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SCIENTIFIC AMERICAN SUPPLEMENT

No. 570.

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THE NAVY'S NEEDS.

The condition of the navy is attracting more attention than it has received at any previous time since the close of the war. Naval officers and a few legislators have long known—and the fact is now generally admitted by the press and the people—that we have not had during the last twenty years a single sea-going ship that would have had a hope of victory if pitted against any of the first-class warships of other nations launched during that time. During those twenty years, but one ship built by or for our government has been any more worthy to be called a modern warship than an old-time sailing frigate of the Constitution class would have been. This one exception was the Trenton, which, though unarmored and none too fast, was, when she was launched, a fairly efficient cruiser. Every dollar spent for construction or repairs outside of the Trenton has been wasted in the creation or perpetuation of ships utterly useless for war purposes. Most of these craft would not have rated high in their respective classes thirty years ago; yet in the face of all the improvements that have been made in other navies, we have gone on tinkering with these old hulls filled with mere scrap metal, called—by courtesy only—boilers, engines, and batteries. Within the past four years, four new ships have been designed and nearly completed, namely, the Chicago, the Boston, the Atlanta, and the Dolphin.

It is unnecessary to go into the controversy as to what measure of success or failure has attended the practical working of these ships, two of which are in commission, while the other two are nearly ready for their crews; assuming, even, that they will accomplish, in the matter of speed and seaworthiness, all that their specifications call for, they are still unsatisfactory specimens of naval architecture, and are costly but inefficient additions to the service. They are not armored for resisting heavy guns, and they have not speed enough for light cruisers. It is now proposed to build four additional steel cruisers, not armored, the proposed tonnage and speed being as follows, respectively: One of 4,000 tons, highest speed 18 knots; one of 3,730 tons, highest speed 18·9 knots; one of 1,700 tons, highest speed 16 knots; one of 870 tons, highest speed 12 knots. It is unnecessary to go into further particulars regarding these vessels, for the foregoing figures are sufficiently condemnatory without criticising the defects of the battery and the particular style of machinery. The two vessels having high speed are too large, while the smaller two are ridiculously slow.

The United States navy ought not to be intended for large offensive operations against land fortifications and heavy ironclads. So much has been admitted by the navy department in the construction of the last four and in the plans of the next four new ships. They are not armored for heavy fighting. They are called "cruisers," and while doubtless they can "cruise" well enough from port to port in time of peace, they ought to have been constructed with special reference to the requirements of war. They ought not to be fighters, but fliers, having the greatest speed and coal capacity consistent with a small but powerful battery. Except for coast defense, we do not need ironclads, but Alabamas.

Now, there is no objection to the speed of the two largest of the new cruisers, namely, 18 and 18·9 knots respectively. If that speed could be maintained for ten days, and if they could carry coal enough to last that time, they would be model "cruisers," for they could overhaul anything afloat; but unfortunately that is not intended to be their sustained speed, and it is not likely that even 15 knots could be kept up for any great length of time, or that they could carry sufficient coal for long steaming at great speed. Consequently, not being efficient as armored fighting ships, and not having even sufficient speed to escape from the first-class armored ships of other nations or to overhaul the fast merchant steamers whose capture would be desirable, it is difficult to see what effective service they could perform. As for the two smaller ships, a maximum speed of 12 and 16 knots respectively makes them, of course, even less satisfactory than the larger pair. It seems as though—following the example set in the Chicago, Atlanta, etc.—the Navy Department proposes to build ships that can neither fight nor run.

It is apparent that we must keep up a considerable naval establishment for two reasons: First, as a navy cannot, like an army, be created at short notice, an effective nucleus of trained officers and men must be maintained at all times; second, even in time of peace there are barbarous or semi-civilized nations with whom no arrangement is effective unless the power to enforce our rights is made clearly apparent. Therefore, we need a moderate number of cruisers to keep officers and men actively employed, and to visit the ports of all semi-civilized and barbarous nations frequently. The ships should not be so large as to be unduly costly to build and to keep in commission, but they should have high speed, large coal capacity, and a very few long range guns. For coast defense, a few very heavily armored ships of the Monitor type, capable of going to sea in ordinary weather, might be desirable, to meet a hostile fleet just outside our ports in case of a blockade or bombardment; but it is becoming more and more questionable whether these would be absolutely essential to our defense. In their place, a swarm of torpedo craft, Ericsson's Destroyer, and dynamite-gun carriers could be provided at very moderate expense, and there are few naval officers who do not admit that they would rather fight ironclads than torpedoes.

