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Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 400,

For the Week ending September 1, 1883.

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SUGAR AND FODDER, IN ONE.

In discussing recently the *future sugar* of the United States, under the title of "The Sugar Canes," a number of points were necessarily left untouched, and the subject is one of such exceedingly great interest that it is worth while to recur to it again and again. In that article, while urging that we ought to become exporters of sugar instead of importers, it was remarked that by so doing we need not interfere with any crop now cultivated. We will see if that remark was not strictly in accordance with truth. We can scarcely afford to cut off any of our present resources, even for the sake of getting new ones.

Of course it is understood, from what has been previously written, that our proposed supply of sugar for the future is to come from sorghum, and our expectations and promises are based on the recent advances in chemical and manufacturing knowledge, by means of which the crystallization of sugar from sorghum is no longer a matter of caprice and uncertainty, but becomes an established business fact.

Sorghum, as is well known, can be grown, as a general rule, wherever Indian corn can be raised satisfactorily; and it has this advantage in point of success, that it thrives well on land which is too poor to yield any more than a very indifferent crop of corn. It follows that the regions of extended corn growing are likely to be also the regions demanded for sorghum when we come to produce our 2,000,000,000 pounds of sugar and then go on beyond that to supply the foreign market.

Shall we not, therefore, cut off our supply of corn? If we turn our corn-fields into sugar-fields, are we not about to diminish our yield of beef and of pork, the very bone and sinew of the nation? And shall we not deprive our people of the "hominy" as well as the "hog," which have been inelegantly said to furnish the staple food of many millions in our southern and western border lands?

If it could be shown that the widespread cultivation of sorghum for sugar production would result in a diminished food supply for either man or beast, a strong argument would at once be found against such cultivation, notwithstanding the fact that pecuniarily it was more profitable. But we propose to show that no such diminution need occur, or will occur, even assuming that not an acre of additional land should be brought into use. Our great corn-producing sections, the broad plains of the Western and Northwestern States, which will presently be waving in every direction with magnificent cane-fields of sorghum, contain, as yet, almost illimitable ranges which have never felt the plow, and the natural progress of population and of industry will, in due time, sweep them within the area of our wealth-yielding lands. But, even without them, we can produce our full measure of sugar, as already given—2,000,000,000—and hog and hominy shall still prevail, as now. The present corn-fields, "from Ohio to Nebraska, and from Kentucky to Minnesota, can do it all."

To make our position plain, we will assume a definite case. A farmer in Iowa has this year 100 acres in corn. The records of the State show that his average yield may be expected at 3,800 bushels, worth in round numbers $900. Of this he consumes, on the premises, we will say 2,500 bushels, selling the remainder. Of this 2,500 bushels by far the largest portion has gone as food for his hogs, horses, etc. The human consumption, according to the number in his family, has not in all probability exceeded 100 bushels. He needed therefore to supply his family with their direct corn-food only three acres of corn; and to supply his stock he needed sixty-five acres, and outside of this he had a money value of corn sold of $310.

Now turn the slate, and cipher on the other side. The next year he plants corn for his family, say ten acres, so as to allow a free margin, and his remaining ninety acres he plants in sorghum, the variety selected being according to his locality. The one feature which above all others is essential to his getting the value from his sorghum as a sugar producer is that the crop should become perfectly mature, the seed fully ripe. And here is where the two values of his crop coincide in giving him their returns. Experience abundantly shows that sorghum seed, as food for live stock, is equal in every respect to Indian corn. Cattle, horses, hogs, eat it freely and thrive upon it to perfection. When thoroughly ripe, its fattening qualities are not at all surpassed by those of the corn; and acre for acre, the yield of an average crop of ripe sorghum is equal in feeding value to an average crop of corn.

How does our farmer's account therefore stand as compared with last years' returns? His family have had their supply as then; on his sixty-five acres he has fed the same amount of stock as then; on his remaining 25 acres he has realized seed which has enabled him to feed a proportionately increased number of hogs, or of mules, or of whatever stock he has chosen, and he has their value in return, but he has not his $310 for sales of corn.

Is the wealth of the country diminished because the farmer planted ninety acres in sorghum instead of in corn? It has received all the pork and beef that it did before, and in addition the pork and beef represented by the twenty-five acres. And what has the farmer in exchange for his $310 of corn money?

