reshoff type it varies greatly in construction, the tubes being arranged horizontally in sets immediately over the fire—each set being at right angles to those just above it. Exhaust steam is led to a surface condenser. An ordinary pump takes the water from the condenser, forces it into the upper set of boiler tubes, through the boiler to a separator located in front of the boiler, and to which the steam pipe is connected. The boiler will work safely with 160 pounds of steam, but in the race with the Mary Powell it was only found necessary to use from 120 to 125 pounds. The fire box is 6¼ feet square.

The screw is four-bladed, 4 feet in diameter, and 6½ feet pitch. At the stern the boat draws 4½ feet and at the bow 3 feet. We may notice that there are now building at the yards of Yarrow & Co., England, two torpedo boats which are expected to run, when light, at the rate of 24 knots an hour, or nearly 28 miles. The Stiletto must do better than 25 miles an hour before she can claim the broad title of the fastest boat in the world. In our issue of next week we will illustrate and describe in detail the construction of the boiler and engine and the method of forcing the circulation.

THE ENGLISH CUTTER GENESTA.

The greatest sporting event on the water this year will be the international yacht race for the America's cup, held under the auspices of the New York Yacht Club. Great interest is being manifested by the yachtsmen and others throughout the whole country in the coming contest, while the patriotic pride of many wealthy men in the race has been aroused to such a pitch that they have ordered several new and costly yachts to be built for the protection of the cup. Even General Butler has dropped politics (and law) long enough to say that he wants to enter the ancient America in the race. England will send two very fast yachts, with the hope that one of them will walk away with the prize. These are the cutters Genesta and Galatea. The former is the favorite, and seems to be most feared by the Yankee yachtsmen.

It is understood that the match is to be three races, best two to win—one a triangle 40 miles, one over the New York Club course, and the third, if necessary, 20 miles and return, starting from Sandy Hook.

The Genesta was built by Messrs. Henderson Bros., at Patrick-on-the-Clyde. She is 90 feet over all, 81 feet on the water line, 15 feet beam, 11¾ feet depth of hold, and 13½ feet draught. Although originally she had only 60 tons of lead outside, she now carries 70 tons of lead on her keel. She has also been recently coppered and fitted with new and heavier spars. Keelson stringers, frames, and strengthening plates are all of steel, while the planking is teak and elm.

With great accommodations beneath, the cutter's fittings are plain but substantial. The deck fittings present several novelties. The bowsprit comes over the steamhead in the center of the yacht, with more than the usual difficulties in reefing it. To obviate this difficulty, one of the checks of the steel bits is hinged. This device permits of the bowsprit heel being swung round clear of the scuttle and the capstan, and run aft alongside the mast. The fore scuttle, oval in form, is a steel tube, round which the wire-fall of the bobstay tackle is coiled in easier turns than it would be belayed in the ordinary way. Just before the mast is a second scuttle, which accommodates the steward, and also the crew, on racing days. Behind the mast is a third scuttle, down which canvas can be lowered into the sailroom under the cabin sole.

The Genesta will be without any provisions for screening the weather spray, besides a racing cabin. The Genesta has a fine saloon fitted up lightly and elegantly, a ladies' cabin aft, and spacious accommodations for the crew, steward, and captain. The whole length of the yacht has been utilized, and the space obtained is remarkable. The Genesta is to be in charge of C. Carter, who is well known on the Clyde as a clever yacht sailor. She is owned by Sir Richard Sutton. Our first page engraving is taken from an instantaneous photograph, representing the Genesta plowing through the water at full speed; it clearly shows the wave line, and indicates the ease with which she parts the water. All through the yachting season last year this boat met the best of the British fleets, and although not always a winner, she proved herself to be without doubt the best "all around" boat in the kingdom.

A New Military Shield.

Some interesting experiments have been carried out at Ryde, Eng., with a new arm of defense. The implement is simply a steel shield to be fixed on the muzzle of a rifle as a bayonet is fixed. It covers one superficial foot, weighs three pounds, can be easily slung under the arm, and does not appear to be unwieldy. On skirmishing duty the infantry soldier would take his "cover" with him, place the point in the earth, lie behind it, and pick off his men with ease, the shield forming a rest for the rifle. The shield, which is claimed to be bullet proof, has been submitted to the War Office, and the military authorities are said to view it with some favor.