Finally, the navy wants to forget some things and learn some others. It especially needs to forget that vessels ever were propelled by the wind. If every manufacturer using a steam engine insisted on erecting a windmill over his workshop to assist the steam power below, he would be regarded as a "crank;" yet that is practically what many of the older naval officers insist upon on board ship. Because sails and spars were once necessities, they cannot see that they can be dispensed with now. They need to forget that it is necessary to follow the lead of European navies in preparing for a game of war. All the pretty little rules by which foreign experts prepare themselves to meet their European enemies may well be ignored and dispensed with, just as we always have ignored them when actual fighting was to be done. Modern naval warfare—in theory, at least, for there has been precious little practice—is beginning somewhat to resemble the middle-age tournaments in armor. The ships are now cuirassed instead of the knights, but the rigidity and cumbrousness of the combat are likely to be marvelously similar. We want none of this kind of training. We can get along without the armor and without the clumsy rules that its use necessitates. Let our naval officers study the weak points of their possible adversaries to avoid—not to copy—them, and exercise their ingenuity in inventing devices for resisting and repelling any attack that may be made on us.

The *personnel* of the United States navy—as universally admitted by foreign officers—has no superior in education, originality, quickness in device, and promptness in execution. If the government will only provide the right kind of ships, there need be no doubt that a good account will be rendered of them.

INCIDENTS IN BIRD LIFE AT THE PARK.

The curious behavior of a sheldrake in the Central Park Zoological Gardens has puzzled Superintendent Conklin and the keepers, and is attracting much attention among visitors. When the two sea lions were brought to the Park recently, this sheldrake was the only one among all the birds in the little inclosure outside the lion house, where the sea lion tank is, that took any interest in the new comers. The sheldrake comes from Australia, where there are not any sea lions, and is, therefore, unacquainted with these monsters. Perhaps to this fact may be attributed the strong interest he took in them; for, ever since they were dumped into the tank, he has seemed to regard himself their special guardian, and spends the hours of each day on or near its edge.

He stands like a sentry, usually on one leg, and at first attacked the other birds, when they approached, with such fierceness that they seem now to have a wholesome dread of him, and at times, when very thirsty, sneak up to the basin, take a hasty sip, and scurry away as though they had come to the belief that the tank and its waters belonged exclusively to the sheldrake. Now, there are in this inclosure many large birds, such as the pelican, stork, and bittern—birds able to defend themselves; but, strange to say, they submit meekly to the assumption of proprietary rights by this little wood duck, as if by some unseen, but potent, influence directed. The ponderous, sleek, and slow moving sea lions come up to the surface now and then, watch their little champion drive away intruders, and then, after blinking, sleepy-eyed, for a few moments, fall over lazily into the water and disappear.

The sheldrake is not known among naturalists as an aggressive bird, and hence to see him fly furiously at a great pelican, drive him from the field, and then send a long-legged sand bill crane scampering after in evident alarm, is a curious sight. While the sheldrake will allow no other bird to approach the sea lions by day, he relaxes his vigil after nightfall, when the sea lions and birds repair to the little house near the tank to sleep, and there is a tacit understanding that the other birds may then approach.

This sheldrake is of the sub-family *Anatinæ* and of the genera *Tadorna* (Leach) and *Casarka* (Bonap.). The species are to be seen on the sea shore as well as on the lakes, feeding on marine plants, crustaceans, and mollusks. The note is a shrill whistle.

