

Reviews and Notices.

Chapters on the Mineralogy of Scotland, by M. FORSTER HEDDLE, M.D.

CHAPTER II.—*The Felspars.*

FEW modern papers on Mineralogy, either in general interest, or in the amount of detailed labour, equal this elaborate Memoir—which was presented to the Royal Society of Edinburgh, in 1877.

The author commences with some general remarks upon the method of analysis employed, remarking with regard to the Silica determinations, “We cannot hope to execute correct analyses of Silicates until we employ vessels of a material other than glass.”

Then follows an enquiry into the condition of the Silica in minerals, where the author finds the proportions of “insoluble” Silica to vary in orthoclase from different districts, from .027 p.c. up to 18.62 p.c., —*i.e.* of the silica itself—while even in specimens of the *same* mineral from the *same* locality differences as great as 2 to 1 have been met with when operating in as far as possible precisely the same manner. There is next a description of the methods adopted for obtaining pure specimens for analysis, *apropos* of which Professor Heddle gives the following letter from a former laboratory assistant.

Edinburgh, June 31, 1876.

Dear Dr. Heddle,—In reply to your note asking me to say how long I was engaged at the picking out of the Withamite, I have to say that it was my regular employment, when not called away for a temporary matter, from March to July, both inclusive, of Session 1873-74, and for some weeks of Session 1874-5.

I am yours truly,

R. M. MURRAY

A large series of analyses is then given, together with full details of localities, structural peculiarities, and modes of occurrence.

The following summarised tables we here re-produce as being exceedingly useful for reference.

ORTHOCLASE.													
	Colour.	Cleavage Angle.	Specific Gravity.	Si.	Al ₂ .	Fe ₂ .	Mn.	Mg.	Ca.	K ₂ .	Na ₂ .	H ₂ O.	Total.
Ben Capval ...	Blue	89 50	2.565	64.86	18.47	.67	...	.71	...	12.98	1.89	.5	100.09
Stromay, Harris...	Grey	89 55	2.574	65.35	17.68	.92	...	.25	.68	15.13	2.5	.18	100.69
Glen Fernste ...	Pink	90	2.525	63.99	17.06	2.47	...	.07	.52	14.85	.53	.65	100.17
Cowlythe, 3rd vein	Flesh	...	2.561	64.74	18.3	1.99	...	.04	.97	9.87	3.94	.17	99.43
Do., 4th vein	Do.	89 40	2.559	66.0	18.3	2.03	...	...	1.	10.02	3.19	.16	100.71
Clattering Briggs	Fawn	...	...	64.03	19.17	.3	.22	.94	1.4	11.84	1.37	.57	99.83
Rubislaw ...	Flesh	89 58	2.554	64.54	18.36	.32	...	.09	.36	13.05	2.58	.09	99.39
Lairy ...	Buff	89 59	2.555	62.62	19.63	.06	...	.64	.6	13.72	2.92	.13	100.32
Tongue ...	Green	89 43	2.569	64.2	18.39	.45	.15	.07	.72	12.75	2.95	.51	100.22
Froster Hill	White	89 58	2.548	63.31	18.17	.87	...	...	1.07	13.27	2.06	.81	99.51
Blirydine ...	White	89 41	2.551	63.59	19.58	1.69	...	.08	.68	12.53	2.76	.42	100.73
Banchory ...	White	90	5.554	63.11	18.98	.98	...	.57	.88	13.06	2.34	.34	100.26
Balvraid ...	Blue	89 58	2.558	63.04	19.31	...	...	.21	.97	14.63	1.02	.56	99.74
Struay, Ross	Pink	...	2.543	65.	17.03	1.43	.69	...	.73	13.82	1.	.50	100.20
Do. Do.	Blue	89 50	2.545	64.19	17.39	1.2	.46	...	.69	13.31	1.96	.86	99.76
Canisp, Sutherland	Brick	...	2.545	63.54	17.36	1.37	.38	...	1.33	12.93	1.69	1.12	100.34
Corriegills	Colourless	89 50	2.609	66.85	17.24	.42	.06	.06	1.22	9.2	4.32	.86	100.17
Kinkell ...	Yellow	...	...	63.07	18.69	2.47	...	...	2.2	6.62	5.5	...	99.99

Ratio of Soda to Potash
% to 1; to 2 to 1, Sanidines

OLIGOCLASE.													
	Colour.	Cleavage Angle.	Specific Gravity.	Si.	Al ₂ .	Fe.	Mn.	Mg.	Ca.	K ₂ .	Na ₂ .	H ₂ .	Total.
		°	'										
Rispond	White	86	14	2.636	61.85	21.7	3.37	.09	4.13	1.63	6.95	.37	100.29
Coyle	Cream	86	32	2.627	63.54	21.45	1.86	.23	3.88	1.07	7.64	.44	100.1
Barra Hill	Milk	86	12	2.834	64.67	23.18	1.44	.01	1.89	1.54	7.62	.15	99.53
Dyce	White	86	15	...	64.85	23.2	...	.2	.96	3.77	8.12	.01	101.12
Selkay	White	...	...	...	59.53	21.05	1.81	.88	3.63	4.73	7.23	1.88	100.75
Rubislaw	White	...	...	2.637	62.53	23.52	1.28	.36	4.97	1.32	6.19	.6	100.78
Craigie Buckler	White	86	14	2.622	61.58	22	1.28	.32	4.19	1.52	8.27	.54	99.67
Lairg	Colourless	86	15	2.618	62.81	22.92	1.16	.08	4.25	.84	8.53	.29	99.88
Canisp	Cream	...	...	...	64.44	20.47	.88	...	1.3	1.13	9.96	1.46	100.02
LABRADORITE.													
Portsoy, massive	White	...	2.672	53.03	29.85	.13	...	.61	11.44	.64	4.21	.42	100.34
Hart-o-Corry	White	...	...	49.15	29.62	1.15	...	.91	15.31	.69	2.91	.73	100.39
Loch Scavaig	Grey	86° 42'	2.715	50.81	29.48	.25	...	.12	12.69	.55	3.92	2.48	100.29
Glen Bucket	White	...	2.674	50.59	28.33	3.05	...	.59	11.17	2.18	2.56	1.42	99.89
Balta	Lavender	...	2.95	52.21	29.64	.48	...	.26	12.43	.44	4.	.11	99.57
Do.	White	...	2.954	53.14	29.99	.25	...	.21	12.3	.47	3.86	.21	100.42
Portsoy crystals	White	...	2.83	52.41	28.96	.15	.91	.54	10.85	1.61	3.48	.93	99.84
Kildrumny	Cream	...	2.674	51.31	26.76	1.82	.76	.41	10.14	2.11	6.43	.73	100.42
Kinneff	Colourless	86	40	...	53.19	26.43	2.85	.92	9.68	1.51	4.59	.73	99.91
Belvraid	granular	...	2.708	47.44	28.02	.34	tr.	.41	11.03	3.51	4.61	5.2	100.58
Do.	fibrous	...	2.705	49.33	26.7	.25	...	.07	11.02	2.59	5.25	4.84	100.06