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THE NEW U. S. CRUISER DOLPHIN.

The fourth official trial of this new ship took place June 11, when by order of the Navy Department the vessel was sent out on the Jersey coast, near New York, for a six hours' continuous trial at sea. The requisition was that she should show herself capable of a speed of twelve knots an hour during the above period. The ship considerably exceeded this requirement, as she ran over fourteen knots per hour, and might have been driven to fifteen or sixteen knots.

On several of the preliminary trials of this vessel, when the machinery was new and stiff, the progress of the ship had to be stopped by reason of the heating of journals, a common occurrence with new steamers. These incidents were made the basis of certain letters and orders published over the name of the youthful Secretary of the Navy concerning the Dolphin; and some of the newspapers busied themselves by casting ridicule upon the ship and the contractor, Mr. John Roach, who executed the work.

It was made to appear that the Dolphin was little better than a worthless hulk; whereas in reality she is a noble specimen of naval architecture, fully equal in workmanship and speed to any boat of her class now afloat. The Dolphin was built in conformity with the drawings and specifications furnished by the Navy Department, and so far as can be ascertained, Mr. Roach, the builder, has faithfully carried out all the stipulations of his contract. The Dolphin is one of three ships of war for which the Department offered competitive plans for construction, and the bids of Mr. Roach were found to be nearly one million dollars less than those of any other builders. He has executed his work thus far in the most superior manner, and is entitled to the highest credit. We congratulate him upon the success of the Dolphin, and trust the other ships will show equally good work.

The governing condition in the design of the Dolphin has been high speed capable of being maintained for several days. It is intended for a dispatch boat for furnishing rapid communication from the seat of government to any point on the coast, or to act as fleet dispatch boat if a United States squadron should need its services. In designing it, all attempt at protection was abandoned, and machinery of the most durable and efficient type adopted.

The principal features of the Dolphin are:

Length between perpendiculars	240	feet.
Length, extreme	256·5	"
Breadth, moulded	31·85	"
Breadth, extreme	32	"
Depth from top of floors to top of main deck beams,	18·25	"
Depth from base line to top of main deck beams..	20·07	"
Top of main deck at side above load water line	6·28	"
Mean draught	14·25	"
Displacement at mean draught	1,485	tons.
Complement of men	80	
Battery—one 6-inch pivot, four revolving cannon.		
Indicated horse power	2,300	
Speed	15	knots.
Capacity of coal bunkers	310	tons.

The contract price for the hull, machinery, and fittings of the Dolphin, exclusive of the masts, spars, rigging, sails, boats, etc., was $315,000.

New Mode of Hardening Plaster.

Mr. Julhe, in a note presented to the Academie des Sciences, describes some experiments that he has performed with a view to rendering the use of plaster still more general.

Of all materials used in building, plaster is the only one which increases in bulk after its application, while mortars and cements, and even wood, undergo shrinkage and cracking through drying. When applied in sufficiently thick coats to resist breakage, it offers, then, a surface that time and atmospheric variations will not change, provided it be protected against water. But it is necessary to give this material two properties that it lacks—hardness and resistance to crushing. This is what Mr. Julhe proposes to effect by his process.

Six parts of plaster are mixed with one of finely sifted unslaked lime. This mixture is used like ordinary plaster for moulding any object whatever, and, when once dry, the object is soaked in a solution of a sulphate having a base precipitable by lime, and the precipitate of which is insoluble. There form sulphate and oxide of lime, both of them insoluble, which fill the pores of the object and render it hard and tough.

Sulphates of zinc and iron are the salts that answer the purpose best. With the first the object remains white, and with the second it gradually assumes the tint of sesquioxide of iron.—*Chronique Industrielle.*

English Channel Tunnel.

The projected scheme for building a tunnel under the channel to connect France with England has met with so decided a defeat in the House of Commons, that the question will probably not be brought up again for some time to come. The majority which rejected the project recently is larger than on any previous occasion when the subject has been discussed. Not a hundred members were found willing to allow even the experimental works at Dover to be continued, and two hundred and eighty-one votes were registered in opposition to the proposal.

