Thursday Island measured and photographed by Saville-Kent were remeasured by Mayer twenty-three years later. These results show that large coral heads may increase as much as two inches in diameter per year, while some kinds do not grow beyond a certain specific size. The average annual growth appears to be about one inch, though in the Floridian reefs the rate of increase is less.

Mayer states that stream waters pouring outward from forested volcanic shores are alkaline and thus can not dissolve limestone by reason of their "acidity." Thus the Murray-Agassiz solution theory of the formation of atolls is not supported. Holothurians are a potent factor in dissolving the materials that go to make reef limestones, which they swallow, and the effects of currents in scouring are important factors tending to convert fringing reefs into barrier reefs.

The problem of the precipitation of $CaCO_3$ in the ocean and the possibility of its solution there is discussed in the light of the latest evidence, and the conclusion is reached that in the shoal waters of the tropics, ocean-water does not dissolve calcium carbonate, but that the contrary process—precipitation by both inorganic and organic (bacterial) agencies—is taking place. Conditions in the deep sea, and perhaps in the cold waters of high latitudes, are different.

In the Murray Island reef sediments, Vaughan states that the dominant rock makers are (1) corals (34 to 42 per cent.); (2) coralline algæ (32 to 42 per cent.); (3) molluscs (10 to 15 per cent.); foraminifers (4 to 12 per cent.) and alcyonarians. Other marine animals are unimportant in their skeletal additions.

Cary shows that, in the Tortugas area, the gorgonians are also very important reef builders and therefore great rock contributors, since nearly 20 to 36 per cent. of their bodies consists of calcareous spicules. As almost all of these colonies die a violent death, and on the average all those living within 30 feet of water are replaced in five years by other colonies, he calculates that at least one ton of spicules or limestone is added per year to each acre of reef ground. In fact, when the gorgonians are common, they are more important as limestone makers than are even the stony corals.

Charles Schuchert

## SPECIAL ARTICLES

### A METHOD OF DEMONSTRATING THE DIFFERENCE-TONES

If a Rayleigh inductometer bridge be connected up, and a telephone receiver $A$ be in series with the alternating e.m.f., the demonstration of the difference-tone is an exceedingly simple matter. Let the bridge be balanced for a high frequency $F'$, say about 2,500; this tone will therefore not reach the ears if the balancing receivers be of the double, head-strap variety. Now whistle a scale into the receiver $A$. Since the bridge is not balanced for the new frequency, the whistle "gets through" into the balancing receivers. But one also hears another tone which slides down as the whistle slides up the scale. If between the balancing receiver and the bridge a good amplifier be connected, then the balancing receiver may be a "loud-speaking receiver" (such as are now used for announcing trains in large stations, etc.) and the apparatus is suitable for class demonstration. The great advantage of this arrangement is that we are not confined to any two fundamentals, as in the case of forks.

The phenomenon is unquestionably slightly complicated by the action of one alternator on the other, but I had not the time to see to what extent the extra tone differs from $F'-F''$.

The writer offers the above as a lecture experiment in physics and psychology, being under the impression that it has not been reported before.

Paul F. Gaehr
Wells College,
Aurora, N. Y.

## THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

### REPORT OF THE TREASURER FOR 1918

In conformity with Article 15 of the constitution and by direction of the council, the treasurer has the honor to submit the following report for the period December 15, 1917, to December 16, 1918, both inclusive.

The total of cash receipts during the year is $7,747.27. Disbursements made in accordance with directions of the council amounted to $7,786.00. These include $4,000 for purchase of a like amount of United States Third and Fourth Liberty Loan Bonds of 1918 for the association and held as an investment.

The total amount of funds of the association consisting of cash, cost value of securities purchased, and appraised value of securities received from the Colburn estate is $116,605.45.

A detailed statement is appended.