ALBITE.												
	Colour.	Cleavage Angle.	Specific Gravity.	Si.	Al ₂ O ₃ .	Fe.	Mg.	Ca.	K ₂ .	Na ₂ .	H ₂ .	Total.
Stromay, Harris ...	Grey	86° 21'	2.627	66.97	19.46	.6	.21	2.04	1.23	9.54	.31	100.36
Colafirth, Snetland — " beautiful rock" ...	White	...	2.622	66.8	17.83	1.13	.14	1.5	.92	11.52	.48	100.32
Colafirth ...	White	86 45	2.61	66.84	16.73	2.42	.37	.94	.73	10.76	.89	99.69
Hillswick ...	Pink	...	2.615	66.71	19.81	.9	.09	1.38	1.26	9.23	.54	99.93
Cleavlandite ...	White	...	2.622	67.79	18.76	1.43*	...	.52	.76	10.49	.16	99.96

ANDESINE.													
	Colour.	Cleavage Angle.	Specific Gravity.	Si.	Al ₂ O ₃ .	Fe ₂ O ₃ .	Mn.	Mg.	Ca.	K ₂ .	Na ₂ .	H ₂ .	Total.
Glen Urquhart ...	White	86° 28'	2.672	58.38	22.5	2.12	.15	tr.	5.34	3.2	5.21	3.41	100.31
Glen Cairn ...	Bine ...	86 21	2.705	57.18	24.04	1.12	..	.12	6.11	2.83	7.13	1.6	100.13
Do. ...	White	...	2.689	56.96	23.81	.94	...	.09	7.98	2.56	6.85	1.62	100.81
Crathie ...	White	86 24	2.677	56.3	25.71	.97	tr.	...	9.35	1.49	4.72	1.82	100.36
Portsoy ...	White	...	2.692	58.36	23.34	.24	...	.5	8.24	1.15	7.84	.53	100.21

* Fe₂ also .06 mn.

ANORTHITE.														
	Colour.	Cleavage Angle.	Specific Gravity.	Si.	Al ₃ .	Fe ₂ .	Fe.	Mn.	Mg.	Ca.	K ₂ .	Na ₂ .	H ₂ .	Total.
Fedlar, Shetland ...	Cream	..	3.089	46.92	30.77	..	..	tr.	.09	16.34	1.5	3.07	1.54	100.24
Lendalfoot, Ayr ...	Greyish	36.42	2.761	44.22	31.44	1.95	..	..	1.	14.18	1.48	1.63	3.69	99.59
Glengairn ...	Green	..	2.958	46.42	21.86	..	5.92	.69	2.92	18.88	1.26	1.69	1.08	100.23
LATROBITE.														
Glengairn ...	Rose ...	..	2.749	45.2	31.04	3.43	tr.	.68	1.2	5.21	7.12	.49	5.7	100.06
Do. ...	Do.	..	..	46.87	29.31	2.31	.11	1.15	1.88	6.46	7.31	.83	4.49	100.21

The conclusion of the paper is as follows :—

“ In reviewing the results of this extensive series of analyses, the first point calling for consideration is the light (if any) which is thrown by it on the ever-recurring question as to the specific distinction between the felspars,—the number of species into which they are to be divided.

In speaking of the light that may be thrown upon the question, I would not have it thought that I consider it now as an open one; I conceive that the masterly paper by Descloiseaux in the *Comptus rendus** has definitely settled the matter, and must have satisfied Tschermak himself. Nor would I reduce it to a mere question of personal opinion or experience, by enumerating the grounds which have induced me long to take the view advocated by Descloiseaux; but—postponing, to the second part of this paper, the chemical consideration of the subject—I would only endeavour, meantime, to strengthen his position by drawing attention to the evidence of the rocks themselves, as clearly declared by the geognostic position of the minerals.

All mineralogists admit the three species, orthoclase, albite, anorthite;—some also labradorite,—but do not admit oligoclase or andesine.

It appears to me that, in Scotland, the geognostic relations of the three last bear out their specific individuality quite as thoroughly as that of the universally acknowledged species is borne out.