The Quaternary Fauna of Indiana.

BY H. C. HOVEY.

As every student of geology knows, the Quaternary period was characterized by great changes of climate, accompanied by remarkable sinking and rising of the earth's crust. Enormous quantities of clay, gravel, and bowlders were carried by glacial action from the higher latitudes as far south as the Ohio River, and even, at some points, a few miles into Kentucky. The area thus covered by drift extends from Cape Cod as far west as Dakota, and, farther north, to the Rocky Mountains and the Pacific coast. The limits of glacial action are marked by ridges known as moraines, in which have been found some interesting relics of ancient life. Following this glacial era came one of general depression, when the Atlantic Ocean extended inland so far that whales and seals played in the waters now known as Lake Champlain; while the chain of lakes along our northern border were connected with the Gulf of Mexico. A subsequent upward movement of the earth's crust restored this depressed region to its former level, when the continent took its present shape, and what is geologically known as the Recent period began, which is still in continuance.

The Quaternary period was remarkable for its gigantic mammalian fauna, and numerous animals then existed in North America that have now no living representatives. Years ago my attention was called to fossil bones and teeth found in the moraines and lacustral deposits of Indiana. There was a long moraine near New Albany, on the Ohio River, in which my friend, Dr. J. W. Sloane, imagined there must be inhumed the bones of animals caught between the foot of the glacier and the broad river formed by its melting torrents. Whether his theory were correct or not, his conjectures were amply verified. He bought the moraine and leveled it. One day he came riding at full speed on his black horse, crying, "Eureka! eureka!" The workmen had unearthed a mastodon. We examined the remains carefully. The white bones and long tusks lay perfect and entire in the mound of black loam that had once been the flesh of the monster. Efforts were made to preserve the skeleton, but the materials quickly crumbled to decay. The largest fossil elephant's tooth ever found anywhere was probably the one my father placed in the cabinet of Wabash College, in the year 1870. I do not know the precise locality whence it was exhumed. It weighs 21 pounds, is 15 inches long, and 13 inches in its vertical depth. The triturating surface of this huge molar measures 9 inches across. The teeth of the mammoth differ from those of the mastodon in the corrugations of their grinding surfaces. In the former these are crimped ridges of dentine; while in the latter there are knobby or mammillary protuberances, whence the name mastodon (nipple tooth). Both varieties have been repeatedly found in different portions of Indiana, and specimens, both of the tusks and the teeth, may be seen in various public and private collections.

A nearly entire skeleton of an adult megalonyx, or giant sloth, may be seen in the cabinet of the State University at Bloomington. It was obtained by Prof. D. D. Owen, on the banks of the Ohio River near Henderson, and was described by Prof. Leidy in 1853. It is conjectured that the living animal must have been as large as an ox. Its habits were arboreal, and its structure was such as to make it probable that the creature was accustomed to stand on its hind legs and pull the branches of trees down within reach for food.

Bones and teeth of an extinct species of beaver have been found in Carroll, Kosciusko, and Vanderburg counties, to which the name of *Casteroides ohioensis* has been given. Judging from the skull, which has a length of over 12 inches, this ancient representative of the beaver family must have been as large as a black bear, and larger than the modern capybara, said to be "the largest of existing rodents."

The remains of the *Bison latifrons*, an animal fully one-third larger than the common buffalo, have been found in Vanderburg County. The horn-cores being 21 inches in circumference, the horns themselves must have been more than 4 feet long. The musk ox is thought also to have been among the ancient fauna of Indiana, whence it ranged as far south as Texas. At Laketon fragments of an extinct quadruped allied to the living peccary have been found. The tapir, horse, and elk also had their ancient congeners. And while these peaceful creatures browsed amid the semi-tropical forests, or lazily wallowed in the marshes, or sunned themselves along the ancient river, compared with which the lordly Ohio is but a rivulet, there were gigantic lions and wolves lying in wait for their prey, amid the adjacent jungles. It does not appear, from any relics yet found, that man was a witness of this old-time scene of forage and strife.

