NOTES AND NEWS

ANALYSES AND DERIVATIONS OF TWO BEACH SANDS FROM THE HOLSTEINSBORG DISTRICT OF GREENLAND*

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INTRODUCTION

There have been three University of Michigan Expeditions into the Holsteinsborg District of southwest Greenland. Dr. William H. Hobbs of the University of Michigan was the Director of the expeditions. It was on the third expedition, during the summer of 1928, that the author collected two samples of interesting beach sands.

The sands were collected at opposite ends of a six hundred and twenty-five foot beach, some twenty-five miles from the edge of the inland ice, on the north shore of the Söndre Strömfjord in the Holsteinsborg District. The beach was at the foot of a terrace composed of glacial materials, and was flanked by out-crops of metamorphic rocks. The origin of the majority of the grains of the beach was found to be in these metamorphic rocks. The terrace material would add little to the beach, except possibly during the spring tides and very stormy weather.

MINERAL CHARACTERISTICS OF THE SANDS

A garnet-magnetite-hornblende sand, (Sand No. 1), was found at the western end of the beach. These loose detrital materials graded into a feldspar-quartz sand within three hundred feet, and at the eastern extremity of the beach a sample of the feldspar-quartz sand, (Sand No. 2), was collected.

METHOD OF STUDY. An average sample of each sand was screened, and a solution of bromoform, (sp. gr. 2.71), was used to float off the feldspar and quartz. The concentrates were washed, and examined under the binocular microscope. The minerals were separated according to color, degree of rounding, cleavage and fracture, and were placed in small vials, for later examination with the petrographic microscope. Approximately 17,800 grains of Sand No. 1 and 7350 grains of Sand No. 2 were used in the calculations of the percentages of the mineral constituents. Slides were made of each of the mineral types.

PARENT ROCKS. The rocks which contributed grains to the garnet-magnetite-hornblende sand are, in order of their importance: (a) *garnetiferous-hornblende gneiss*, (b) *biotite gneiss*, and (c) *feldspar-quartz pegmatites*. The garnetiferous hornblende gneiss is a metamorphosed igneous intrusive into the biotite gneiss. The pegmatites cut the biotite gneiss.

A thin section of the *garnetiferous-hornblende gneiss* shows, in order of abundance: green hornblende, quartz, almandite, oligoclase, orthoclase, magnetite, titanite, zircon, pyrite, pennine, sericite, and kaolin.

A thin section of the biotite gneiss exhibits the following minerals, in order of abundance: quartz, orthoclase, oligoclase, biotite, microcline, titanite, muscovite, apatite, zircon, pennine, epidote, sericite, and kaolin. The orthoclase is the most abundant feldspar, and the oligoclase is present in approximately half the quantity of the orthoclase.

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The rocks which contributed material to the feldspar-quartz sand, (Sand No. 2), are, in order of their abundance: (a) *granodiorite gneiss*, (b) *hornblende gneiss*, and (c) *feldspar-quartz pegmatites*. The granodiorite gneiss is the main rock from which this sand was derived.

A thin section of the granodiorite gneiss exhibits the following minerals, in order of abundance: oligoclase, quartz, orthoclase, microcline, magnetite, titanite, epidote, zircon, apatite, pennine, sericite, kaolin, leucoxene, and limonite. The plagioclase is the most abundant mineral in the section, and the quartz is in slight excess of the orthoclase. The epidote is seen to have a yellowish tinge between parallel nicols. (This is, also, true of the epidote in the sand.)

Derivation of the Sands. In Sand No. 1 the greater part of the garnet was derived, undoubtedly, from the garnetiferous-hornblende gneiss, as were the following constituents: magnetite, green hornblende, ilmenite, diopside, zircon, pyrite, rutile, calcite, chlorite, oligoclase, and some of the quartz and titanite. The biotite gneiss contributed, in order of importance: quartz, feldspar, tourmaline, titanite, epidote, andalusite, biotite, and muscovite. The pegmatites were the source of some of the tourmaline, quartz, and feldspar. The galena and some of the calcite were derived, most probably, from small veins in the immediate vicinity of the west end of the beach.

In Sand No. 2 the feldspar and the quartz were derived mainly from the granodiorite gneiss. The excess of the plagioclase over the quartz and orthoclase in the thin section is reflected in the sand, as shown by the percentages of the constituent grains. The epidote, titanite, zircon, muscovite, and chlorite, have their origins in this rock. The remaining minerals in the sand came from the hornblende gneiss, with the possible exception of some of the tourmaline, which came, most probably, from the pegmatites.

Certain well-rounded quartz grains were possibly brought to the beach on the fjord from the outwash plain in front of the Russell Glacier by the Watson River. However, this constituent may have been brought down from a sand flat some few miles to the east of the bay. The rounding may be the result of wind action. In the analysis of the 25,000 grains, used in calculating the percentages of the mineral constituents, only 10 of this type were noted.

The plate accompanying the article shows the relative sizes and shapes of a few of the type grains of Sand No. 1.

Summary and Conclusions

Sand No. 1 contains the following minerals, in order of abundance: garnet, magnetite, green hornblende, ilmenite, tourmaline, feldspars, (plagioclase, orthoclase, microcline.), quartz, diopside, titanite, epidote, zircon, andalusite, pyrite, galena, rutile, calcite, biotite, chlorite, and muscovite. These loose detrital materials came from the following metamorphic rocks, in the order of importance: (a) garnetiferous-hornblende gneiss, (b) biotite gneiss, and (c) feldspar-quartz pegmatites.