Another interesting phase of bird life has been developed in the big cage on the eastern side of the arsenal, where a scarlet ibis (*Ibis rubra*) has taken a strong dislike to the note of the whooping crane (*Grus americana*); and, as if in furtherance of Oscar Wilde's suggestion as to an art police which should prevent discordance in music as well as deformity in other branches, this ibis essays forcibly to restrain the whooping crane from uttering his unmusical note. One day last week, the crane got to work in real earnest, and whooped away for nearly half an hour, pursued the while by the ibis, which, following him from one part of the cage to another, struck at him with his sharp bill after each note.

The note of the whooping crane somewhat resembles the cries of a human being in distress, and is not, therefore, pleasant to the ear.

Yet it would seem a refinement of sarcasm for a bird with a cry like unto that of the red ibis or the white ibis to object so vehemently to the screech of the whooping crane, for the note of the ibis while not unpleasing heard in the distance, has a harsh and uncanny sound when near at hand.

The intelligence of the ibis is well known, and those who have been along the Spanish Main will perhaps remember its cleverness when in pursuit of the crayfish. In the dry season, when food is scarce, the latter burrows some three or four feet beneath the surface, for he is not fairly comfortable save in the damp or moist earth. Coming upon one of these burrows, the ibis tumbles the earth back in the aperture, and the crayfish, shut off from the air, comes up to repair damages, and is seized by the ibis and devoured.

The ibis was worshiped by the Egyptians, and reared in their temples. Some saw a connection between the changes in its plumage and the phases of the moon, while others, because the inundation of the valley of the Nile took place just after the return of the ibis, were inclined to attribute this welcome phenomenon to its coming; tracing the rise and spread of the stream, which attracted the hungry birds, as the consequence rather than, as it really is, the cause of their appearance.

Herodotus has depicted the iris as a destroyer of serpents, which would seem to be a mistake, though he devours frogs, toads, and water lizards with evident relish.

The whooping crane is also from South America. It is found on the shores of large ponds and lakes, and occupies itself for the most part in delving for the roots of the great water lily, of which it is fond.

Life in the Formation of the Earth.

When we look at the surface of the earth, the vast strata of rocks and soil, we are not at first thought apt to consider the important part that life, in various phases, has taken in the formation of the visible part of the world as it now stands. To the earth life is indebted for its existence, and to life much of the earth's present form is due. They are and have been interdependent.

As rain falls from the sky it strikes sometimes upon clay and sometimes upon decaying vegetable matter; but in either case it eventually sinks deep into the earth, and finally finds its way back to the sea. When it strikes the earth, it has a very slight dissolving power, but, as it sinks, becomes compressed and charged with gases. Even the most insoluble substances can be taken up. Few elements are then free from its power. Charged with the various gases, it dissolves carbonate of lime, to be used in building marine shells, salt for the sea, and substances necessary to the existence of marine plants. Sea weeds, having no roots, must take elements necessary to their existence directly from the surrounding water. Bromine, iodine, potassium, gold, and silver must all be ready for them when needed, and it is to carbonic acid gas that they thus owe their existence. In the same way, corals and other calcareous structures are directly dependent upon this property of charged waters.

The water, passing through limestone rock, dissolves away the carbonate of lime, carries it to the coral polyp in the tropical waters, where it is appropriated by the animal, and left when the creature dies to be worn away by the waves and partly redissolved. What remains is piled up on the shore, where it afterward forms into hard coral rock. This is the cycle of the carbonic acid gas, and this the key to the formation of our coral reef, of our limestone and marble. In a similar way chalk has been formed. Various causes may unite to decompose these lime rocks, and the gas thus set free will aid in another cycle.

Life depends upon the sun for existence, and all life is either directly or indirectly made up of energy from the sun. Some of this energy may have come to-day, some ages ago; but, no matter when it came, it is solar energy. The beef we eat, the water we drink, simply give up latent heat taken from the sun; and this heat is what works our vital system and supplies us with energy. In other words, we are simply using up stored sunlight. In a given body, a plant, for instance, at the time of its death there is a certain amount of unused heat, which if the plant decays, is partly used up in decay. If the plant only partially decays, we have some sunlight or heat stored up for future use. This is the case of our coal. In ages past, millions of years perhaps, the solar heat poured down from a cloudless sky upon vast and magnificent forests of trees, which lived and died just as our trees do to-day; but, because they fell in damp places, they only partially gave up their solar heat. Then they became buried, and finally transformed into hard mineral. Thus by some wise provision of nature we have immense areas of coal, time-stored sunlight, ready for use; and now man is using these masses of coal and making them give up to him the sunlight which they have so carefully stored through their vast ages.

