*Principles of Economic Zoology.* By L. S. DAUGHERTY, M.S., Ph.D., Professor of Zoology, State Normal School, Kirksville, Mo., and M. C. DAUGHERTY, Kirksville, Mo. Philadelphia and London: W. B. Saunders Company. 1912. Cloth, 12mo. Pp. 410. 301 illustrations. $2.00 net.

This recent text-book presents a number of commendable features and adds another to the rather numerous list of available text-books for the beginner in zoology. It seems more particularly adapted for the normal school work in which the authors are engaged, and this perhaps accounts for the effort to include a very large number of examples rather than to give a more detailed and exact description of representative forms in the principal groups of animals. Possibly the great number of forms mentioned would be confusing, but in the hands of a skillful teacher the book could certainly be very useful in the extending of acquaintance with animal forms in general. The economic feature of the work, which has been emphasized in its title, will make it welcome in many schools where attention to this phase of the subject is desired. While these references are usually brief they generally sum up in fairly compact form the more important economic points, and are quite suggestive for references to more extended works in this field.

The illustrations are numerous, usually well selected and very well printed, and add a very important feature to the book.

One point which seems somewhat of a blemish is the inclusion of a discussion of economic or other matter referring to an entirely different class under a sub-heading which is restricted to some minor division of the group, for example pages 40, 44 and 70, the discussion of economic importance included in a paragraph under minor classes in the branch, relate for the most part to species included in entirely different classes and without especial attention of the student might very likely be supposed to refer to the class in which the paragraph occurs. This fault is one which might easily be corrected by a different arrangement of sub-headings.

The substance in general seems to be carefully stated and while there are some errors, due no doubt to lack of first-hand knowledge, the preparation shows care, and while stated to be essentially a compilation, the authors are to be commended for the success shown in selection and presentation of material.

In typographical respects the book is very satisfactory and a credit to the publishers.

HERBERT OSBORN

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*THE MINERAL WEALTH OF CANADA*

ALTHOUGH the discussion of reciprocity with Canada is now quiescent, yet all citizens of the United States are naturally interested in the development of our sister country. This is especially true of the readers of SCIENCE, because Canada has given to this country such a large number of eminent, influential and successful educators and scientists.

A recent publication of the Canadian Department of Mines gives us many items relating to the mineral wealth and to some of the resulting manufactures that ought to be of importance to our own people. This work is entitled "A General Summary of the Mineral Production of Canada during the Calendar Year 1911," by John McLeish, B.A., chief of the Division of Mineral Resources and Statistics.

From this we learn that the total value of the mineral products of Canada in 1911 was $103,220,994, or $14.42 per capita. The production was distributed amongst the various Canadian provinces arranged in order of the values as follows: Ontario, $42,796,162; British Columbia, $21,299,305; Nova Scotia, $15,409,397; Quebec, $9,304,717; Alberta, $6,662,673; Yukon, $4,707,432; Manitoba, $1,791,772; Saskatchewan, $636,706; and New Brunswick, $612,830.

Of these mineral products the metallic were valued at $46,105,423; the non-metallic at $57,115,571, of which $22,709,611 were for structural materials and clay products.

As a matter of comparison it is here pointed out that for the same year 1911 the mineral products of the United States, according to our

National Geological Survey, amounted to $1,918,326,253, of which $672,179,600 were for metallic and $1,245,896,653 were for non-metallic, with a value of $250,000 for materials not differentiated.

The table here given shows the relative values of some of the important mineral products common to Canada and this country. In those given Canada surpasses the United States in the value of its products only in nickel; but a few decades will doubtless see a great change in the relative values of the arsenic, asbestos (chrysotile), corundum and products of the two countries.

| | Canada Value | United States Value |
|---|---|---|
| Metallic | | |
| Pig iron | $12,307,125 | $327,334,624 |
| Silver | 17,355,272 | 32,615,700 |
| Gold | 9,781,077 | 96,890,000 |
| Copper | 6,886,998 | 137,154,092 |
| Lead | 827,717 | 36,553,320 |
| Zinc | 101,072 | 30,964,794 |
| Nickel | 10,229,623 | 127,000 |
| Non-metallic | | |
| Coal | 26,467,646 | 626,366,876 |
| Natural gas | 1,917,678 | 74,127,534 |
| Petroleum | 357,073 | 134,044,752 |
| Peat | 3,817 | 272,114 |
| Clay products | 8,359,933 | 162,236,181 |
| Cement | 7,644,537 | 66,705,136 |
| Gypsum | 993,394 | 6,462,035 |
| Lime | 1,517,599 | 13,689,054 |
| Sand-lime-brick | 442,427 | 897,664 |
| Slate | 8,248 | 5,728,019 |
| Stone | 4,428,757 | 77,108,567 |
| Corundum and emery | 161,873 | 6,778 |
| Grindstones | 52,942 | 907,316 |
| Arsenious oxide | 76,237 | 73,408 |
| Phosphate rock | 5,206 | 11,900,693 |
| Pyrite | 365,820 | 1,164,871 |
| Asbestos | 2,922,062 | 119,935 |
| Mica | 128,677 | 355,704 |
| Mineral waters | 223,758 | 6,837,888 |
| Graphite | 69,576 | 288,465 |
| Salt | 443,004 | 8,345,692 |
| Talc | 22,100 | 1,646,018 |

The mineral statistics were first collected for Canada in 1886, in which year the total value was $10,221,255, since which time the values have in general increased up to 1910, when they were $106,823,623 or the maximum. The falling off in 1911 is attributed to the prolonged strike of the coal miners in the Province of Alberta and the Crowsnest district of British Columbia, as the resulting scarcity of coal and coke in those provinces seriously interfered with the smelting operations.

