

Correspondence.

Again the Nest Building Fishes.

To the Editor of the SCIENTIFIC AMERICAN:  
In the SCIENTIFIC AMERICAN of November 28, Charles F. Gilbert criticises an article on the nest building fishes which appeared in your issue of August 1. Mr. Gilbert has evidently reference to some other fish than the Paradise fish spoken of in your issue of August 1. He will find an absolutely correct article, with an absolutely correct illustration of the nest building Paradise fish of India (*Macropodus venustus*), on page 95 of the "Amateur Aquarist," by Mark Samuel, the late aquarist of Columbia College, published by the Baker Taylor Company, 5 East Sixteenth Street, New York; and he will also find an illustrated article on the nest building stickleback on page 99 of the same work.

The fish Mr. Gilbert refers to he says builds no nest; but the Paradise fish does build a nest made of bubbles on the surface of the water. The fish that Mr. Gilbert speaks of he says attains a weight of twenty pounds. The adult Paradise fish measures only five inches in length.

I would like to correct a few errors in the otherwise excellent article of August 1, which refers to the real Paradise fish. As I have raised these fish for five years, and have made a constant study of their every action, my observations correspond exactly with those of Mark Samuel in the "Amateur Aquarist." The female never makes the nest. The whole process of making the nest and caring for the young is done by the male. Instead of the eggs hatching in five days, they hatch in about thirty-six hours.

Any one can raise these fish with a very little care in an ordinary small aquarium, and they are a most interesting fish, especially during the breeding season, when they change their various brilliant colors and extend their tail and fins in a very much more beautiful manner than any other fish known.

CHARLES H. LOOMIS.

The Commercial Value of Ideas.

In his lecture before the League for Political Education, at the Berkeley Lyceum, on "The Commercial Value of Ideas," Mr. Clarence Cook described a fancied visit to Parnassus, where he met Fortune riding down on her "wheel," in a bicycling costume that had been modeled upon the antique, and recalling the statue of the huntress Diana. Questioned upon her mission, Fortune said that she was carrying gifts from the muses to the men and women of the world. "You seem to be very lightly laden," said the questioner. "I have all I can carry," she replied; "for my load is made up of ideas, suggestions, and even a few happy guesses." As she sped down the mountainside she called back: "I never carry money with me, but only the means by which to make it."

From this suggestion the lecturer pointed out some ideas from which have been made fortune and fame. He found all the muses actively engaged in business—Parnassus turned into a workshop. All were busy in teaching men how to extract money from sculpture, from the writings of history, from the dreams of poetry, and even from the divine graces of the Muses' dance. Clio said that she had taught Herodotus to write history, and although his books were filled with "vain imaginings," they still had "a good sale."

Plato, he said, had called the boy "the most fearful wild beast living." Occasionally, however, the boy proves of great usefulness. Thousands of idle boys had sat lazily by their mothers' fires and seen kettle lids bobbing up and down; thousands of men, also, had seen it; but it was reserved for the boy Watt to investigate cause, and give to the world the steam engine.

Another little boy, tired of holding the skein of yarn for his mother, devised the reel, so that he could go out to play. Another, turning a crank and seeing other boys at play, looked about for some way to have his work done so that he could go out in the fields. He noticed another crank, moving simultaneously with his. He attached a wire from the other crank to his own, saw that one did the work of two, and went out to play, leaving behind him a blessing to mankind.

"We are apt to consider Nebuchadnezzar a tiresome old fellow, and he was certainly addicted to strange ways in his old age, but he first conceived the idea of canalization. Pharaoh-Necho also had the idea of canals, and first suggested the cutting of a canal through the Isthmus of Suez. In those days they had no newspapers to tell people what to do, but they had what fulfilled this function of the newspaper—the oracle. Pharaoh-Necho went, therefore, to the oracle, and it gave him exactly the same reason for not cutting the Suez Canal that the papers give now for America's not cutting a canal across Nicaragua. It said: "You are working for the barbarians." The idea was that the canal would benefit the people of the Mediterranean more than it would Egypt. We are afraid of helping some one else, but the canal will have to be cut some time. Pharaoh-Necho's plan was afterward utilized by De Lesseps, and brought him fame and fortune.

"Long ago there were three toys in China with which

those people played for centuries. They were little wooden blocks, on which figures and characters were cut; a little toy machine which had a needle that, when moved about, always turned to the north, and which the Chinese found useful in sailing up and down their coasts, and the last was the firecracker. These toys are still so used in China, and would never have been of any great service to mankind if they had not been brought to Europe, where the crude ideas they embodied were fertilized by the ideas of thinkers, and then they revolutionized the world. From the little blocks of wood came the printing press; from the curious little toy of Chinese junk sailors came the mariner's compass, and from the firecrackers were evolved the cannons that battered down the feudal walls of Europe."