There are other ways in which vegetable matter has been accumulating so as to form parts of the earth's surface. At the end of the glacial period, over the northeastern portion of this country there were vast numbers of small, shallow lakes left, dotting the country here and there. When the frozen mass of snow and ice gradually receded, these were filled with clear, cold water; but the water and the earth about were utterly devoid of life. Soon the southern breezes brought spores and seeds of plants; then animals came. The water began to fill with life and sediment to be formed on the bottom; then the moss sphagnum took root on the banks of these lakes, and, according to its habit, began to grow out on the surface of the water, dropping sediment as it went; and year after year, growing further and filling in more and more, until, centuries having passed, the lakes became transformed into swamps of peat. This was the way our swamps were formed, and we have them even now in this same process of formation. In Ireland the far famed peat beds are examples. Here, in America, where coal is abundant, we have no need of peat, but when our supplies of coal are decreased, we have yet large tracts of peat to depend upon. In New England alone there are 2,000,000 acres of peat swamp.

In Kentucky there is a curious bed of carbonaceous shale, which, before the discovery of oil wells, was used for an oil supply. This use is now abandoned, but we may yet have to resort to it again. This shale was once a great sargassum sea in the midst of the geological ocean that covered our continent. Just such a bed is being formed in the Atlantic Ocean, by the accumulation of vast beds of sea weed beneath the sargassum sea, in the center of the eddy formed by the ocean currents.

The peat beds are formed by the dropping down of decaying matter from the surface, but our salt marshes are formed in just the reverse manner. In these the plants grow from the bottom, while the peat beds are mainly formed by deposition from the surface. Through some cause or other, by winds or eddies, a sand bank is formed in some sheltered bay or creek. As time passes, this grows shallower and the surface becomes rich with decayed matter of both animal and vegetable origin. Soon it is uncovered at low tide, and then we see something green growing upon the highest part. This is eel grass. Each year the grass decays until a sod is formed, which spreads as the bank becomes elevated, until the top is entirely covered with a layer of rich vegetable matter in a state of decay. Then the salt grass or marsh grass begins to grow, and soon only the highest tides flow upon what a few centuries back, was a bank of sand entirely covered with water. This formation, in every stage, may be seen on our sea coast. Vast areas of this kind of land extend along our entire Atlantic coast, and much of it might be reclaimed at very little expense, as has been done in England to large tracts of salt marsh.

These are a few of the strata in the earth which are due mainly to life for their present position. There are many others of minor importance, but these few mentioned best illustrate the principle of mutual dependence. When we think of it, we are surprised at the importance of life to the globe. Without its influence what a barren mass of rocks and soil we should have to live upon! It has shaped the continent moulded the contours of mountains, and made life easy. T.

The Bee's Sting a Useful Tool.

A new champion has arisen to defend the honey bee from the obloquy under which it has always rested. Mr. Wm. F. Clarke, of Canada, claims to have discovered, from repeated observations, that the most important function of the bee's sting is not stinging. In a recent article he says:

My observations and reflections have convinced me that the most important office of the bee sting is that which is performed in doing the artistic cell work, capping the comb, and infusing the formic acid by means of which honey receives its keeping qualities. As I said at Detroit, the sting is really a skillfully contrived little trowel, with which the bee finishes off and caps the cells when they are filled brimful of honey. This explains why honey extracted before it is capped over does not keep well. The formic acid has not been injected into it. This is done in the very act of putting the last touches on the cell work. As the little pliant trowel is worked to and fro with such dexterity, the darts, of which there are two, pierce the plastic cell surface and leave the nectar beneath its tiny drops of the fluid which makes it keep well. This is the "art preservative" of honey. A most wonderful provision of nature, truly! Herein we see that the sting and the poison bag, with which so many of us would like to dispense, are essential to the storage of our coveted product, and that without them the beautiful comb honey of commerce would be a thing unknown.

