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THE SCIENTIFIC AMERICAN SUPPLEMENT.

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THE best way to destroy thistles is to cut through the roots just before the buds form, with a spede, at a point 2 inches below the surface.

DARWIN ON CONSANGUINEOUS MARRIAGES.

There are few questions in social economy which have given rise to more scientific discussion than that of the intermarriage of near relations. While some attribute to those marriages no sinister results, others, on the contrary, affirm that they are fraught with the gravest danger to society, and that the offspring are, as a rule, disposed to be lymphatics, deaf mutes, idiots, epileptics, or sufferers from some one of the maladies of the nervous systems. Various investigations have been set on foot from time to time with a view of reaching some definite data on which to base a general law, without, however, attaining the desired object. A large number of instances of marriages between first cousins were at one period collected in France, among which were some terrible examples. In a Protestant family of the Isle de Ré, three brothers married three sisters, the parties bearing the above-stated relation. Out of eighteen children, the issue of these alliances, but one was exempt from infirmity; of the others, some died young, and the rest dragged out wretched lives as idiots and invalids. On the other hand, a French physician, Dr. Bourgeois, gives a history of his own immediate family, in which there were records of seventy-four consanguineous marriages, not one of which resulted in misfortune to the descendants.

Some new investigations on this important subject have recently been undertaken by Mr. George Darwin, the son of the celebrated naturalist, and carried through in a striking and novel manner. The questions to be settled were, first: What is the rate of consanguineous to ordinary marriages in the entire English population? And second: In asylums for idiots, deaf mutes, and the blind, what is the proportion of inmates, who are the offspring of consanguineous marriages, to the total population of the institution? It is clear that, if the second ratio should exceed the first, danger in consanguineous marriages might be inferred. If, on the other hand, the ratios should appear equal, such alliances might be considered as free from harmful results.

In beginning his work, Mr. Darwin counted all the marriages announced in the Pall Mall Gazette, a London journal, and especially noted such as were contracted between persons of like name, regarding such as taking place between first cousins, and intending to use the data as a basis for his calculations. The objection, however, at once suggests itself that many persons have the same name but are not at all related to each other; but this Mr. Darwin foresaw, and provided for. By consulting the English census of 1853, which showed the frequency of different family names in England, he discovered, for example, that out of every seventy-two persons there is one Smith; out of every seventy-six persons, one Jones, and so on. Now by the law of probabilities, which teaches that a composite event has for probability the product of the probabilities of the events of which it is composed, the chance that one Smith marries is 1/72, and the chance that he will marry another Smith, not a relative, is 1/72 x 1/72 or 1/5184, evidently a faint shadow of probability. Similarly, that a Jones will marry another Jones, not a relative, the chance is 1/8078. Mr. Darwin calculated these probabilities from all the well known names, and deduced from these the chances of the less common appellations. Then, by taking the sum of all the probabilities, he found that the chance of persons, of like name but of different families, contracting marriage is only about 1 in 1,000, a probability so small that he considered himself justified in neglecting it; and thus he substantiated his first assumption, above-noted, and was led to conclude that in England the proportion of marriages contracted between cousins (of any degree) of like name is about 1/1000 of the marriages in general. It now remained to deduce the proportion of consanguineous marriages, when the two parties bore not merely the same but different names.