Mr. A. J. Russell, of Janesville, Wis., President of the Wisconsin Amber Cane Growers' Association, reports to the Hon. Geo. B. Loring, U. S. Commissioner of Agriculture, in Dec., 1881, tha the yield from sorghum per acre there was 1,000 pounds of sugar, selling for nine cents per pound, with sirup worth half as much in addition. And Mr. Russell expressly states that this is no fair return, inasmuch as the farmers, from lack of knowledge as to fertilizers, etc., had produced on an average only about half of what might fairly be expected, and of what would actually be yielded in the future. He had himself produced 2,000 pounds to the acre, with sirup in proportion.

But taking the returns only as given at these lowest figures, an acre yields $130. We do not dare to multiply that by the 90 which represents the number of acres which our farmer had in sorghum, for fear the figures should seem too flattering for belief, but there they are, and any one can take the slate and pencil and work out the sum for himself. We will only remark that the farmer did not lose by giving up the crop of Indian corn, even if he lost his $310.

Now, let no one suppose that we are going off in wild visions of boundless wealth to tumble into every man's pocket from sorghum growing. It is no more certain than everything else of human labor. Crops will fail, as crops of all sorts fail. But crops also will succeed, and where Indian corn will produce its value, sorghum will also produce its own value, and the relative value of the two on a hundred acres we have considered.

PETROLEUM—THE OLD IN THE NEW.

Perhaps never in the world's history has there occurred a case in which an article known from time immemorial, and counted as being of too small value to have any influence whatever, has all at once become one of the forces which sway the commerce, and almost the destinies of nations, to an extent so wonderful as is actually true in regard to petroleum. Its progress, its development, the grasp which it has on the welfare, the politics, and the destiny of various countries, above all others, of our own, deserve a careful study. A few words in relation to one feature of its history are all that our present space will allow; we may recur to it at another time.

When we look into the columns of the various daily papers, the *Times*, *Tribune*, *Herald*, etc., and see with how much care the petroleum column is worked up, how its daily, and sometimes hourly, fluctuations are studied and quoted, and when we read a little further and see what enormous amounts of the crude article are brought to the seaports—New York, of course, chiefly—and what immense shipments are made to the very ends of the earth (for China, on the opposite side of the globe, is becoming now one of our very thirsty absorbents), we find it difficult to realize that all this is only a thing of yesterday, as it were. And yet that is strictly true. Forty years ago the word *petroleum* had no existence in current language. It is a compound term meaning simply rock oil; it was in the dictionaries, but it was not known to people in general. And yet the article at that time was on sale, in the large cities, and occasionally in smaller places. But it was in very small quantities, and was disposed of by the ounce. Very probably the entire stock on hand in the city of New York could have been held in a few five gallon cans. Those who are old enough to remember as far back as 1840 can possibly recall a very bad-smelling medicine to which they were perhaps subjected. It was called Seneca Oil, and was "dreadful good for the rheumatiz," being fortunately, in most instances, used externally, though not always. It was understood to be brought from the "Seneca Nation," in the Southwestern part of the State of New York; hence its name. Seneca oil was simply crude petroleum, and it is on the instant recognized that it came from the immediate vicinity, the very border of the region which has within these later years revolutionized the world with its oil wells.

But in going back to Seneca oil do we touch the early days of petroleum? Not at all; and we shall never touch them. No glimmering light shines back so far. When the fires fell on the Cities of the Plain, in the circuit of Jordan, at the north end of the Dead Sea, the combustible material which insured the destruction of Sodom and Gomorrah was crude petroleum, the "slime pits" of the Vale of Siddim. Later still petroleum, in its viscid form, served to make watertight the cradle of the baby Moses. But both these instances are relatively of modern date; for perfectly untold ages before that time petroleum had served to aid in preserving the Egyptian dead from decomposition, for the very oldest of all the mummies yet brought to light reveal its presence. And how early in the experience of the human race its remarkable properties were brought into play we can only conjecture, for nothing remains to tell us.

Petroleum, therefore, has two histories, and they may be said to be as distinct from each other as though they were of two separate articles. The old reaches back, so we have seen, to the days of shadow and fable; the new begins August 6, 1859, only twenty-four years ago! And it begins at Titusville, on Oil Creek, a branch of the Alleghany River, in Crawford County, Pennsylvania. To such narrow limits in both time and space are we able to concentrate our attention, and yet we are looking at that which has become one of the mighty factors in modern civilization.