Reviewing each in turn, and admitting only the evidence of such specimens as have either been actually analysed, or otherwise determined by evidence sufficiently cumulative to leave no room for doubt, we find true or ordinary *orthoclase* occurring in crystalline schists—as in gneiss at Glen Urquhart, Dee side, and central Sutherland; the associated minerals being hyaline quartz paste, carrying either Haughtonite or lepidomelane, and rarely apatite. Rarely in cavities of chlorite schist, as in Strath Alnack; the associates being chlorite and rutile. Exceptionally, otherwise then crypto-crystalline, in porphyry, with granular quartz and pinite, or black hexagonal mica (? Biotite) as associates. Exceptionally in syenite, as on Morven and Froster hills, and near New Leslie, in Aberdeenshire; the associates there being hornblende, menaccanite, and sphene. And very exceptionally (*necronite*) in granular limestone, the immediate associates being Biotite, balvraidite, and hydrous labradorite.

The more sodaic *sanidines* occur in tufa or in pitchstone.

The *corded orthoclases* alone occur in granitic veins, or bands; the ordinary associates being oligoclase and muscovite in a quartz paste; the more occasional associates, arranged in the order of the frequency of their occur-

rence, being either Haughtonite or lepidomelane, tourmaline, apatite, garnet, beryl, magnetite, rarely ilmenite and pinité; and—where the veins cut syenite,—sphene, menaccanite, Allanite, Babingtonite, zircon, and thorite.

Though a constituent of a greater number of rocks than any other of the felspars, there are rocks in which orthoclase finds no place: its geognostic habitudes are therefore clearly defined.

Albite in Scotland is confined to the somewhat hornblendic and epidotic red granite of Peterhead, the rare associates being agalmatolite and fluor.*

A rock *sui generis*, which is associated with serpentine, and which stretches in a belt from Fethaland Point to Hillswick Ness, contains it in association with hornblende, or with augite; a graphic vein near serpentine, at Bigsetter Voe, may be an offset from the above.

An exceptional occurrence is that of the moonstone of Stromay, where it would appear to replace oligoclase. The geognostic relationships of albite in Scotland are therefore ill-developed, if not also ill-defined.

Anorthite in Scotland seems to replace labradorite in the diabase of Fetlar, and in portions of the gabbro of Ayrshire; as Latrobite it very rarely is found in granular limestone in Glen Gairn. Its relationships therefore are also ill-defined.

The habitudes of the other—the doubted—species are much more definite and clear.

Labradorite finds its place, admitting no other felspar to play its part, or even associate itself with it, in all the varieties of diabase,—gabbros, primitive greestones, diallage rock, “heathens”—or whatever name their varying features may procure them—from Balta to Ballantræ. Showing a slight tendency to pass over to anorthite very rarely; only in one case (Fetlar) yielding to it. Even when in Glen Bucket the rock actually passes into diorite, the felspar is unchanged.

Nor has it stepped far afield when it also asserts itself as the felspar special to the porphyritic amygdaloids of the south-west and north-east. LE HUNT showed it to be the felspar of the traps on both sides of the Clyde, and we now find it to be that of Bervie, Kinneff, Thornyhythe, Tremuda, and all that coast.

Nothing could be stronger than the evidence of the rocks as to the specific individuality of this mineral.

* The “felspar” of the rock of Corstorphine hill is usually called albite,—it has not been analysed.

Oligoclase again presents itself as the very frequent associate of the corded felspar in granite veins*—only in one locality (Coyle) is it found in another association; the evidence as regards it is also perfectly definite. No one who has become familiar with the ever-recurring exfiltration veins—called *crocus* by the quarrymen—which lace the grey granite of Aberdeenshire, will hesitate in considering the well-defined crystals of the *white* felspar of these veins to be as thoroughly good a species as the accompanying flesh-coloured orthoclase.

A similar association with orthoclase is also to be seen in the veins—whether intrusive or exfiltration—which occur in hornblendic gneiss;—as at Rispond, and Geo na Shermaig.

And I consider that it is even more singularly clear as to the last of the felspars—that which is generally held to be the most doubtful.

Andesine is by many held to be merely an altered oligoclase; but in Scotland oligoclase is a *granitic* felspar, andesine is a *gneissic* one; and it occurs only in, or in near proximity to primary limestone. One would have expected that the felspar specially pertaining to limestone would be the most calcareous of all; but it is not so; with the exception of the limestone locality at Glen Beg, andesine is the only felspar I have found in limestone—and it occurs only with limestone.

In Scotland it cannot, for two reasons, be altered oligoclase:—first, there is no oligoclase with it, or near it; and second, it is perfectly fresh, lustrous, undecomposed,—and in larger crystals than the oligoclase which occurs elsewhere.

In Scotland, therefore, the felspars belong so specially each to its own rock, that if we can tell the felspar, we may say that we are well on in the determination of the rock.

But can we tell the felspars? That is—can we discriminate between them, as they ordinarily occur in rock masses?

That they can be distinguished by the employment of the polariscope according to the method established by DESCLOISEAUX, we know; but the bulky polariscope could not be employed in the field, even supposing that the obtaining plates sufficiently delicate for that mode of investigation were an effort of ordinary skill, which is very far from being the case.

* It also constitutes the bulk of the grey granite of Aberdeen; this I find generally to consist of a great deal of oligoclase, little orthoclase, comparatively little quartz, very small quantities of muscovite, and a good deal of Haughtonite. The hornblendic gneiss of the Cape Wrath district frequently consists almost solely of a granular mixture of oligoclase and hornblende.

† Except as regards the discrimination of oligoclase and andesine.

We have the old physical distinction of striation, laid down as infallible in separating the ortho from plagio-clastics; let us see this to be an infallible test, or what value is to be assigned to it.

No twinning of orthoclase has yet been shown to be so repeated as to exhibit the phenomenon.

Does the absence of striation then entitle us to pronounce the felspar to be orthoclase?

Reverting to the physical descriptions of the felspars analysed, we find that to the eye, or to the lens, there exhibited striation—of four albites, *one*—rarely; of ten oligoclases, *four*; of four andesines, *one*; of ten labradorites, *three*; of two anorthites, *one*; of one Labradorite, *none*; or, altogether in the thirty-one plagioclastic felspars, striation was ten times seen, twenty-one times not seen.