First cousins may be divided into four classes: 1. Children of fathers' brothers; 2, of fathers' sisters; 3, of mothers' brothers, and 4, of mothers' sisters. If these categories were all of them equal, then the ratio of cousins of like names to cousins of different names would be about 1/3. Such an assumption is untenable, and very many cases can be cited where it would be impossible; therefore the investigator is compelled to resort to actual statistics. Mr. Darwin prepared questions which were answered by the members of 283 families; and from the figures thus obtained he deduced that the ratio of first cousins of the same name to first cousins of different names is about 1/3. But so hypothetical a conclusion needed more direct confirmation; and therefore Mr. Darwin distributed another set of questions, in which he asked to be informed relatively to the marriages between cousins which took place among the nearest relatives of the persons addressed. The results thus obtained confirmed the first ones, and the investigator was able to affirm that the sought-for ratio is comprised between 1/112 and 1/123. Applying this to the proportion of marriages of the same names, as previously stated, Mr. Darwin obtains the response to his first question, namely, that in England the ratio of marriages between first cousins is between 2 and 3 per cent of all marriages occurring. Other though more limited researches, by means of genealogical works and records, confirmed the above result, and showed further that in London the ratio falls to 1 1/2 per cent, while in the rural districts it rises to 2 1/2 per cent. Among people in good circumstances it reaches 3 1/2 per cent, and among the titled aristocracy attains its highest figure, 4 1/2 per cent.

The second portion of Mr. Darwin's work consists in researches made in about twenty insane asylums, and in a number of institutions for deaf mutes and blind children. He obtained information relating to the families of 4,822 idiots; and out of this large total he found that but 170 marriages between first cousins had insane issue, or from 3 to

4 per cent of the total number. The families of 366 deaf mutes (so born) contained but 8 (or 2 per cent) marriages of first cousins. This ratio is founded on too few a number of observations to merit complete confidence; but such as it is, it is far from being unfavorable to consanguineous marriages.

This is the present extent of Mr. Darwin's labors; and the accumulation of future researches will, of course, place them in more definite shape. As far as can be now judged, it would seem that there is no such serious danger attendant upon consanguineous marriages as has been stated and popularly believed. It is a misfortune that the suggestion of Sir John Lubbock, relative to adding a question regarding consanguineous marriages to the queries to be annexed to the English census papers of 1871, was not adopted, since the statistics thus obtained would have been of great value in Mr. Darwin's hands. Mr. Darwin's investigations, however, are remarkably bold, and certainly his deductions in the beginning are ingenious. Besides, in common with all similar work, they add to our knowledge of the science which underlies the welfare of the community; for it will be evident that, should such researches eventually prove that consanguineous marriages are dangerous to posterity, it then becomes the plain duty of society, for its own preservation, if not to interdict them, at least to prevent their occurrence as much as possible.

AN ENERGETIC EMPEROR.

The Emperor of Brazil (or rather Dom Pedro de Alcantara, as he is registered in the book of arrivals at the Fifth avenue hotel, and as he prefers to be called, seeing that he travels as a private gentleman), together with the Empress and suite, arrived in this city on Saturday, April 15, and, after a stay of some forty-eight hours, departed for San Francisco. Brief as this flying visit was, it has been amply long to demonstrate the fact that the sojourn of his majesty in this country is not going to involve a repetition of the ovations which were accorded to the Prince of Wales and the Russian Grand Duke. Not that Dom Pedro does not merit, or would not under other circumstances receive, the grandest welcome we could give him; for as a potentate he outranks both the above dignitaries, and as a man he is immeasurably their superior; but he wishes it understood that his imperial paraphernalia are all left behind in Brazil, and that here he is simply Mr. Alcantara. Therefore no one need look for a royal progress, for they will be more likely to meet his majesty ensconced in a street car, as he was the other day in the suburbs of this city, and paying his five cents fare like any other passenger.