Plates and descriptions of most of the above-named mammals may be found in Collett's Fourteenth Annual Report on Geology and Natural History (1884), prepared by Cope and Wortman, whose indefatigable labors in the department of comparative anatomy cannot be too highly praised. Prof. Cope remarks that the list of discoveries thus far made "displays but a small proportion of the species that inhabited Indiana during the Post-pliocene, or Quaternary, period, and it may be expected that the future will reveal many additions to the list." The places where such remains are most liable to be found are in the numerous caverns of southern Indiana, the wide marshes and swamps of the northern portion of the State, the moraines and other deposits left by the glacial action of the earlier part of the period, and the beaches and terraces characterizing the later portion. And it would greatly add to the interest taken in specimens displayed if, whenever possible, the exact nature of the locality should also be described, and even specimens be shown of the sand, clay, soil, or peat in which the bones, etc., lay inhumed.

Choosing a Pursuit Scientifically.

In the SCIENTIFIC AMERICAN for May 30, a short article was published under the caption of "Choice of Occupation," in which allusion was made to the resort made by some people to "professional head and face readers," to indicate the line to which the unformed mind should be directed. The general drift of the article seems to indicate that boys will naturally gravitate toward their proper line, and that, "circumstances not hindering," they will be likely to fall into their true pursuit.

I have no desire to inflict upon the editor or readers of the SCIENTIFIC AMERICAN a special plea in behalf of "character readers," or phrenologists, but merely to suggest what seems to me of great importance, giving young people some clear intimations of their mental peculiarities, so that they may be saved from making great mistakes. "Circumstances" appear to hinder or prevent the majority of young men from falling into the pursuit for which they are best adapted. A close observer writes:

"Thousands have spent the formatory period of their lives sweating over the classics or mathematics, or vainly endeavoring to become qualified for some profession or mechanical trade, and have failed to win respectability or secure their daily bread, and are thus made wretched for life."

Another observer, who won for himself special eminence in the field of education, Horace Mann, deemed it of the highest importance that every youth should, for his entrance upon life, be furnished with all the help at the command of science. He wrote: "By the temperament, which indicates the degree of activity; by the natural language, which is a hundredfold polygraph; and by the size of the organ, which is one of the measures of power, every man advertises what he is, and, unlike common advertisements, his are true, for the hand of Nature has written them."

There is so much of the artificial in our every-day life that "circumstances" are likely to become a stronger hinderance to the young man's finding his true sphere. This is particularly the case in the cities, which are crowded with the best of our young men and young women, for there they think that they shall soonest win reputation and fortune. They press into professional lines, because through them respectability seems most likely to be secured; but certainly very few of these in entering upon the practice of law or medicine or art adopt such a sphere because of a strong natural bent. We know an Ohio clergyman who for years before he ascended the pulpit was a cobbler in an obscure Western town, expecting to end his days in that capacity; but an almost accidental introduction to mental science, as it is presented in the treatises of phrenologists, led him to study and prepare for the ministerial calling. Again, an eminent inventor, Mr. Ray, was met by a well known practical phrenologist, while working as a common hand in a blacksmith shop; he was advised to try his hand at invention, and with but doubting confidence in the advice he *did* try, and several very valuable devices have made him rich and the world his debtor. The late Mr. Clark Mills, of Washington, had not thought of sculpture before he was encouraged by a "character reader" to study it.

Mr. Depew said, not long ago, to an audience composed chiefly of young men: "Failures are due to two causes: One, that you have mistaken your calling; the other, that you will not or cannot work; distinguished success is in nearly all cases the result of individual adaptation to the sphere selected, and patient industry." It is with this idea in mind that Carlyle says, "Happy is the man that hath found his work."

I know many persons of good standing in our community who think it is the duty of all to avail themselves of the advice of a scientific phrenologist with reference to the education of their children.

In one of his lectures, the Rev. James Freeman Clark says: "I recommend the phrenological arrangement of human powers simply as a convenient one in self-study; if a man wishes to know what he is fit for, and capable of, this gives him a useful method of investigation."

Intellectual and moral qualities are so important to balance of character and happy adaptation to circumstances, that I wonder our educators are not more urgent in advocating some well digested scheme for their development in the young. I believe that in the schools we have quite enough of intellectual training, and that the great need is for proper moral education, and in the application of any rules for this purpose there is need of a true system of mental organization.