Now once more we will see what we can do in the work of bringing our ideas to a focus, and this time we will look at the subject geographically. Petroleum is found in very various parts of the world, in fact, almost in every country, to some extent. There are, however, certain points of concentration, and they are not many. The island of Zante, the mainland opposite in Hungary, Gallicia, and Moldavia; then, again, away off on the Irawaddy, but most of all—on the Eastern Continent—the shores of the Caspian, especially near Baku; all of these produce petroleum, and the springs

of Baku yield more than all the others combined. But we may fairly set all of them—the entire Eastern Continent—aside as being of no great moment. It is no mere figure of speech, it is not rank boasting, to say that petroleum, so far as the markets of the world are concerned, is an *American product*. Our regular daily and monthly yield so far surpasses all others that they cannot be counted as rivals in the trade and its results.

The springs of Baku yield about 500,000 barrels annually; we turn out that amount in the space of a very few weeks at any time. The records of 1879, not to speak of anything later, give the exports only from the three ports of Philadelphia, Baltimore, and New York at 8,500,000 barrels. Surely we may call petroleum, in all its bearings, an American product.

And does it come from all parts of America? Perhaps few persons are aware how very much restricted really is the region which yields such incredible results. The fact is that the "oil center," that from which petroleum has been produced in paying quantities, can all be comprised within a space 39½ *square miles*. It is wonderful. We will look to it again.

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

BY H. C. HOVEY.

The attendance on the thirty-second annual meeting of this influential organization was less than for several years past. This was mainly owing to its being held in a locality so far to the West, and to the refusal of some of the main trunk-lines to reduce railroad rates. Yet there were from 300 to 400 scientific people convened at Minneapolis from all parts of the country, and although the hospitality of this thriving and beautiful city is ample, the probability is that it was sufficiently taxed. The majority of members present was from the Western States, while barely a hundred were from the East. The daily sessions, from Aug 15 to 22, were held in the admirably located buildings of the State University, near the Falls of St. Anthony. The opening prayer was by Bishop Foss, after which addresses of welcome were made by Mr. G. A. Pillsbury, chairman of the local committee, Gov. Hubbard, Mayor Ames, and Pres. Folwell, of the University, men who had seen Minneapolis grow from a cluster of huts amid wolves and Indians to be a city of 100,000 inhabitants. Surely the representatives of such a place were pardonable for a little boasting as they indicated its vast resources, and pointed to its proofs of tireless energy. To these words of welcome Prof. C. A. Young, the President of the Association, responded; after which Prof. F. W. Putnam made his report as Secretary, and read the list of members who have died during the year—18 in all.

The sections were then organized, and heard addresses from the Vice-Presidents. Prof. W. A. Rogers spoke, in Section A, on "The German Survey of the Northern Heavens." Previous to this work, undertaken by the German Astronomical Society, formed in 1866, stellar catalogues abounded in errors, and no attempt had been made to get at a homogeneous system. This society has undertaken to determine the co ordinates of all stars in the northern heavens down to the ninth degree of magnitude. Special interest attaches to the work, both on account of its practically useful results and also its bearing on the principles underlying the form and stability of the stellar and solar systems.

In taking the chair in Section B—Physics—Prof. H. A. Rowland made an able plea for "Pure Science." Before any science can be applied it must exist. In America we are mainly applying what we borrow from countries where pure science is cultivated. Our colleges are too many, and too poorly equipped. Over 100 institutions in this country are called universities. The term should not be applied to anything having an endowment of less than $1,000,000. He attacked in severe language the little colleges with incompetent professors. There were in this country, in 1880, about 400 colleges with a total wealth of $40,000,000 in buildings and $43,000,000 in funds. He would, if possible, concentrate this into one great university with $10,000,000, four minor ones of $5,000,000 each, and 26 colleges of $2,000,000 each. Then the interests of pure science could be properly cared for.

Prof. Otis T. Mason addressed the Anthropological Section on the nature and value of anthropological studies, which he defined as an attempt to apply to the inductive study of man the methods approved in the general study of natural history. Patient investigation should be made into the whole series of problems arising as to the human race; its ethnology, glossology, technology, psychology, sociology, mythology, and hexiology, or balancing of harmony with the outer world. Men should study man. Science has her mission field as well as religion.

The opening address in the section of Biology was by Prof. W. J. Beal, who chose to speak on the scientific needs of agriculture. No industry excels this in importance, yet none is more at the mercy of caprice. It should be protected against the whims of politicians. He spoke of the value of chemistry, entomology, meteorology, and other sciences in their application to agriculture.