The Emperor characteristically began his visit by promptly declining to undergo the ceremonious reception which the government had provided for him, wholly regardless of the fact that three cabinet ministers, a vice-admiral, a major general, one man of war, a tug, and a steam launch had been dispatched to convey him from the Brazilian steamer to the city. When the high officials boarded his vessel, they found him in slouch hat and traveling garb, chatting pleasantly with a band of newspaper reporters, and their formal proceedings degenerated into a solemn farce. Dom Pedro declined to accompany them, so perforce they returned alone, and received the royal salutes thundered forth by mistaken forts and ships: while the Emperor quietly remained on board the steamer until she reached her pier, and then, with his party, hired hacks and drove to the Fifth avenue hotel. Two hours after his arrival he visited one of the principal theaters and witnessed one of Shakespeare's plays, Henry V., on his return to his hotel he received a serenade, and then, at an hour (one o'clock Sunday morning) when it might be supposed that even royalty would become sleepy and tired after the long voyage, he started off to the Herald office, and watched the whole process of stereotyping and printing the morning edition of the paper. The Emperors' sight-seeing capacities are certainly extraordinary. At six o'clock the same morning he was wandering over Central Park; and during the next twenty-four hours he found time to attend church, to devote two hours to being photographed, to inspect the Croton water works, to visit Messrs. Moody and Sankey's meeting at the Hippodrome, and to spend the greater part of the night curiously examining the newsboys' lodging house, a police station, and the practical workings of the fire telegraph system in an engine house. On the subsequent morning, at an equally early hour, the Emperor was driven over to Jersey city (narrowly escaping a serious accident on the way, by the collision of his vehicle with a heavy cart) and made a thorough inspection of the vicinity. He was particularly pleased with the horse car elevator which lifts the street cars bodily up the Bergen heights, and mentioned the need of such engineering works to several Brazilian towns. On his return to the city, he visited several of the public schools and two hospitals, received an address from a committee of citizens, and at 6 P. M., after declining the proffered courtesy of a special train, installed himself with a portion of his suite in a Pullman car on the Erie Railroad, and started for San Francisco. The Empress remains in this city; Dom Pedro will proceed direct to San Francisco, remain there five days, and return by way of Denver, Salt Lake city, and Chicago, in time to reach Philadelphia at the opening of the Centennial.

The remarkable energy manifested by the Emperor in this city, in acquiring the utmost information in the brief time at his disposal, typifies his whole character. He is utterly averse to ceremony of every description, and even in his own capital throws off the seclusion peculiar to royalty, and mingles with his subjects at public places without restraint. As a ruler, none has done more to benefit his country. He has abolished slavery in his dominions, built railroads, successfully carried on great internal improvements, consolidated

his government, and raised Brazil to a position of undisputed pre-eminence on the South American continent. As a man, Dom Pedro possesses great literary and scientific acquirements. He was a warm friend of Agassiz, and rendered that naturalist invaluable aid in his studies on the Amazon; he is a member of the French Academy of Sciences, and for many years has been a reader of the SCIENTIFIC AMERICAN. His ideas on scientific subjects are broadly liberal. To a correspondent on board the vessel coming from Rio Janeiro, while discussing Darwin's theory, he said: "The theory advanced by Darwin is undeniable, but I do not agree with the deductions of some of Darwin's followers. I often recommend our young men to read Darwin's work, because I am a partisan of truth; and the more I read the more I am convinced that all truth is one, and that all Science meets in the point of truth. Therefore no obstacle should be thrown in the way of the development of any science." With such an advocate in the cause of Science, progress and enlightenment in Brazil will make rapid strides.

In conclusion we desire especially to bespeak for the Emperor a warm welcome from the scientific and progressive people of our land. And that welcome, we ask, shall not be meaningless displays or ovations, but the careful exhibition and explanation to his majesty of all industrial operations, of all new machinery, and all engineering and mining works which he may encounter in his journey. We can assure inventors, mechanics, engineers, and all scientific men that they will meet a most appreciative and eager listener, one who is well informed as to what American genius has already accomplished, and beyond all a man who discards the name of Emperor for the self imposed title of student.

SELF-IMPROVEMENT.

There are many young working men who are anxious to improve their minds by reading and study out of business hours. But too many grow discouraged and fail in their efforts for self-improvement, although they begin with the best intentions.

A want of thoroughness in whatever is undertaken is, perhaps, one great cause of such failures. A practical writer on that topic gives the following good direction: "Never leave what you undertake to learn until you can reach your arms around it, and clench your hands on the other side." It is not the amount of reading you run over that will ever make you learned; it is the amount you retain. Dr. Abernethy maintained that "there was a point of saturation in his mind," beyond which it was not capable of taking in more. Whatever was pressed upon it afterwards crowded out something else. It is probable that few of us have minds more sponge like than that of the great doctor.