The oligoclase near Lairg,—the crystals of which are perhaps larger than at any other locality,—is cream-coloured, and possibly somewhat altered by incipient weathering; it does not show striation. From the centre of one of these crystals, however, a clear colourless translucent portion was obtained, which was distinctly striated: here then, one and the same crystal had a striated and an unstriated portion, the striated being inside.

We are hardly therefore justified in going even the length which Cotta does when he says—“This striping, when observable, is a very characteristic sign; but its absence is not equally so.”

But it can only profess to be characteristic as between the ortho and the plagio; for its being seen indiscriminately, sometimes in coarse pattern, sometimes of microscopic minuteness, among all the plagioclastics, renders it inapplicable as a mode of discriminating among *them*; and there is reason to believe that the time even now is, when it is more imperative that the field geologist should be able to determine between the various plagioclastic felspars, than even to recognise “common felspar.”

Let us now see what aid we derive from specific gravities.

The specific gravities of Scottish Orthoclases, numerically arranged, are the following,—the numbers being in some cases the mean of several determinations:—

Pitfechie Monnymusk, Aberdeen ..	2·503
Glen Fernate, Perthshire.. ..	2·525
Ben-na-chie, Aberdeen	2·534
Ben Resipol, Argyle	2·538
Blackwater, Ross-shire	2·54
Loch of Leys, Aberdeen	2·542
Struay, Ross	2·544
Selattey, Aberdeen	2·545

Canisp, Sutherland	2·545
Froster Hill, Aberdeen	2·548
Yestnaby, Orkney	2·549
Rinashat, Aberdeen	2·55
Blirydrine, Kincardine	2·551
West Stocklet, Harris	2·552
Rubislaw, Aberdeen	2·554
Lua-yayi, Erribol, Sutherland ..	2·554
Torry, Kincardine	2·554
Lairg, Sutherland	2·555
Scaire Ruidh, Harris	2·555
Anguston, Aberdeen	2·555
Scotie Hill, Aberdeen	2·555
Midstrath, Aberdeen	2·555
Glen Beg, Glenelg	2·558
Rubislaw, pinkish	2·559
Shinness, Sutherland	2·56
Cowhythe, Banffshire	2·56
Spy Hill, Kincardine	2·562
Rubislaw, grey.. .. .	2·562
Geo na Shermaig, Cape Wrath ..	2·563
Ben Capval, Harris	2·565
Tongue, Sutherland.. .. .	2·569
Stromay, Harris	2·574
Pitfodles, Aberdeen	2·579
Cowhythe Head, Banff	2·58

The average of these thirty-four is 2·553: the number 2·555 (occurring five times) may be more easily retained in the memory. The range ·077 is so small that the gravity of orthoclase must be regarded as a highly characteristic physical feature.

The specific gravities of the Albites determined are—

Colafirth Voe, Shetland (av. of 4) ..	2·607
Nudista, Hillswick (av. of 2).. ..	2·615
Beautiful Rock, Colafirth	2·622
Cleavlandite, Sutherland.. .. .	2·622
Moonstone, Harris	2·627

Average, 2·618; the range, ·02.

Of Oligoclase:—

Anguston, Aberdeen	2·611
Lairg, Sutherland	2·618
Craigie Buckler, Aberdeen	2·622
Ben Dubh, Coyle, Aberdeen	2·627
Rispond, Sutherland	2·636
Rubislaw, Aberdeen.. .. .	2·637
Geo na Shermaig, Cape Wrath ..	2·654
Barrahill, Aberdeen.. .. .	2·834

Average, 2·655; the exceptionality of the Barra Hill gives here the large range ·223. Excluding the anomalous Barra Hill specimen, the average is 2·629, and the range only ·043

Of Andesine:—

Glen Urquhart, Inverness-shire ..	2·672
Crathie, Aberdeenshire	2·677
Glen Gairn, white, Aberdeen	2·689
Cowhythe, Banffshire	2·692
Glen Gairn, blue	2·705

Average, 2·687; range, ·033.

Of Labradorite:—

Portsoy, massive, Banffshire	2·672
Glen Bucket, Aberdeen	2·674
Kildrummy, Aberdeen	2·674
Badnagoach, Aberdeen	2·681
Balvraid, Glenelg, granular	2·705
Belvraid, Glenelg, fibrous	2·708
Loch Scavig, Skye	2·715
Portsoy, crystallised	2·813
Balta, blue, Shetland	2·95
Balta, white	2·954

Average, 2·755; range, ·282.

Combining Anorthite and Latrobite, we have—

Latrobite, Glen Gairn	2·749
Lendalfoot, Ayrshire	2·761
Fetlar, Shetland	3·099

Average, 2·87; range, ·35.

2·5	2·6	2·7	2·8	2·9	3.
2·503	2·58				
Orthoclase					
	2·607	2·627			
	Albite				
	2·618		Oligoclase	2·834	
	2·672	2·705			
	Andesine				
	2·672		Labradorite	2·954	
			2·761	Anorthite	3·099

A consideration of the above diagram shows that, as there exists a well-defined gap between the specific gravities of orthoclase and the other felspars, the former might, failing other distinctions, be recognised by its low gravity: secondly, that as the gravities of each of the plagioclastic felspars *overlaps* from some localities those of the others, no one of these species can be individualised by the determination of its gravity.

It is interesting, however, to observe the gradual increase of gravity, as the percentage of silica is diminished, and that of alumina increased, in the different members of this family.

Gravity having thus failed to lend much aid, we turn to the cleavage angle. The use of the reflecting goniometer, in far shorter time than any other process of determination, and with unerring certainty, enables us to determine the orthoclases. But when we measure such rough cleavages as are to be obtained by the splitting up of imbedded crystals of the other felspars, we do not obtain all the aid that we might hope for.