The "Methods of Statistics" were treated fully and admirably by Dr. F. B. Hough, in opening the newly constituted section on Economic Science. The collection and classification of data demand simplicity, accuracy, and completeness, and on this thoroughness depends the success of both public and private enterprises. Loss and failure flow from ignorance or inattention to facts. Our common interests may be promoted by associations for gathering statistics. This stimulates inquiry and activity in business of all kinds, and furnishes a sound guarantee for all sorts of human undertakings, whether commercial, political, religious, or educational, and tends to check speculation and fraud. Official statistics may be classified as being: (1.) Summaries of current business published annually. (2.) Periodical inquiries at wider intervals, like the census taken every decade. (3.) Special inquiries by experts or commissions created for the purpose. The speaker then gave a historical sketch of census taking from colonial times to the present day. Great difficulties yet remain, the chief ones being in getting at facts with certainty, recording them accurately, and condensing the mass of materials into a useful and accessible form. Estimates will depend on the intelligence and honesty of him who makes them. The speaker dwelt at some length on the use of what he termed "graphic illustrations," *i. e.*, devices by means of lines, areas, and colors to represent quantity, time, direction, and intensity of force. Their skillful use will greatly facilitate comparison of subjects and the study of the relation of causes and effects.

The opening address on "Geology and Geography" was by Prof. C. H. Hitchcock, who showed that these sciences were associated and interdependent. The very zones of the earth must have been arranged according to the varying density of a cooling globe. The primeval ocean came from condensed vapors assuming liquidity as soon as water could remain upon the solid crust of what had been an igneous sphere. Through such a crust numerous volcanoes, discharging melted rock, would build up hills overlooking the water and forming the dry land—continents would arise inclosing land-locked valleys and wide areas of fresh water. Some of these immense basins would be filled by the action of various forces, until the resulting plains would be capable of sustaining the varied forms of organic life. Glacial action put on the finishing touches of the earth's contour, and the completed structure must be pronounced "very good."

The sections having been duly organized and opened, the retiring president, Dr. J. W. Dawson, of Montreal, addressed the assembled body at Westminster Church on "Some Undiscovered Truths of Geology." It abounded in interesting thoughts, of which but an epitome can be given. His subject covered the whole history of the earth in all time, allying itself at the beginning with astronomy, physics, and celestial chemistry; and dealing along its course with meteorology, geography, and biology, and finally getting mixed with questions of archæology and anthropology.

In such a wide sweep we need not be surprised to learn that there are yet some unsolved problems. We are met at the outset with an inquiry as to man's place in the nature he is to study. His organism is certainly a part of nature, and he is the terminal link of a long chain of being. As a scientific animal, man finds within himself a mind more potent than matter, and that reacts on nature. We recognize this difficulty when we divide science into experimental and observational. It does little good to meet mysteries by guesses, nor should we on the other hand resign ourselves to ignorance. We must wrestle with the unsolved questions of nature, mastering what we can and leaving others to be grappled with by our successors. In proceeding to mark out the limits of ascertained knowledge, the speaker began with the oldest rocks, a formation of immense thickness, and corresponding to what used to be called fundamental granite. He intimated his belief that this was deposited as gneiss from a shoreless ocean. The Lower Laurentian rocks probably limit our progress backward, beyond which lie only physical hypotheses as to a cooling incandescent globe. Ascending, we meet with significant changes. Beds of limestone are associated with the beds of gneiss. Gravel beds show the existence of shores; and graphite informs us of some sort of plant life, and iron ores of organic matters. In the Middle Laurentian appeared the *Eozoon Canadense*, probably the oldest form of life of which we have any knowledge. Metamorphism next came into play. Nothing in geology perishes. Heat may change clays into slates, and limestones into marbles; but nothing wholly disappears. A great battle rages over the genealogy of the rocks, the steps of which Dr. Dawson set forth, claiming that the sudden incoming of life in varied forms baffled biologists and furnished an unsolved problem. The theories of evolution are insufficient to account for it. The process still is as mysterious as ever, and a great gap is left in our accumulated knowledge.

Suppose that we start, however, with a number of organisms ready made; we ask, how can these have varied so as to give us new species? It is a singular illusion that variation may be boundless, aimless, and fortuitous, and that development arises from spontaneous selection. Varieties must have causes, and the vast and orderly succession of nature must be regulated by fixed laws, only a few of which are yet known to us. One consideration showing how imperfect are our attempts to reach the true causes of genera and species, is the remarkable fixity of leading types. Trace certain forms of life along their own line through stupendous vicissitudes and across the ages, and you find them substantially unchanged. Examples are the foliage and fructification of mosses, the venation of wings of insects, the structure and form of snails; all of which were settled in the Carboniferous age. Huxley holds that there are but two possible alternatives as to the origin of species, viz., 1. Mechanical construction, 2. Evolution. But we know that instead of two there are numerous possible methods, such as absolute creation, mediate creation, critical evolution, and gradual evolution. The origin of whales affords an example of the difficulties arising from referring existing forms to imaginary ancestors. Gaudry, though a strong evolutionist, candidly says, "We have questioned these strange and gigantic sovereigns of the Tertiary oceans, and they leave us without a reply."