If these things are so, how mistaken those people are who suppose that a bee is, like the Prince of Evil, always going about prowling in search of a victim. The fact is that the bee attends to its own business very diligently, and has no time to waste in unnecessary quarrels. A bee is like a farmer working with a fork in his hay field. He is fully occupied, and very busy. If molested or meddled with, he will be very apt to defend himself with the implement he is working with. This is what the bee does; and man, by means of his knowledge of the nature and habits of this wondrous little insect, is enabled, in most cases, to ward off or evade attack. It is proof of their natural quietness, industry, and peaceableness that so many thousands of them will go through a summer of ceaseless activity close to your dwelling house, and perhaps not half a dozen stings be inflicted during a whole season.

The Coloring of Metals.

According to the *Illustrirte Zeitung fur Blechindustrie*, a grayish black coloring on copper may be obtained by placing the object for treatment, after being well cleansed, in a weak solution of liver of sulphur. When a caustic effect has, after a short time, been produced, the object is rinsed, slightly heated, and brushed with a stiff brush. This coating is said to be very durable.

A blackish brown bronzing can be applied to vases, figures, busts, etc., cast from zinc, by the application of a solution of sulphate of copper. If the projecting portions are then well rubbed with a woolen rag, they assume a coppery red brilliancy, which increases the resemblance to genuine bronze. A solution of verdigris in vinegar also produces an effective bronzing.

Brass may be colored black by repeatedly coating the cleansed metal with a moderately warm solution of nitrate of copper. Heating over a charcoal fire follows. Finally, the tone is heightened by rubbing with olive oil.

The Greatest of Great Walls.

Says a correspondent of the *Milling World*, who has recently been traveling in China: Of course we had to go to the great wall of China. This country abounds in great walls. Her mural defenses were most extensive—walled country, walled cities, walled villages, walled palaces and temples—wall after wall and wall within wall. But the greatest of all is the great wall of China, which crests the mountain range and crosses the gorge from here some forty miles away. Squeezing through the last deep gorge and a deep rift in the solid rock cut out by ages of rolling wheels and tramping feet, we reach the great, frowning, double bastioned gate of stone and hard burned brick-one archway tumbled in. This was the object of our mission, the great wall of China, built two hundred and thirteen years before our era; built of great slabs of well hewn stone, laid in regular courses some twenty feet high and then topped out with large, hard burned bricks, filled in with earth and closely paved on the top with more dark tawny brick—the ramparts high and thick and castellated for the use of arms. Right and left the great wall sprang far up the mountain side—now straight, now curved, to meet the mountain ridge, turreted each three hundred feet—a frowning mass of masonry. No need to tell you of this wall; the books will tell you how it was built to keep the warlike Tartars out—twenty-five feet high by forty thick, twelve hundred miles long, with room on top for six horses to be driven abreast. Nor need I tell you that for fourteen hundred years it kept those hordes at bay, nor that, in the main, the material used upon it is just as good and firm and strong as when put in place. Twelve hundred miles of this gigantic work built on the rugged, craggy mountain tops, vaulting over gorges, spanning wide streams, netting the river archways with huge hard bars of copper, with double gates, with swinging doors and bars set thick with iron armor—a wonder in the world before which the old time classic seven wonders, all gone now save the great pyramid, were toys. The great pyramid has 85,000,000 cubic feet, the great wall 6,350,000,000 cubic feet. An engineer in Seward's party here some years ago gave it as his opinion that the cost of this wall, figuring labor at the same rate, would more than equal that of all the 100,000 miles of railroad in the United States. The material it contains would build a wall six feet high and two feet thick right straight around the globe. Yet this was done in only twenty years without a trace of debt or bond. It is the greatest individual labor the world has ever known.

A CORRESPONDENT writing from Caldwell, Kan., says: "Silver has been recently discovered in large quantities north and south of this city, where the lead crops out; in fact, it underlies the entire city about 36 feet from the surface, and extends several miles into the territory. It assays from $35 to $108 per 2,000 lb. rock.