Of Albites,—true angle $86^{\circ} 24'$,—there were got—

Stromay	86° 21'
Nudista, curved	86 32
Colafirth	86 45

Of Oligoclase,—true angle $86^{\circ} 10'$,—there were got—

Anguston	86° 10'
Lairg, colourless.. .. .	86 10
Rispond	86 14
Craigie Buckler	86 14
Dyce	86 15
Lairg, cream	86 15
Rubislaw	86 15
Coyle	86 32

Of Andesine,—angle according to DESCLOISEAUX 87° to 88° ,—there were got—

Glen Gairn	86° 21
Crathie	86 24
Glen Urquhart	86 28

Of Labradorite,—true angle $86^{\circ} 40'$,—there were got—

Kildrummy	86° 28 to 86° 40
Kinneff (curved), about	86 40
Balvraid, about	86 40
Scavig	86 42
Portsoy.. .. .	86 42
Badnagoach	86 45

Of Anorthite,—true angle $85^{\circ} 50'$,—there was got—

Lendalfoot, *hydrous* $86^{\circ} 42'$

This is not altogether satisfactory ; we have much the same overlapping that we had in the gravities : an angle of $86^{\circ} 15'$, or under that, would pretty certainly indicate oligoclase,—of $86^{\circ} 40'$ or over it, would indicate labradorite. The low angle with a low gravity,—and the high angle with a high gravity would make assurance more than doubly sure. This is about all that we can say, and it takes no account of albite, andesine, and anorthite, as regards at least their discrimination from one another

Albite usually occurs in free crystals superimposed upon orthoclase ;—this is, however, the chronicling of a habit, not the observation of an inherent property.

Truly we are sadly in want of a rapid and trustworthy test.

As to whether the eye can be educated to the ordinary recognition of all these felspars as they occur in rocks, with the simple aid of the lens, I can only say that,—after having selected from the rocks the specimens to be analysed, after having manipulated them by grinding on the lapidary's wheel for testing their gravity, after having examined with the lens their myriad chips in purifying them for analysis, and after having analysed them ; that is, after having obtained that absolute knowledge which enabled me to correct my own errors,—I should not like to have to pronounce upon certain obscure varieties ;—but, that if I did see such an amount of recognisable features as to warrant the expression of an opinion, I should be inclined to maintain it against that of any one whose eye had not been educated to a similar extent."

Andesine, anorthite, and Labradorite are now first introduced as British minerals.

J. H. C.

ARTIFICIAL FORMATION OF RUBIES, SAPPHIRES, EMERALDS, &c.—(*Comptes rendus*. lxxxv. p.102.) Frey and Feil have lately succeeded in preparing artificially, variously-coloured crystallized corundum and emerald, of such size and transparency as to be suitable for the purposes of the jeweller and watchmaker. Several methods of preparation have been adopted, but that which is said to give the best results is to dissolve alumina in oxide of lead at a high temperature in an earthen crucible. After the solution is complete, the temperature is maintained for about 20 days. The silex of the crucible is gradually dissolved, and by replacing the alumina causes it to crystallize out very slowly. The remarkable success obtained is mainly due to the authors having used as much material as 20 or 30 kilogrammes, and having the command of

large furnaces. The variously coloured specimens of corundum have the same specific gravity, hardness, and crystalline form as the natural mineral. The artificial ruby was coloured, as is the natural, with oxide of chromium; but the artificial sapphire was coloured with oxide of cobalt, and they probably differ from the natural. Very blue sapphire does not give a spectrum at all like that due to cobalt. The true nature of the colouring substance is somewhat doubtful.

H. C. S.

ALUMINIUM PLATE AS A SUPPORT IN BLOWPIPE-WORK—(W. M. Hutchings, *Chem. News*, Vol. 36, p.p. 208-210, and 217-219). Attention is drawn to the many advantages possessed by the Aluminium plate, first introduced by Major Ross, as a substitute for charcoal or for the porcelain support suggested by Dr. Foster, for obtaining and examining sublimes by the blowpipe. Directions are given for preparing the plate for use. It is made from a strip of sheet-aluminium about 5 inches long by $1\frac{1}{2}$ inches wide, of about the thickness of a sixpence. At one end a ledge of about $\frac{1}{2}$ inch is turned up so as to make rather less than a right angle with the rest of the plate; and the surfaces of plate and ledge are polished with bone-ash and water.

Substances to be tested are laid either directly on the ledge, or on a small slip of charcoal about $\frac{1}{2}$ inch square and as thick as a penny, which rests on the ledge. The plate is held by steel forceps in such a manner as to be almost vertical, being only just sufficiently inclined to prevent the assay or the charcoal slip from falling off the ledge.

These little slips being the only charcoal required, and the plate being small and easily packed, there is a very great gain in portability and cleanliness as compared with the usual large pieces of charcoal; and as these latter are expensive, even when suitable pieces can be obtained at all, there is also a considerable gain in cheapness, an aluminium plate as above described costing 3s. 6d., and being indestructible with careful usage. But in addition to these advantages of portability, cleanliness and cheapness, the aluminum plate gives, in almost all cases, very much better indications of the volatile substances to be sought for. Its principal points of superiority over charcoal are as follows.

- 1st. Several sublimes in succession can be obtained from the same fragment of the assay. When laid directly on the ledge and gently heated, only the more volatile constituents come off, as the aluminium keeps the fragment from getting very hot. On heating more strongly, the plate and the assay get gradually hotter, and more and more sublimate is given off, till finally a limit is reached beyond which no

sublimate can be obtained. If the same fragment be now laid on one of the little slips of charcoal and heated again, sublimates are obtained of those constituents which could not be volatilised as long as the assay was partially covered by contact by the aluminium. Thus, for instance, a mineral containing antimony and lead will give off almost all the former on the bare ledge, while the latter will not be driven off till the assay is treated on the charcoal-slip.