Every young man should endeavor to perfect himself in the science of the business he has chosen. Without this, he must always content himself in the lower walks of his calling. The cost of a few cigars will buy all the books he requires, and his own diligence may be made to well supply the place of a tutor. Without such diligence, the best teacher in the world could not manufacture him into a scholar. If once going over a point will not master it, he must tackle it again. Better give a week's study to a page than conclude that you cannot comprehend it.

But though it is wise to give your main strength to your own specialty, you should not confine yourself to such studies exclusively. The perfection of all your powers should be your aspiration. Those who can only think or talk on one subject may be efficient in their line; but they are not agreeable members of society in any of its departments. Neither have they made the most of themselves. They become one sided and narrow in their views, and are reduced to a humiliating dependence on one branch of industry. It costs nothing to carry knowledge; and in times like these, to be able to put his hand to more than one branch of industry often serves a man a good turn.

Do not attempt too much in the way of study to begin with; you will surely lose heart if you do. Be humble and modest in your aspirations, and if you are diligent never fear but that you will hear a voice saying: "Come up higher." Be content to gather the precious gold of learning grain by grain; you will soon be able to see the pile growing, and will learn from it the wonderful power of the littles, which is felt and shown in mental as well as in golden gains.

THE GREAT SUSPENSION BRIDGE BETWEEN NEW YORK AND BROOKLYN.

It is a curious circumstance that, while the government of the United States has, at an enormous expense, undertaken the removal of the Hell Gate rocks from our East river, it has at the same time given its formal sanction, through the Secretary of War, to the erection of new impediments to navigation on the same river, at a point only a short distance from the first named obstructions. We allude to the suspension bridge over the East river, between New York and Brooklyn. In our paper for August 7, 1869, Vol. XXI, page 85, we gave a diagram showing the elevation of the intended bridge; and public attention was called to the fact that, unless the level were fixed higher, it would seriously obstruct the navigation of the river. But no notice was taken of the matter by our shipping merchants, and the construction has gone steadily forward until the towers are almost ready for the stretching of the wire cables. A vigorous protest is now in circulation by prominent citizens, who are making an effort to have the level of the bridge altered or the work stopped.

They aver "that the Brooklyn bridge will, if completed, inflict almost incalculable damage to the commerce of this port by preventing the passage of sparred vessels of any considerable size, as the height of the roadway at the towers will be 115 feet, and the center of the span will be only 135

feet above high water mark, while the masts of ships and barks vary in height from 150 to over 200 feet. The petitioners also state that subscriptions are now being made by the citizens of New York, with a view of legally contesting the right of the Secretary of War to authorize the erection of the bridge, believing it to be at variance with the spirit of the Constitution of the United States, and in non conformity with the acts of Congress."

The principal objection to the raising of the level is the additional expense, and the increased grade of the approaches to the bridge. But these are minor considerations, compared with the importance of preserving unimpaired the splendid water way now existing, which will be still more necessary to commerce when the Hell Gate and Harlem river improvements are completed.

We give in our this week's SUPPLEMENT views of the great towers of the bridge, with particulars and dimensions of the various parts. We also give an engraving and description of the new drawbridge proposed for the Thames river at London. It will be seen that the Brooklyn Suspension Bridge, even if carried out on the present level, will be a very small obstruction to navigation as compared with the proposed London structure.

OPENING OF A REMARKABLE RAILWAY IN LONDON.