Sand No. 2 contains the following minerals, in order of abundance: feldspar (plagioclase, orthoclase, microline), quartz, green hornblende, garnet, tourmaline, biotite, epidote, magnetite, diopside, ilmenite, titanite, zircon, calcite, muscovite, and chlorite. These grains were derived from the following metamorphic rocks, in the order of importance: (a) granodiorite gneiss, (b) hornblende gneiss, and (c) feldspar-quartz pegmatites.

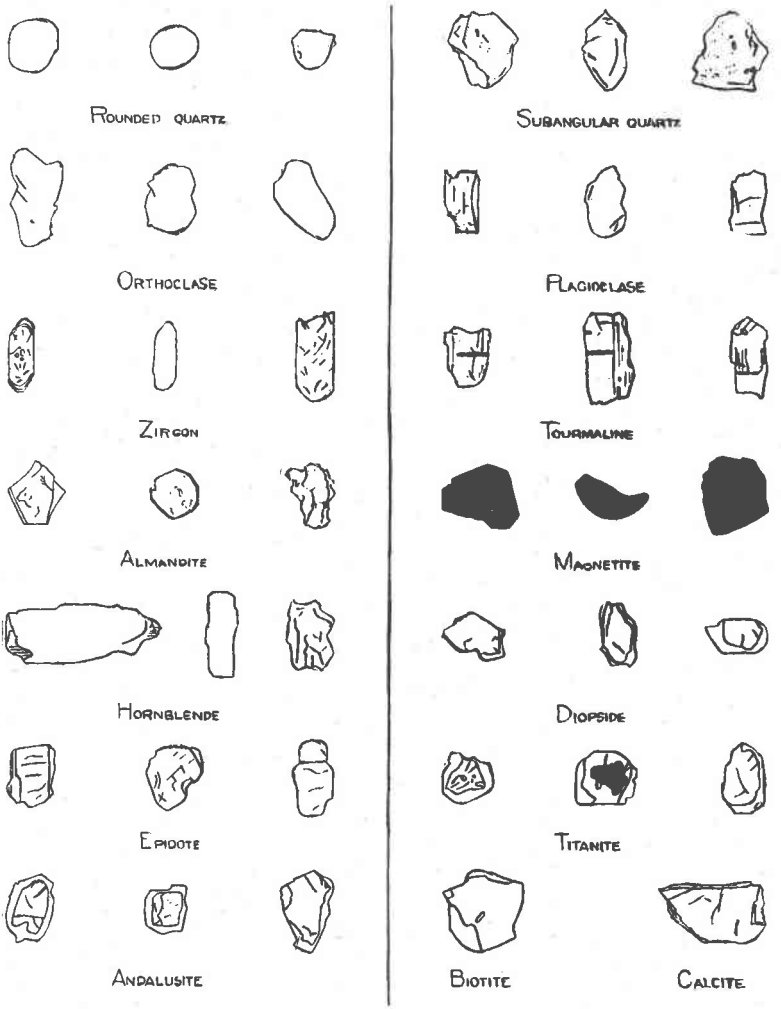

PLATE 1. Diagrams of some mineral grains showing relative sizes and shapes. Sand No. 1 (×20).

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THE MINERALS AND THE PERCENTAGES OF THE CONSTITUENTS OF THE SANDS

Sand No. 1.

1. Garnet.....38.366 %
   *(a) Medium red.
   (b) Pink.
   (c) Wine red.
   * In order of importance.
2. Magnetite.....22.837
3. Hornblende (Green)...19.420
4. Ilmenite..... 8.447
5. Tourmaline..... 5.541
   (a) Brown.
   (b) Yellowish (rare)
6. Feldspar..... 2.608
   (a) Orthoclase (25%)
   (b) Microcline (rare)
   (c) Plagioclase (75%)

97.219+%

The remaining 2.780+% is made up of the following minerals, their percentages on the basis of 100%.

7. Quartz.....46.677%
   (a) Subangular.
   (b) Well-rounded. (rare)
8. Diopside.....21.474
9. Titanite.....12.560
10. Epidote..... 7.293
11. Zircon..... 6.888
12. Andalusite..... 2.106
13. Pyrite..... 1.539
    (a) Unaltered. (rare)
    (b) Altered.
14. Galena..... 0.324
15. Rutile..... 0.162
16. Calcite..... 0.162
17. Biotite..... 0.081
18. Chlorite..... 0.081
19. Muscovite..... 0.081

Gneiss fragments..... 0.972

Total 100.400%

Sand No. 2.

1. Feldspar.....68.175 %
   (a) Orthoclase. (35%)
   (b) Microcline. (rare)
   (c) Plagioclase. (60%)
2. Quartz.....27.270
   (a) Angular. (common)
   (b) Subangular. (")
   (c) Well-rounded. (rare)
3. Hornblende (Green)... 3.967

99.412+%

The remaining 0.587+% is made up of the following minerals, their percentages on the basis of 100%.

4. Garnet.....37.209 %
   (a) Pink.
   (b) Medium red.
5. Tourmaline.....34.888
   (a) Brown.
   (b) Yellowish. (rare)
6. Biotite..... 9.309
7. Epidote..... 6.976
8. Magnetite..... 6.976
9. Diopside..... 4.651

Total 100.009 %

The following minerals are found as traces in sand No. 2.

10. Ilmenite.
11. Titanite.
12. Zircon.
13. Calcite.
14. Muscovite.
15. Chlorite.

Mineral grains found in Sand No. 1, but absent in Sand No. 2 are: (a) andalusite, (b) ilmenite, (c) pyrite, (d) galena, (e) rutile, and (f) wine-red garnet.

A MINERALOGICAL EXAMINATION OF BLACK SAND FROM NOME CREEK, ALASKA

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Very few mineralogical examinations have been made of black sands associated with the gold-placers of Alaska. The writer knows of no previous quantitative