2nd. Sublimates are much more compact and *concentrated* on aluminium than on charcoal;—partly because the plate remains comparatively cool, and also because the vertical surface prevents what is volatilised from being swept along by the blast and spread out so much as on ordinary charcoal.

3rd. When the sublimate is once formed, the aluminium having no further action upon it, many interesting and highly characteristic changes may be observed, by applying an oxidising or reducing flame. Most of these changes cannot be observed at all on charcoal; partly because its being black would hide them, but mainly because it immediately begins to glow under the sublimates when the flame is applied to them, thus altering or destroying them.

Very full instructions are given as to the best mode of using the plate and of examining the sublimates; and finally the author gives a complete list of all the principal sublimates, with their characteristics and means of identifying them, from his own observations.

W. M. H.

DETECTION OF BISMUTH BY THE BLOWPIPE—VON KOBELL'S TEST.—(W. M. Hutchings, *Chem. News*, Vol. 36, p. 249). Von Kobell's excellent test for the presence of Bismuth in minerals, &c., consists in heating the powdered substance on charcoal, with a mixture of potassium iodide and sulphur. If bismuth is present a fine bright red sublimate is obtained. The test-mixture is very deliquescent, owing to the potassium iodide, and cannot be kept, even in stoppered bottles, if often opened for use, without in time getting pasty or even almost liquid. It has also the further defect of itself giving a copious white sublimate. The brilliant red colour obtained when bismuth is present, is caused by the mixture of this white of the potassium salt with the deep red-brown given by bismuth iodide. If very little bismuth is present, and at the same time some other substance which gives a light-coloured sublimate, this white from the test-mixture very materially assists in obscuring the bismuth, which may thus easily escape detection. To remedy these defects the author uses cuprous iodide to replace potassium iodide. Pure precipitated

cuprous iodide is washed free from all trace of potassium salt, dried and then intimately rubbed up with an equal bulk of flowers of sulphur. This mixture is not deliquescent and can be kept in the little wooden boxes of the portable blowpipe-apparatus. It yields at most a trace of whitish sublimate. Using this mixture and Major Ross's aluminium plate, the test is very much increased in delicacy, and is highly recommended by the author.

The substance to be tested is finely powdered, and intimately mixed with twice its bulk of the reagent, made into paste, laid on a slip of charcoal on the ledge of the plate, and very gently heated, after previously warming the plate sufficiently to prevent condensation of iodide, or of moisture, which latter destroys the bismuth sublimate. The red-brown bismuth iodide is very conspicuous on the white aluminium. As little as 0.1 p.c bismuth can be frequently detected in copper ores, regulus, &c.

Lead is the great enemy of this test, lead iodide giving a brilliant yellow which hides the bismuth colour. Cornwall found that with 95 parts lead oxide and 5 parts bismuth oxide, Von Kobell's test no longer gave proof of the bismuth. But by using the cuprous iodide mixture and aluminium plate, bismuth can be detected when 1 part of its oxide is mixed with 99 parts of lead oxide.

W. M. H.

Zeitschrift für Krystallographie, &c. Sechstes Heft.

THE present number brings the first volume of this valuable journal to a close. It contains, besides the usual amount of mineralogical and crystallographical matter, two indices, one of authors, and one of subject matter, and also a table of contents. A glance over the latter will show conclusively that a real demand has been successfully met by the publication of a central organ for this branch of the natural sciences, for we find here literally contributions from almost all parts of the world; and, that the future prosperity of Prof. Groth's *Zeitschrift* need no more be doubtful, as the wide and sound basis on which it has been placed will make it invaluable to all students of the sciences to which it directly or indirectly appeals.

Among the memoirs of this number, of interest to the mineralogist, are the following:—

CRYSTALLOGRAPHICAL AND OPTICAL RESEARCHES ON GLAUBERITE, by H. Laspeyres.—The colourless and perfectly transparent crystals, of the usual form, imbedded in clay nodules, from Aranjuez, in the valley of the Tagus, are exceptionally well developed and permit the most exact goniometrical

measurements, the results of which are given, and which differ only slightly from those of other authors. But the chief value of this paper attaches to the exhaustive investigation of the optical properties of this substance, which is peculiarly adapted for the exhibition and determination of the changes which the optical constants of biaxial media undergo when subject to different temperatures, as it becomes uniaxial for different wave lengths of light, at temperatures which lie within the boundaries of practical experiment, thus offering material for determining the laws that govern these changes.

ON SODA-ORTHOCLASE FROM PANTELLARIA, by H. Fœrstner.—The trachytic rocks of this island are unusually rich in soda, which is referable to the felspar that they contain. The chemical, crystallographical, and especially the optical properties of the latter, lead to the distinction of two varieties of monoclinic soda-felspar, with a composition that agrees with that of an isomorphous mixture of the triclinic albite with monoclinic potash felspar, thus proving the dimorphism of the compound $\text{Na Al Si}_3 \text{O}_8$, while the dimorphism of $\text{K Al Si}_3 \text{O}_8$ has already been proved by Descloizeaux' discovery of microcline.

The composition of the two varieties is represented by the following analysis:—

	1.	O ratio.	2.	3.	O ratio.
SiO_2	66·63	12·1	63·41	69·503	13·1
Fe_2O_3	0·72	—	3·27	—	—
Al_2O_3	19·76	3·1	20·32	18·370	3·0
CaO	0·38	} 1·0	2·76	—	—
MgO	0·30		0·30	—	—
Na_2O	7·31		7·42	8·689	} 1·0
K_2O	4·86		2·53	3·435	
	99·96			100·01	99·997
Sp. Gr.	2·55		2·61		

1. From the crater Cuddia Mida. Optically homogenous.

2. From Monte Gibele. Optically non-homogenous, containing interposed laminae of a triclinic felspar, probably labradorite.