ROBERT S. WOODWARD,
*Treasurer*

December 23, 1918

BALANCE SHEET

*Assets*

| | |
|---|---|
| Investments: | |
| Securities (Exhibit A) | $112,777.50 |
| Cash in banks | 3,827.95 |
| | $116,605.45 |

*Liabilities*

| | |
|---|---|
| Funds: | |
| Life memberships, 343 at $50 | $ 17,150.00 |
| Jane M. Smith Fund | 5,000.00 |
| Colburn Fund | 77,755.74 |
| | 99,905.74 |
| Unexpended balance | 16,699.71 |
| | $116,605.45 |

CASH STATEMENT

*Receipts*

| | | |
|---|---|---|
| 1917 | | |
| Dec. 15. Balance from last report | | $ 3,866.68 |
| Interest from securities... | $5,254.80 | |
| Interest from bank balance | 92.47 | |
| 48 life commutations..... | 2,400.00 | $ 7,747.27 |
| | | $11,613.95 |

*Disbursements*

| | | |
|---|---|---|
| *Investments:* | | |
| $2,000 U. S. Third Liberty Loan of 1918..... | $2,000.00 | |
| $2,000 U. S. Fourth Liberty Loan of 1918..... | 2,000.00 | $ 4,000.00 |
| *Grants:* | | |
| William Tyler Olcott..... | $ 300.00 | |
| A. E. Douglass ..... | 250.00 | |
| Carl Eigenmann ..... | 500.00 | |
| Edwin B. Frost ..... | 500.00 | |
| R. A. Porter ..... | 200.00 | |
| E. W. Sinnott ..... | 200.00 | |
| O. F. Stafford ..... | 500.00 | |
| Herman L. Fairchild..... | 200.00 | |
| S. D. Townley ..... | 250.00 | $ 2,900.00 |
| *Interest on Life Memberships:* | | |
| 4 members (Jane M. Smith Fund) ..... | $ 200.00 | |
| 343 members ($17,150 at 4 per cent.) ..... | 686.00 | $ 886.00 |
| | | $ 7,786.00 |
| *Cash in Banks:* | | |
| Fifth Avenue Bank of New York ..... | $1,722.69 | |
| U. S. Trust Company of New York ..... | 2,105.26 | $ 3,827.95 |
| | | $11,613.95 |

(*Exhibit "A"*)

SCHEDULES OF SECURITIES

*Securities Purchased*

| Par Value | | Purchase Value | |
|---|---|---|---|
| $10,000 | Chicago and Northwestern Railway Co. general mortgage 4 per cent. bonds, due 1987.. | $ 9,425.00 | |
| 10,000 | Atchison, Topeka and Santa Fe Railway Co. general mortgage 4 per cent. bonds, due 1995 ..... | 9,287.50 | |
| 10,000 | Great Northern Railway Co. first and refunding mortgage 4.25 per cent. bonds, due 1961 ..... | 10,050.00 | |
| 10,000 | Pennsylvania Railroad Co. consolidated mortgage 4.5 per cent. bonds, due 1960 ..... | 10,487.50 | |
| 10,000 | Chicago, Burlington and Quincy Railroad Co. general mortgage 4 per cent. bond, due 1958 ..... | 9,350.00 | |
| 10,000 | Union Pacific Railroad Co. first mortgage 4 per cent. bonds, due 2008 ..... | 9,012.50 | |
| 10,000 | Northern Pacific Railway Co. prior lien railway and land grant 4 per cent. bonds, due 1997 ..... | 9,187.50 | |
| 10,000 | New York Central and Hudson River Railroad Co. 3.5 per cent. bonds, due 1997 ..... | 8,237.50 | |
| 8,000 | U. S. Second Liberty Loan Bonds ..... | 8,000.00 | |
| 2,000 | U. S. Third Liberty Loan Bonds ..... | 2,000.00 | |
| 2,000 | U. S. Fourth Liberty Loan Bonds ..... | 2,000.00 | $ 87.037.50 |

*Bonds from Colburn Estate*

| Par Value | | Appraised Value |
|---|---|---|
| $20,000 | Acker, Merrall and Condit Co. debenture 6 per cent. bonds | $13,600.00 |
| 7,000 | Buffalo City Gas Co. first mortgage 5 per cent. bonds ..... | 1,540.00 |
| 8,000 | Park and Tilford Co. sinking fund debenture 6 per cent. bonds. | 6,400.00 |

| | | |
|---|---|---|
| 42,000 Pittsburgh, Shawmut and Northern Railroad first mortgage 4 per cent. bonds, due February 1, 1952..... | 4,200.00 | $ 25,740.00 |
| $169,000 | | $112,777.50 |

I certify that I have audited the accounts of the treasurer of the American Association for the Advancement of Science for the period December 15, 1917, to December 16, 1918; that the securities representing the investments of the association have been exhibited and verified; and that the income therefrom has been duly accounted for.