A matter of practical value to the United States is the question of the mineral exports and imports of the Canadian provinces. The total value of the exports of mine products and the manufactures thereof was $52,546,593, of which $11,424,905 was for manufactures. Nearly all of the Canadian copper, nickel and silver are exported, as are a large part of the gold, asbestos and mica. The manufactures of mine products exported are chiefly iron and steel goods, aluminum, calcium carbide, lime, acetate of lime and coke. Of the exports $33,129,505 were sent into the United States; to the United Kingdom $6,726,015; while the next largest amount was to Newfoundland and Labrador, $580,632.

The imports into Canada of mineral products, chiefly in a manufactured or semi-manufactured condition, were in 1911 valued at $181,839,077. Of these imports iron and steel and the manufactures thereof amounted to $93,000,000; coal, ores, diamonds (unset) and bort, asphaltum, alumina, clays, etc., equaled $48,000,000; copper, gold, silver, lead, platinum, tin and zinc reached $18,750,000; while petroleum and clay products exceeded $11,000,000.

In view of the above facts the following excerpt from the report is of interest:

> The great excess of imports over exports would seem to indicate the existence of large opportunities for the development not only of Canada's mineral production, but also of many manufacturing industries which utilize mine products as raw materials. The fact, however, must not be overlooked that the geographical situation of Canada and the United States, separated by an imaginary barrier 3,000 miles in length, evidently results, notwithstanding the tariffs on both sides, in a mutually advantageous interchange of trade. Then we find large exports as well as imports of coal and of agricultural implements. The con-

tinued large export of crude unrefined ores and metal products and the corresponding imports of refined and manufactured metal products still point to opportunities for the development of metallurgical industries as well as industries for the treatment, refinement and manufacture of non-metallic products.

Owing to our contiguity, our mutual relations, our essential unity of race and general characteristics and identity of language, we can but wish our northern brethren success in the development of their rich mineral country.

AFTER the preceding remarks relating to this subject were in type, but not yet published, a recent "Preliminary Report on the Mineral Production of Canada during the Calendar Year 1912, prepared by John McLeish, B.A.," has been received, although the data are subject to revision for a final report.

The total mineral production is stated for 1912 to be $133,127,489, or $29,906,495 over that of the preceding year, and $26,303,866 over that of 1910, heretofore the banner year. So notable an increase points towards a more general prosperity. The relative rank in production of the different provinces remains as in 1911, except that Alberta and Quebec have changed places, the product of the former being valued at $12,110,960 and the latter $11,675,682. For Ontario the value is $51,023,134, for British Columbia $29,555,323, and for Nova Scotia $18,843,324.

Of the value of the total production, as is quite general, the non-metallic is the greater or $71,949,500, while the metallic is $61,177,989.

The value of some of the more important Canadian mineral products are given in the table below.

| | Value |
|---|---|
| Coal | $36,349,299 |
| Silver | 19,425,656 |
| Pig iron | 14,550,999 |
| Nickel | 13,452,463 |
| Copper | 12,709,311 |
| Gold | 12,559,443 |
| Clay products | 9,343,321 |
| Cement | 9,083,216 |
| Stone | 4,675,851 |
| Asbestos and asbestic | 2,979,384 |
| Natural gas | 2,311,126 |
| Lime | 1,717,771 |
| Lead | 1,597,554 |
| Gypsum | 1,320,883 |

The production of petroleum has been steadily falling off for the past five years, the value for 1912 being $345,050. The values of the production of copper, silver and gold have increased, especially in the case of gold from the Porcupine District. In brief it may be said that except for petroleum, the values of all the Canadian productions have increased since 1911.

For 1912 the value of the exports of mine products and of the manufactures of mine products has been $68,585,286, the chief ones being in order of value: silver, gold, copper, coal, nickel, asbestos, automobiles and aluminum.

By comparing the reports of previous years the mineral industries of Canada present, on the whole, very encouraging features for our northern neighbors and prove that a rapid development is taking place.

M. E. WADSWORTH
UNIVERSITY OF PITTSBURGH,
March 19, 1913

## SPECIAL ARTICLES

### ARTIFICIAL PARTHENOGENESIS IN FUCUS

THE occurrence of natural parthenogenesis or the development of the gametes without fertilization has been reported for several forms among the Phæophyceæ. Berthold and Oltmanns observed it in *Ectocarpus siliculosus,* which possesses, besides zoospores, gametes of two sizes. Both male and female gametes even in the same culture under certain conditions develop parthenogenetically. The question has been raised whether the so-called zoospores are not parthenogenetic gametes. Sauvageau observed that in *Giffordia secunda* antheridia were produced in greater numbers in July, but that none were formed in August or later, while numerous oogonia appeared at this season, many of whose