The periods of rapid introduction of new forms of life were not periods of struggle for existence, but of expansion; while the real periods of struggle were marked by depauperation and extinction.

Another unsolved problem is the inability of palæontology to fill the gaps in the chain of being. Many lines of being present a continuous chain. On the other hand, the abrupt and simultaneous appearance of new types in many specific and generic forms, over wide areas, obliges evolutionists to assume periods of exceptional activity alternating with stagnation—a doctrine scarcely differing from the old theory of special creation. Plainly a vast amount of conscientious work is needed to account for these breaks in the chain.

Another mystery yet unexplained is the cause of the great movements of the earth's crust by which mountains and plains and ocean beds have been formed. It is known, however, that much is due to the unequal settling of the earth toward its center, and also to the pressure of the ocean against the shore. Complex movements of plication are more easily comprehended than the regular pulsations of flat continental areas, each change being accompanied by changes of climate, plants, and animals.

The problems as to coal formations, the ancient fucoids or algæ, and as to the great and much debated glacial period, next received attention. What caused the great climatic changes that have occurred during geologic time? How came there to be a vast continental glacier reaching as far south as the 40th degree of latitude and thousands of feet thick? Shall we not after all have to give up this favorite theory? May not many of the phenomena be explained by supposing a glacial sea with Arctic currents and icebergs wafted southward or due to local glaciers? It may also be questioned if glaciers are not relatively protective rather than erosive agencies, and if sufficient importance has been attached to their work in leveling and filling old hills and channels. Still another question is as to how long a time has elapsed since the glacial era. Recently the opinion has been gaining ground that its cessation dates back only 6,000 or 7,000 years. This problem, of course, carries with it the question of the origin and early history of man.

The practical inference is that we are but new-comers on this earth, and have had but little time to solve such great problems. Geology is young, scarcely a century old. We are surprised that so many regard it as a complete and full grown science. Humility, hard work, and abstinence from hasty generalizations should characterize geologists for at least a few generations to come. Science is light, and light is good. Let us raise it high enough to shine over every obstruction that casts any shadow on the true interests of humanity. Above all, let us hold up the light and not stand in it ourselves.

Copper in the Pickle Jar.

The Court of Appeal in Brussels has just decided that the objection to pickles, artificially colored green by the contact of the vinegar with copper utensils, is a mere prejudice. Some manufacturers of pickled gherkins in that city having been condemned in December last to a fine, for having in the technical language of the judgment "sold or exposed for sale certain substances affected by copper verdigris, of a nature to cause the death of the consumer, or at least to produce effects injurious to health," one of the condemned appealed, and the case has necessitated the examination of scientific witnesses, and the hearing of arguments from eminent counsel on both sides.

On the part of the prosecution, M. Depaire, ex-Professor of Chemistry in the University of Brussels, deposed that salts of copper are unquestionably poisons. For the appellants, however, M. Dumoulin, Professor of Chemistry in the University at Ghent, declared with no less confidence that such salts are "incapable of doing any harm." This witness even stated that so certain was he on this point, he himself, as well as his wife and children, had taken a strong dose; that so far from being unwell they had felt better for the experiment. M. Dumoulin's emphatic assertion that the "sels de cuivre" "had been calumniated by science" is stated to have caused a strong sensation among the parties interested in court. Finally judgment, free of costs, was given for the appellant.—*London Daily News.*

Flowers Colored by Absorption.

At a late social entertainment the Prince of Wales is said to have carried a bouquet of large lilies tinted with delicate pink and blue, by the absorption of dyes through the stems. The dyes do not in the least affect the perfume or freshness of the flowers. The process is the discovery of Mr. Nesbit. It is said flowers refuse to absorb certain colors. Some of the lilies which had been treated with a purple dye separated the red and the blue, the colors being divided in the process of absorption.

Staining Cherry in Imitation of Old Mahogany.

Digest logwood chips in vinegar or acetic acid for twenty-four hours or more. When ready to use, heat the solution, then dip the wood until the suitable color is obtained.