World's Debts Increasing.

Whether it be a good or a bad thing for the nations, there is no room to doubt that the debts of the world are growing steadily. In 1875 it was computed that they stood at £4,750,000,000, as compared with a round £4,200,000,000 two years earlier. On the basis of figures, many of which have been obtained by us at first hand, and are likely on that account to be more accurate than some of the wild guesses to which certain irresponsible statisticians have treated us, we ourselves estimate that the indebtedness of the world to-day stands at £5,800,000,000. As probably everyone knows, France has the doubtful distinction of being the country which has the largest debt. The latest figures put the total at something like £1,200,000,000, which is nearly double the debt—£660,000,000—of Great Britain, which ranks as second on the list. Russia follows with a total of £575,000,000, and insignificant Italy comes fourth with £506,000,000—that is, if we count as separate items the joint debt of Austria-Hungary and the individual debts of the two portions of the nation. The joint debt stood, in 1895, at £275,990,000; while the debt of Austria alone was £122,678,600, and that of Hungary alone £207,729,000, or £606,397,600 in all. The United States debt amounts to £339,000,000, and that of Spain—exclusive of the more recent loans in prosecution of the war in Cuba—at £279,000,000. In the following statement we give a comparison for 1875 and 1895 of the indebtedness of the nations which now owe, or did then owe, £100,000,000 or over:

| Country.             | 1875.<br>(Estimated.) | 1895.<br>(Estimated.) |
|----------------------|-----------------------|-----------------------|
| France.....          | £900,000,000          | £1,200,000,000        |
| Great Britain.....   | 780,000,000           | 660,000,000           |
| Russia.....          | 340,000,000           | 575,000,000           |
| Italy.....           | 890,000,000           | 505,000,000           |
| United States.....   | 440,000,000           | 339,000,000           |
| Spain.....           | 875,000,000           | 279,000,000           |
| Austria-Hungary..... | 350,000,000           | 606,000,000           |
| Germany.....         | 200,000,000           | 84,000,000            |
| Australasia.....     | 46,000,000            | 240,000,000           |
| Turkey.....          | 185,000,000           | 180,000,000           |
| Portugal.....        | 69,000,000            | 153,000,000           |
| India.....           | 130,000,000           | 127,000,000           |
| Brazil.....          | 94,000,000            | 118,000,000           |
| Egypt.....           | 75,000,000            | 106,000,000           |
| Total.....           | £4,224,000,000        | £5,172,000,000        |

In spite of the substantial reduction of the English, American, Spanish and German debts, there is a net increase for the fourteen nations in the twenty years of £848,000,000. It may be added that in 1885 these same twelve nations owed £4,140,000,000, made up thus: France, £998,000,000; Great Britain, £740,000,000; Italy, £455,000,000; Russia, £381,000,000; United States, £379,000,000; Spain, £270,000,000; India, £127,000,000; Turkey, £127,000,000; Australasia, £98,000,000; and Portugal, £83,000,000. In the years 1875-85 there was on this showing a net reduction of about £15,000,000 on the indebtedness of the nations enumerated; but the whole world's obligations in 1885 represented an increase on 1875, our calculations giving a total for the former of nearly £4,900,000,000. Among the minor debtors, Belgium has increased its obligations from £71,000,000, in 1875, to £91,000,000, in 1895, and in the same time the debt of the Netherlands has gone up from £80,000,000 to £92,500,000, and that of Canada from £30,000,000 to £51,300,000. The Greek debt stands at £32,984,000 and that of Mexico at £32,720,000 (as against £63,500,000 in 1875); while among the new borrowers must be reckoned Japan, which now owes £47,300,000, and the Argentine Republic, which owes about £74,000,000. For the small borrowers—Bulgaria, Denmark, Norway, Sweden, Chile, Peru, Serbia, etc.—we have allowed £150,000,000, which is probably only two-thirds of the actual obligations of these nations.