The London papers announce a further extension of rapid transit in that city by the completion and opening for public traffic, on April 5, of the East London Railway, which is another of those gigantic underground enterprises for which the metropolis of England is so distinguished. The most remarkable feature of this new work is the fact that a considerable portion of the line is built under water. The commerce of the world may be said to float and navigate directly over a part of the roof of the tunnel, which extends south easterly, from the Liverpool street station of the Great Eastern Railway, passing directly under the warehouses and water basin of the London Docks, thence under the embankment, across and under the Thames river, to the New Cross station of the Southeastern Railway, thus connecting all the roads named, and also the London and Brighton and South London lines. At Shadwell and Whitechapel, magnificent stations, each four hundred and fifty feet in length, have been erected. The total cost of this new line, which is a little less than six miles in length, has been £3,200,000, or sixteen millions of dollars. Of the advantageous nature of this line to the public, the London papers say there is no doubt. That portion of the line under the Thames passes through the old Thames tunnel, built by the celebrated engineer M. I. Brunel. This work was commenced in 1824, and opened for foot passengers in 1843, but never proved of much value to the public until brought into use several years ago as a railway tunnel. The masonry comprising this remarkable work is 38 feet wide and 22½ feet high, and was carried across underneath the bed of the river by means of a great shield, within which the masonry heading was erected, and the shield then pushed ahead step by step, by jack screws, the masonry being built up as fast as the shield advanced.

ARTIFICIAL EYES MADE SENSITIVE TO LIGHT.

Among the curious developments of Science is the recent production, by Dr. C. W. Siemens, of an artificial eye that is sensitive to light. We wish we could add that it gives vision to the blind; but we cannot, though perhaps it contains a germ of promise in that direction. The new eye is composed of an ordinary glass lens, backed by an artificial retina of selenium. This mineral resembles and is allied to sulphur; it is distilled from bodies that contain sulphur in conjunction with metals, such as iron pyrites, a compound of sulphur and iron.

Mr. May, a telegraph clerk employed at the Valentia station of the Atlantic cable line, first observed, in 1873, that the electrical resistance of selenium was instantly altered by light, the resistance being diminished by increase of light.

Dr. Siemens makes use of this peculiarity of selenium in the construction of his novel eye. An electrical circuit is arranged, of which a bit of selenium forms a part, and constitutes the retina. When a strong light is admitted into the lens and falls upon the selenium retina, the current of electricity flows (and by acting upon small magnets) may be made to work the artificial lids of the eye, opening or closing them according to the intensity of the light.

It is well known that the vibrations of musical sounds may, by an ordinary conducting wire, be electrically transmitted and successfully delivered to the ear. It remains to be determined whether light vibrations can, by means of selenium and electricity, be transmitted to the brain in the absence of the natural eye.

THE WOODBURY PLANER WAR.

The contest between the Woodbury Patent Planer Company and the manufacturers and users of woodworking machinery continues with undiminished acrimony. The former seem to be leaving no means untried to compel the payment of an unjust royalty for the use of the pressure bar from people who have undisturbedly employed that attachment on their planing machines for many years, while numbers of the latter have organized defense associations, banded together to resist the extortion to the last. The most recent tactics of the Woodbury people, if we may credit the assertions of the Northwestern *Mechanical Journal*, the organ of the Northwestern Planing and Molding Machine Association representing some 300 machines, is to avoid the consolidations and confine their offensive efforts to individuals not included in the membership. The associations are wealthy; and can afford to fight the aggressors for any length of time, but on the other hand few isolated concerns would care to

undertake a conflict with the Planer Company, when a sum comparatively small to that which defending an expensive lawsuit would cost them, would secure their immunity. Of course yielding to the demand would be a sacrifice of principle and a submission to the superior force, but on the other hand there are scores of small manufacturers who care nothing for either side of the controversy and would willingly keep themselves and their business clear of it. The Woodbury Company are evidently aware of this fact, and therefore naturally prefer bringing their forces to bear upon isolated opponents rather than upon members belonging to associations likely to prove powerful antagonists. Even if this course has no better results, it is probable that it may secure to the company the means of existence until a decision of the courts settles the question definitely. Obviously the present work of the Association is to strengthen their memberships, otherwise it may be found that the present tactics of the Woodbury people, so far from being a sign of weakening on their part, as our abovementioned contemporary intimates, are likely to work more harm than the open system of attack which they have abandoned.