Analysis 3 represents the calculated composition of the orthoclasic part.

The following table is reproduced to show the connection between the chemical and physical properties of these felspars as compared with typical orthoclase and albite.

No.	Sp. Gr.	Molecular ratio.	Ratio of axes.	Oblique Angle.	Interfacial Angles.			Optical Properties.	
					T : T	P : y	P : n	Angle of bisectrix with oblique axis.	Angle of optic axes (in oil).
		K ₂ O : Na ₂ O							
1	2.573	1 : 1.7th	0.6535 : 1 : 0.5521	63° 57'	60° 50'	81° 2'	44° 12'	4° 35'	—
2	2.57	1 : 1½	0.6492 : 1 : 0.5517	63° 54'	60° 28'	80° 33'	44° 43'	6° 30'	151° 19'
3	2.55	1 : 2½	0.6358 : 1 : 0.5468	63° 38'	59° 19'	81° 23'	44° 22'	8° 30'	142° 52'
4	(2.61)	1 : 4	0.6246 : 1 : 0.5498	63° 17'	59° 35'	82° 28'	44° 29'	(8° 6')	135° 46'
5			0.6333 : 1 : 0.5575	63° 32'	59° 13'	82° 6'	{ 43° 10' 46° 46'	(20.0)	83° 5'

1. Adularia, from Pfitsch.
2. Sanadine, from Laach.
3. Felspar, from Cuddia Mida.
4. Felspar, from Monte Gibele.
5. Albite.

CRYSTALLOGRAPHIC STUDIES ON HEMATITE AND ILMENITE, FROM THE BINNENTHAL, by H. Bücking.—A purely morphological investigation, but remarkable for the discovery of a large number of new forms, principally scalenohedrons, with very complex indices. The hematite crystals are from the Alp Lercheltini, a locality which has of late proved extremely rich in rare and interesting minerals, where they are found in clefts of the gneiss, associated with adularia, quartz, magnetite and rutile. They are classed under seven types, each of which is characterised by forms peculiar to itself, with only the basal plane and the rhombohedron + R common to all; of these types again the seventh is the most common; to it belong the so-called "Eisenrosen" which are titaniferous and usually show small crystals of rutile regularly grouped on the basal plane.

A crystal of ilmenite shows an unmistakable tetartohedral development, thus confirming the observations which Kokscharow made on the ilmenite from the Ilmen mountains.

The author has observed 31 forms on the hematite and ilmenite of the Binnenthal, of which only 9 have been enumerated; but of the 22 new ones, the indices of only 17 could be made out with any degree of certainty. These latter are appended in a tabular form together with the list of 78 forms published by Strüver in his *Studi cristallografici intorno alla Ematite di Traversella, Torino, 1872*, thus bringing the number of known forms up to 95.

In addition to the regular associations of hematite with rutile and magnetite with rutile already known from this locality, the author describes a third one, namely, the implantation of an octahedron of magnetite on the basal plane of a hematite crystal in such a manner that the dominant plane of the former lies parallel to this basal plane, and its edges coincide with the diagonal axes of the hematite crystal.

ON GISMONDITE, by A. Schrauf.—The mineral occurs sporadically with natrolite and analcite, in cavities of basalt at Salesl, in Bohemia. The results of measurements on two small crystals lead to the adoption with *v. Lang (Phil. Mag. 1864, vol. 28)*, of the prismatic system, with

$$\tilde{a} : \tilde{b} : \tilde{c} = 0.99246 : 1 : 0.94897$$

The observed forms are : (011) (110) (101), and the crystals are twinned with (011) as twinning plane, generally forming cross-macles after the manner of bournonite. It is this inclination to repeated twinning which has caused so much difficulty in the determination of the crystallographic elements of this species, and the question is here only considered as temporarily decided until more perfect material be found.

The second instalment of G. vom Rath's "*Mineralogische Mittheilungen*," contains the following articles :—

"ON A STRANGE ASSOCIATION OF BOURNONITE CRYSTALS."—Four small prismatically developed individuals are so closely approximated to one another as almost to touch. They possess a common vertical axis, and are very nearly though not absolutely in the twinned position so common to this mineral. They have obviously influenced each other during their formation. The specimen is from Nagyag and consists of quartz, blende, and rhodochrosite.

"CALCITE FROM BERGEN HILL, NEW JERSEY."—The crystals of calcite from this locality which seem hitherto to have escaped all but casual notice, are interesting on account of their variety of type and form and of a peculiar super-position which is common to most of them, so that a primary crystal of one type is partially overlapped by a secondary growth of another type. A minute discussion of the properties of six new scalenohedrons, with remarkably complex indices, touches again the vexed question of the rationality of the axial sections in this species. The calcite is found on a matrix of serpentine unassociated with other minerals.

"ON A NEW CRYSTALLISED TELLURIUM-GOLD MINERAL, THE BUNSENE OF KRENNER."—Minute silver-white crystals of the prismatic system occur with pyrites and quartz on a piece of gangue rock from Nagyag. Morphologically and chemically they are identical with Krenner's bunsenine, which is composed of tellurium and gold. But as the name

“bunsenite” has already been given to the oxide of nickel from Johannegeorgenstadt, it is proposed to name the above mineral “Krennerit,” after its discoverer Prof. Krenner, of Budapest. It is to be compared with Genth’s calaverite (Au Te_4), petzite from Nagyg, and with hessite (Ag Te).

C. O. T.

Zeitschrift für Krystallographie, &c.—Zweiter Band. Erstes Heft.