Mr. Clark is but one of many sound thinkers who regard the phrenological arrangement of the human powers as excellent for the parent and teacher, and his judgment in this respect is also due, to a great extent, to the fact—that may be a surprise to most people who have not bestowed much, if any, attention upon the subject—that in the system advocated by George Combe and Horace Mann the only well systemized and practicable method for general mental training is to be found.

H. S. DRAYTON.

Mullein Leaves in Consumption.

Dr. Quinlan, of Dublin, read before the International Medical Congress at Copenhagen last year an interesting paper on the medicinal qualities of the mullein. It has attracted widespread attention, and among the more recent articles confirmatory of Dr. Quinlan's statements is one by Dr. Wilfert, of Cincinnati, which appears in the last number of the *Lancet and Clinic* of that city. From the results obtained in 127 cases of pulmonary consumption treated by Dr. Quinlan with mullein alone, he draws the following conclusions, which are condensed from his original article, viz.:

1. In the earlier and pretubercular stage of pulmonary consumption, mullein has a weight-increasing and curative power greater than that of cod liver oil, and equal to that of Russian koumiss.

2. In cases where tubercles are well established or cavities exist, the mullein has great power in relieving cough—a great boon to consumptives, whose weak stomachs too frequently cannot tolerate the usual cough remedies.

3. Phthisical diarrhœa is completely obviated by the mullein.

4. Mullein has no power or effect on the night sweats of consumption, which should be combated by atropia sulphate.

The method of using the mullein, which originated among the Irish peasantry, and was adopted by Dr. Quinlan just as he found it, is as follows: Three ounces of the fresh green leaves, or about ten times that much of the dried, are boiled in a pint of fresh cow's milk. After boiling a moment the infusion is allowed to stand and "sipe" for ten minutes, when it is strained, sweetened, and drunk while warm. This quantity is taken twice or three times a day. It is generally much relished by the patients, who regard it as a pleasant article of diet rather than as a medicine. The smoke of the mullein leaves inhaled into the respiratory passages relieves irritation and spasmodic cough.

Dr. Wilfert states that he has followed Dr. Quinlan's method in twenty cases of undoubted pulmonary phthisis, all of them more or less advanced, and all improved during the administration of mullein, no other drugs being used. These results are certainly very encouraging, and should be followed up.

Tricks of the Chewing Gum Trade.

According to the Portland *Press*, this is a great gum year in Maine, especially on the Penobscot, and now that the sun is climbing up into the north and the lumbermen are coming out, the air is fairly redolent with the perfume of spruce. The logs, knees, and bark are not the only valuable parts of the great timber tree, for the gum is worth considerable even its rough state, just as it is hacked from the crotches of old trees. There are two or three firms in Maine which buy large quantities of it from lumbermen and gum hunters for the purpose of refining it, as they say. But as a general thing the refining consists in adulteration with resin. They throw it into a big kettle, bark and all, and boil it into about the consistency of thick molasses, skimming the impurities off as they rise to the surface. Then, if the purpose be to adulterate, some lard or grease and a lot of resin is added, and in some cases a little sugar. The mixture then becomes thicker, and, after more stirring, is poured out on a slab, where, while it is yet hot, it is rolled out in a sheet about a quarter of an inch thick, and then chopped with a steel die into pieces half an inch wide and three-quarters of an inch long. These pieces are wrapped in tissue paper and packed in wooden boxes. There are 200 pieces in a box. Some gum is treated in this way without adulteration. The best gum comes from no particular locality, but always from the biggest trees.

A Lime Light for Demonstration Purposes.

At a meeting of the Edinburgh Medico-Chirurgical Society, Dr. Foulis recently gave a demonstration of the circulation in the web of a frog's foot and of some botanical test objects by means of the oxyhydrogen light. The light, transmitted through a powerful condenser, passed through an ordinary microscope lens, and was thrown upon a large plate of ground glass at a distance of about 25 feet. The image of the object demonstrated could be focused on this plate with great exactitude, the definition even with high powers being excellent, and the general effect strikingly satisfactory.