THE LOUGHBRIDGE AIR BRAKE.

The use of the air brake has for many years been persistently advocated by Mr. William Loughbridge, of Batimore Md., who ranks among the earliest inventors and patentees in this line. To some extent others have obtained laurels that were in strict justice his due. Recent trials upon the Baltimore and Ohio Railroad appear to have practically established the superiority of his devices.

On one of these occasions a train of ten cars, drawn at the highest attainable speed, by the best engine owned by the company, was brought to a stop, from a velocity of 42 61 miles per hour, within a distance of 590 feet, in 16 seconds time. This, we believe, beats anything heretofore accomplished, either in this country or England. The following are the particulars:

EXPERIMENT WITH LOUGHBRIDGE AIR BRAKE, AS TRIED ON WASHINGTON BRANCH, B. & O. R., BETWEEN BRANCHVILLE AND ALEXANDRIA JUNCTION, 1876.

No. of engine.....	323
Direction of movement.....	southward.
Weight of engine.....	76,700 lbs.
Weight of tender.....	38,370 "
Average weight of cars.....	37,608 "
Total weight of train.....	245 1150-2240 tons
No. engine driving wheels.....	4
Diameter engine driving wheels.....	69 inches.
Size of engine cylinder.....	17x24 "
Size of air cylinders under cars.....	11x11¼ "
No. of cars.....	10
Total length of train.....	635 feet
Total number of wheels in train.....	98
No. of wheels to which brakes were applied.....	92
State of steam gage at start.....	130 lbs.
" " " on shutting off.....	120 "
" " " when train stopped.....	125 "
" air gage at start.....	60 "
" " at time of applying brakes.....	80 "
" " when train stopped.....	50 "
Distance run for speed.....	12,180 feet.
Time consumed in running last 1,000 feet before shutting off.....	16 seconds.
Distance run after shutting off steam before applying brakes.....	300 feet.
Speed of train when brakes were applied.....	42 61 m. per h.
Time occupied in making stop.....	16 seconds.

REMARKABLE OCEAN STEAMING.

The recent voyage of the Pacific Mail Steamer Company's new steamer City of New York, from this port to San Francisco, was in some respects remarkable. The total distance, 13,552 miles, was performed in 59 days, the actual steaming time being 54 days 14 hours. The entire passage was made on the coal shipped at New York, none having been taken on board en route. The runs made were as follows:

New York to Cape Virgin, west entrance of the Straits of Magellan.....	7,074 miles.
Through the Straits.....	340 "
Cape Pillar, east entrance of Straits of Magellan, to San Francisco.....	6,138 "
	13,552 "

Prior to the famous first trips between England and New York, of the steamers Sirius and Great Western, in 1838, when the subject of ocean steam navigation was under discussion in England, Dr. Dionysius Lardner predicted that steamers could not be run with commercial success across the Atlantic until the consumption of fuel was reduced, as the cost and bulk of coal would eat up all profit. And he was right. For over twenty years after the opening of the Cunard line in 1840, it required the payment of enormous special subsidies by the governments, in order to make good the losses to owners. First class steamers between New York and Liverpool consumed nearly 100 tons of coal a day. The largest vessels now only require about one fourth the above fuel, and are also in other respects more economical than formerly. The following are some of the particulars of the City of New York's voyage;

Total revolutions of the engines.....	3,338,105
" distance by observation.....	13,552 miles.
" distance by crew.....	14,235 "
" amount of coal consumed (dock to dock).....	1,495 tons.
Total amount of coal consumed at anchor (port consumption).....	45 "
Total amount of coal consumed for steaming.....	1,440 "
Average consumption of coal per day.....	26¼ "
" " " mile.....	239 lbs.
" revolution per day, running time.....	61,250
" " " minute.....	42 63
" speed per day, running time.....	248½ miles.

The dimensions of the City of New York are as follows: Length 353 feet, beam 40½ feet, tonnage 3,019. Engines 1,000 horse power.