The sum paid annually as interest on the world's debts approximates to £230,000,000. Twenty years ago the total was about £200,000,000, and the increase of only £30,000,000 with a capital addition of more than £1,000,000,000 is explained by the fact that money now is cheaper, provided credits are good, than it was in 1875, when on some of its loans England was paying 3¼ per cent, India, 4 per cent, Holland 4¼ per cent, Canada 4½ per cent, France, Russia, and Brazil 5 per cent, Italy and Portugal 6 per cent, Hungary 7½ per cent, Egypt 8 per cent, Turkey and Peru 10 per cent, Spain 15 per cent, and Mexico 18 per cent. France, of course, pays out the largest sum of money every year in the way of

interest, the total running to about £37,000,000, or 19s. 8d. per head of the population. Great Britain's disbursement is £24,540,000, or 12s. 9d. per head. Russia pays out a little more, £24,726,000, or 4s. 11d. per head. Austria-Hungary, on the joint and special debts, pays out £37,190,000 a year, and the average per capita expenditure on the joint debt is 4s. 10d., on the special Austrian debt 10s. 10d., and on the special Hungarian debt 15s. The annual charge in Italy amounts to £23,450,000, which works out at the rate of 15s. 1d. per head. Spain pays nearly £11,300,000 interest annually, or 13s. 1d. per head. Though the capital itself is a large item, the charge per annum in the United States is no more than 1s. 9d. per head. In Uruguay, on the other hand, it runs to as much as £1 2s. 6d. per head. Burdett says that in Peru this per capita charge runs to £1 3s., but there must be something wrong with Burdett's figures. In Portugal the amount is 15s. 10d. per head, and in Egypt 11s. 10d. per head. In Germany it is no more than 1s. 4d.

Can any one say offhand what is the aggregate debt of all the English possessions in all parts of the globe? We will give the total—it is £1,097,166,600. After the mother country, India has the heaviest debt; the total being, as we have seen, £127,600,000. Then comes New South Wales with £58,225,000, Canada with £51,288,000 (net), Victoria with £47,937,300, New Zealand with £39,635,000, Queensland with £30,639,500, Cape Colony with £27,675,178, and South Australia with £23,100,000. St. Helena brings up the rear with a modest £5,408.—Pall Mall Gazette.

Note on the Preparation of Phosphorescent Barium Sulphide.

In some recent experiments with phosphorographic plates the writer had occasion to use some pure barium sulphide. As this could not at the time be obtained from any of the Chicago firms dealing in chemicals, I decided to prepare it for myself.

Solutions of pure barium sulphide (Ba Cl<sub>2</sub>) and sodium hydrate (Na(OH)) were mixed in molecular proportions so as to obtain barium hydrate (Ba(OH)<sub>2</sub>) and sodium chloride (Na Cl). Hydrogen sulphide gas, prepared and washed in the usual manner, was then passed through the concentrated solution, throwing down the barium sulphide as a flocculent sparingly soluble precipitate, leaving only sodium chloride in solution. The complete reaction is



The precipitate was collected on a filter, sparingly washed with cold water, and thoroughly dried in a steam bath. Although barium sulphide is, as is well known, ordinarily strongly phosphorescent, it showed, when prepared in this way, only the faintest traces of phosphorescence even after exposure to bright sunlight for several hours. Somewhat nonplussed by this discovery, of which I could find no mention in any of the works on chemistry which I consulted, I determined to try some of the same material prepared in the ordinary way (by fusing together barium carbonate and sulphur). This, although not as strongly luminous as the powdered blende (perhaps because of impurities), was fairly satisfactory. It then occurred to me that the phosphorescent property might be due to the action of the high heat employed in the dry process of preparation, and that the precipitated material might similarly be rendered luminous by heating. An experiment with a small fragment of the dried precipitate, which was placed in a small porcelain crucible and heated over a gas blowpipe, showed this to be the case.

The power of phosphorescing depended to some degree on the degree of heat applied and the length of the heating.

These experiments are of interest as indicating that barium sulphide may exist in two molecular states, chemically identical but physically different. It will be interesting to determine whether this change is accompanied by corresponding changes in other physical properties, as in the case of fluorspar, lepidolite, and some other substances which become phosphorescent when only moderately heated.

As soon as time permits, further experiments will be made on this and other interesting questions which have presented themselves.—F. L. O. Wadsworth, in the Astrophysical Journal.

Air in the London Underground Railway.

The analysis showed that the amount of oxygen in some air taken between Gower Street and King's Cross [London] was only 20.60 per 100 parts by volume, while in the worst courts of London it was never found lower than 20.86, says Health News. Pure air contains 20.94 per cent of oxygen. And with diminution of oxygen there was a proportionate increase of carbonic acid gas. The normal quantity is 0.037 in 100 parts, but Dr. Angus Smith (whose analysis we are quoting) found that in one of the Metropolitan Railway tunnels the carbonic acid gas was 0.388 per cent; this is excessively high when we take into consideration Prof. Pettenkoper's assertion that whenever the carbonic gas in the atmosphere exceeds 0.100 per cent the air is too much polluted to be breathed with safety to health.