO, BaO, ZnO.$$

By using this glaze with a similar one containing lime, MM. Lauth and Dutailly have succeeded in obtaining a great variety of colors on the same material, and in producing some effects on porcelain which have not hitherto been achieved.

The New Justice of the Supreme Court from an Anthropological Point of View.

The appointment of Mr. Justice Lamar to a seat upon the bench of the Supreme Court of the United States marks an era in the history of our country. Every one recognizes this as true politically, but I speak of it anthropologically. Mr. Justice Lamar is said to be what is called in French "*visuaire*"—that is, mental impressions are received upon his brain with greater facility through the eye than through the ear. One who receives these impressions best through the ear is called an "*auditaire.*" The "visuaire" understands the thought best by *seeing* the printed page, while the "auditaire" receives his best impression by hearing. In the Supreme Court the arguments of counsel are, of course, oral, and how Mr. Justice Lamar, with this peculiarity of mental organization, will adapt himself to his new position remains to be seen.

These differences in human mental organization are well known to anthropologists. As some men can understand better when they see, and others when they hear, so some can think better when they speak than when they write, while others are the contrary. Governor Corwin, of Ohio, was a notable illustration. Whether in the Senate, in the House of Representatives, at the bar, or on the stump, as an orator he was equaled by few and excelled by none. He thought well and clearly when on his feet. Amid all his wit and humor he was a most consummate logician, and could carry on the thread of an abstruse argument and support it by most cogent reasoning. But as governor or cabinet officer, his state papers were not above the ordinary. Taking a pen in his hand, his thoughts seemed to scatter, and his writing was commonplace. Addressing the multitude, his thoughts seemed to crystallize into most beautiful forms, and he spake as one inspired. The causes of these differences have never been discovered. They are suggested as a theme for the student—biologist or anthropologist—as instructive as they are interesting.—*Thos. Wilson, in American Naturalist.*

In view of the above, it might be well for the Senate to send over to the Smithsonian Institution and make a few anthropological inquiries concerning the new candidate for the Chief Justiceship, Mr. Fuller, of Illinois: Is he an "auditaire" or a "visuaire"?

Compressed Gas.

It has been urged that the use of compressed gas for lighting cars is attended with the danger of the gas exploding in the event of a collision. The imaginary nature of this danger was shown by the recent accident on the Philadelphia & Reading, where an escape of compressed gas from a leaky hose simply burnt for a few moments without any explosion. Experience in Germany has been of a similar nature, and a recent collision near Birkenhead, England, between two trains lit with compressed gas was unaccompanied by any explosion. At the time of the collision between the Hoylake and Mersey tunnel trains, the gas in the latter was alight. The gas cylinders of the smashed coaches were taken from the debris and tested to a pressure of 150 lb. per sq. in., and they were found to be entirely uninjured beyond a few severe dents. The gas fittings of the remaining portion of both trains had not suffered in the least through the collision, and, with the exception of those in the smashed cars, not a single lamp glass was broken in either train.