with the observations made by myself in the field, and also with the analyses previously alluded to.

It is not improbable that many minor details are omitted in my section, considering the difficulties under which the observations were made, my sole object being to explain the general geological features of a comparatively little-known district.

Note on some Rocks from SOUTH AMERICA.

By the Rev. Prof. T. G. BONNEY, M.A., F.R.S., Sec. G.S.

1. (Near Potosi, p. 586.) This rock has been much altered. The following constituents are present:—(a) crystalline grains composed of earthy-looking granules and minute, rather fibrous microliths, showing light colour with the two Nicols, being one of the decomposition pseudomorphs after felspar, often called saussurite; (b) augite and diallage, more or less converted into hornblende and a chloritic mineral; (c) iron peroxide, probably ilmenite; (d) a little apatite. The general aspect of the saussuritic grains suggests that the felspar has been plagioclastic. Of the pyroxenic mineral the greater part is altered, being converted into hornblende with strong dichroism and very characteristic cleavage, associated with which are smaller more fibrous forms, some of which are probably varieties of hornblende, others rather more resemble chlorite. Portions of the diallage and augite remain unchanged in many of the grains; both minerals appear to be present. One or two serpentinous-looking aggregates may possibly replace olivine. We may venture to say that the rock has once been a gabbro, in which the pyroxenic constituent has been almost wholly converted into hornblende, as has not seldom happened*.

2. (Quacipati, p. 585.) The ground-mass of the rock consists chiefly of minute grains of quartz, looking as if fused together. In this are scattered many small grains of epidote and scales of mica. Of the latter there appear to be two kinds—one having its darkest tint an olive-green, rather strongly dichroic; the other nearly colourless, and showing brilliant tints with the two Nicols, rather like paragonite; indeed these two types of mica are common in the granitoid gneiss of the St. Gothard. In this ground-mass are several crystalline grains, not very clearly defined in outline, and containing the epidote and mica-granules. One or two rather resemble kyanite; but, as far as I can make out, they are only felspar, and two or three suggest plagioclase. The rock is a metamorphic one, a kind of fine-grained gneiss.

3. (Cunuri, p. 585.) Consists mainly of hornblende grains rather irregular in form, with characteristic cleavage and strong dichroism; but associated with these, and apparently partially replaced by them, is a mineral which, from absence of dichroism and general aspect, more resembles decomposing augite. There are a good many grains of quartz and some of decomposing felspar. The rock appears to be a hornblende schist with but slight traces of foliation.

* Quart. Journ. Geol. Soc. vol. xxxiii. p. 896.

4. (Cunuri, p. 585.) A gneiss, though but little foliated: consists of quartz, felspar, mica, and epidote, with a little sphene, iron peroxide, and a few other microliths. The quartz is rather free from cavities and enclosures, what there are being very minute. The felspar is in rather irregular grains; orthoclase appears to predominate, some showing cross-hatched structure. Several grains of felspar show twinning, by a series of rather faint bands of a darker tint. The mica appears to be biotite. One or two of the microliths may be apatite, others are short belonites of a very pale greenish, almost colourless, mineral (? hornblende); there are also a few specks of a secondary mineral, probably zeolitic. In general microscopic character this rock resembles a slide in my collection from a specimen collected at Godhaven, Disco Island, and its aspect is one which I have often noted in very ancient rocks.

5. (Maño Piedra, p. 585.) A basalt; small crystals of plagioclase and clustered grains of augite, with iron peroxide, mostly ilmenite. I do not see any olivine.

6. (Between Upata and Maño Piedra mountain, p. 584.) A ferri-ferous quartzite, consisting of subangular grains of rather clear quartz and of opaque iron peroxide, probably magnetite and ilmenite, in proportion of about two to one. Some of the smaller grains of peroxide are included in those of quartz; the larger occupy interstices and are more irregular in form than the latter. A few of the little colourless microliths mentioned above (4) are present in the quartz, as well as some tufted trichites. A fair number of minute cavities are to be seen in the quartz; they seem not to contain any fluid.

7. (Upata, p. 584.) A crystalline rock consisting chiefly of rather irregularly formed grains of a felspar and a greenish mineral. The former is generally, if not always, a closely twinned plagioclase, and is remarkable for containing very numerous microliths; these are prismatic in form, resembling prisms of the monoclinic system, but generally a little distorted, so that it is difficult to ascertain the exact shape of the section*; they are, on an average, about .01 in. in length, and four or five times as long as broad. As a rule, they are arranged parallel to a twinning plane, and so probably lie in the brachydiagonal. The green mineral is rather intermediate in character between augite and hornblende; it is in irregular rounded grains†; in texture it seems intermediate between fibrous or platy and granular, approaching in some respects to epidote; the cleavage is rather imperfect and not very characteristic, on the whole perhaps rather nearer that of augite, and is sometimes platy, rather like diallage. The mineral is very distinctly dichroic, sections roughly basal being pale brown, roughly prismatic pale olive-green; the latter changes little in tint; the former takes almost that of the other section, when the plane of polarization of the transmitted light is changed. This mineral occurs in a slide of eclogite from Eppenreuth in my collection, and

* Similar microliths occur in a felspar in no. 4, and in one in a gneiss from Ceylon in my collection.

† In two or three cases the grains seem to have imperfectly developed angles.

is probably omphacite; irregular grains of iron peroxide are also present, with quartz and a little apatite. Macroscopically this rock closely resembles, and microscopically is almost identical with, one in my collection brought from Holsteinburg in South Greenland by Mr. P. H. Carpenter, and is nearly related to a specimen (locality unknown) given to me by Prof. Rupert Jones. The structure is rather abnormal; but I think it must be an igneous rock, and thus is a variety of quartz-diorite.

8. (Puerto de Tablas, p. 582.) A crystalline rock consisting chiefly of felspar with some quartz and a dark green mineral. The greater part of the slide is very characteristic microcline, with numerous wavy fibres of interbanded albite, as figured by Des Cloiseaux*. Minute enclosures are present, some opacite, some hornblende (?) microliths or opaque belonites, commonly arranged so as to cross at angles of about 60° , and roughly bisected by the albite bands. The green mineral is very dark in colour, fairly strongly dichroic, and shows one very decided cleavage; it seems rather altered, and perhaps is partly replaced by a chloritic mineral; but, though not very characteristic, it is probably hornblende. There are some grains of iron peroxide (some being hæmatite), and ferruginous stains are frequent; also two or three grains of epidote and a little apatite (?). The rock appears to be of igneous origin, and so is a microclinic syenite.

9. (Potosi Mines, p. 586.) Much decomposed, but appear to have consisted of plagioclase felspar, augite, and ilmenite: the felspar is now replaced by a saussuritic mineral; the augite rather decomposed, stained, and replaced by groups of microliths; the ilmenite also much decomposed. The rock evidently has been a fine-grained dolerite, and for convenience may now be roughly grouped with the diabases.

* *Zeitschr. deutsch. geol. Gesellsch.* (1875), vol. xxvii. p. 956. Not being at the time familiar with the aspect of microcline, I submitted this specimen to T. Davies, Esq., F.G.S. (to whose extensive knowledge of minerals I have so often been indebted), and he pronounced it undoubtedly microcline.