The financial statements accompanying the treasurer's report are in accord with the books of the association and correctly summarize the accounts thereof.

HERBERT A. GILL,
*Auditor*

Dated December 23, 1918

L. O. HOWARD, PERMANENT SECRETARY, IN ACCOUNT WITH THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

From November 1, 1917, to October 31, 1918

*Dr.*

| | | |
|---|---|---|
| To balance from last account..... | | $ 6,739.26 |
| *To receipts from menbers:* | | |
| Annual dues, 1918..... | $32,809.00 | |
| Annual dues, 1919..... | 208.00 | |
| Annual dues, previous yrs. | 312.00 | |
| Admission fees ..... | 715.00 | |
| Associate fees .. ..... | 6.00 | |
| Life membership fees.... | 1,247.00 | $35,297.00 |
| *To other receipts:* | | |
| Sale of publications ..... | 47.50 | |
| Miscellaneous receipts including treasurer's payment of SCIENCE subscriptions for life members, interest, foreign postage, sale of programs, etc. ..... | 1,700.73 | $ 1,748.23 |
| | | $43,784.49 |

*Cr.*

| | | |
|---|---|---|
| *By publications:* | | |
| Publishers SCIENCE .....$23,007.48 | | |
| Preliminary announcement, circulars, forms, etc. ..... | 1,222.50 | $24,229.98 |
| *By expenses Pittsburgh meeting:* | | |
| Sectional secretaries' commutations, accounts, etc. | | 896.98 |
| *By expenses Pacific Division.* | | 950.00 |
| *By expenses Washington office:* | | |
| Salary, permanent sec'y...$ | 1,500.00 | |
| Salary, assistant sec'y.... | 2,000.00 | |
| Extra clerical help..... | 1,916.60 | |
| Postage ..... | 1,266.24 | |
| Express, telephone and telegrams ..... | 91.79 | |
| Office equipment ..... | 375.30 | |
| Stationery and forms.... | 556.15 | $ 7,706.08 |
| *By miscellaneous expenses:* | | |
| To treasurer, life membership fees .....$ | 2,400.00 | |
| To overpaid dues returned. | 26.00 | $ 2,426.00 |
| | | $36,209.04 |
| *By balance to new account.. .* | | 7,575.45 |
| | | $43,784.49 |

The foregoing account has been examined and found correct, the expenditures being supported by proper vouchers. The balance of $7,575.45 is with the following Washington, D. C. banks:

| | |
|---|---|
| American Security & Trust Co..... | $2,327.27 |
| American National Bank of Washington. | 3,243.28 |
| American National Bank of Washington (Savings Department) ..... | 2,004.90 |
| | $7,575.45 |

HERBERT A. GILL,
*Auditor*

WASHINGTON, D. C.
December 18, 1918

## SECTION E—GEOLOGY AND GEOGRAPHY

SECTION E of the American Association for the Advancement of Science met this year in conjunction with the Geological Society of America and the Association of American Geographers in the Civil Engineering building of Johns Hopkins University, Baltimore, on December 27 and 28. Following the present agreement whereby the affiliated societies take charge of the program whenever they meet jointly with Section E, the section had no program of its own. The address of the retiring vice-president, Professor George H. Perkins, of the University of Vermont, upon the subject, "Vermont physiography," was delivered on the evening of December 28 at the annual dinner of the Geological Society of America held in the Southern Hotel. It will be published in SCIENCE. The papers of the general sessions will appear in the *Bulletin* of the Geological Society of America, Vol. 30, and in the *Annals* of the Association of American Geographers, Vol. 9.

Dr. C. K. Leith, of the University of Wisconsin, was elected vice-president of the association and chairman of Section E for the coming year; Dr. H. A. Buehler, state geologist of Missouri, member of the council; Dr. W. W. Atwood, of Harvard University, member of the Sectional Committee for five years, and Frank W. DeWolf, state geologist of Illinois, member of the general committee.

ROLLIN T. CHAMBERLIN,
*Secretary*