ORIGINAL Memoirs on some Tellurium and Vanadium Minerals, by F. A. Genth. The new minerals—coloradoite, magnolite, ferrotellurite, and roscoelite, described in this paper, have already been noticed in our Magazine from a different source. The author concludes that the vanadium in the latter mineral exists solely in the state of V_2O_5 , and has republished the analysis, with the necessary correction.

The other minerals described are native tellurium, hessite, calaverite, and tellurite, mostly from mines in Colorado; a green mineral from Colorado, probably a variety of roscoelite, and volborthite from Siberia. A complete analysis of the latter mineral shows that it is closely related to psittacinite; it contains Ba and Ca, but no Pb.

THE MICA GROUP, PART I., by G. Tschermak.—It is proposed to give a short account of this classical research after its completion.

WALNEWITE, A NEW VARIETY XANTHOPHYLLITE, by N. von Kokscharow.—Occurs in chloritic schist near Achmatowsk, associated with perowskite and other minerals, in tabular and laminar crystals, often with hexagonal outline. Externally it is very like clinocllore, but much harder. Cleavage basal, very perfect. $H=4.5$, $G=3.093$. Colour leek, or bottle-green. Transparent in thin plates, translucent. Lustre vitreous, pearly on cleavage face. Dichroism very pronounced, green parallel to the vertical axis, reddish-brown at right-angles to it. Composition:

Si O_2	16.90
Al_2O_3	43.55
Fe_2O_3	2.31
Fe O	0.33
Ca O	13.00
Mg O	17.47
H_2O	5.07

Crystals often very perfect, but the faces not sufficiently polished for exact measurement. The form is similar to that of mica, and referable to the fundamental elements adopted for the latter by Tschermak. The axial elements and observed forms are :

$$a : b : c = 0.5768 : 1 : 3.2728$$

$$\beta = 90^\circ 0'$$

(001), (102), ($\bar{1}34$), (014), (130), (118), ($\bar{1}18$).

Twins very common, after the same law as mica, viz. : twinning plane (110), composition plane either (110) or (001). Optic axes in the plane of symmetry, with an apparent angle in air, for different colours, of about $20\frac{1}{2}^\circ$. Inclination of acute bisectrix to the normal of (001) is $32'$, for rays of medium refrangibility.

ON MIARGYRITE, by A. Weisbach.—A continuation of some former researches on this mineral (*Pogg. Ann.* 125, 441). The examination of a very fine small crystal, from Bräunsdorf, led to the elements :

$$a : b : c = 1.0136 : 1 : 1.3026.$$

$$\beta = 48^\circ 38'.$$

The great angular variations observed in different crystals are explained by partial isomorphic substitution of the principal components.

The author concludes, from the specific gravities, and the constituents, as far as these are known, that kenn Gottite from Felsöbanya ($G=5.31-5.47$) is a variety of, and hypargyrite from Andreasberg ($G=5.21-5.27$) identical with miargyrite.

This view is fully borne out in L. Sipöcz' paper on miargyrite and kenn Gottite, which is abstracted in this number of the "Zeitschrift." The following analyses are given :

I and II, miargyrite from Felsöbanya ; III, miargyrite from Bräunsdorf (H. Rose) ; IV, kenn Gottite from Felsöbanya.

	I	II	III	IV
S	21.65	21.94	21.95	20.66
Sb	40.86	40.50	38.61	39.46
Ag	32.74	32.80	36.40	35.28
Pb	3.95	4.07	..	1.76
Cu	0.50	0.52	1.06	0.50
Fe	0.23	0.14	0.62	0.25
	99.93	99.97	98.64	97.91
	$G=5.273$	5.322		$G=5.29-5.38$

These all correspond with the formula $Ag Sb S_2$, if Pb be assumed as replacing Ag_2 . Kenn Gottite may therefore be described as a plumbic miargyrite, or as an isomorphic mixture of $Ag_2 Sb S$ and $Pb Sb_2 S_4$.

ON SOME MODIFICATIONS OF GROTH'S UNIVERSAL APPARATUS, &c., by L. Calderon.—The principal improvement suggested is the replacement of Brezina's composition plate of calcite, in the stauroscope, by a plate prepared from an artificial twin of calcite. This arrangement permits a much more exact determination of the position of the axes of elasticity, and does not strain the eyes of the observer to such a painful extent.

ON THE CRYSTALLISATION OF THE DIAMOND, after G. ROSE'S POSTHUMOUS NOTES, by A. Sadebeck.—This lengthy monograph is divided into several parts. A short historical introduction and a summary of the literature precede a minute description of the simple forms, combinations, twins, and the external development of the diamond crystals; this is followed by a chapter on the crystallotectonics or structure of the diamond, and by a classification of the different crystal-types. It appears that the South African diamonds are mostly combinations of the octahedron (rarely with indented edges) with hexakisoctahedrons, the Brazilian generally dodecahedrons with rounded faces, often approaching to flat hexakisoctahedrons, or tabular twins and octahedrons, the latter mostly with indented edges, the Indian mostly octahedrons.

The principal result arrived at is, that the diamond crystallizes holohedrally. The original memoir is illustrated by four quarto plates.

ON THE CRYSTALLOGRAPHIC SYSTEM AND THE ANGLES OF MICA by N. von Kokscharow.—The main results of this research agree very closely with those of Tschermak, and show that all the micas crystallize in the monoclinic system, and exhibit monoclinic symmetry, with the axial angle $ac=90^{\circ} 0'$, and the prismatic angle $=60^{\circ} 0'$.

THE DETERMINATION OF THE REFRACTIVE INDICES OF SOLIDS BY MEANS OF TOTAL REFLECTION, by F. Rohlrausch.—The angle of total reflection is determined by means of a small instrument named a "Total-reflectometer." It consists of a small wide-necked bottle with a part of its side ground away vertically, and replaced by a glass plate with parallel surfaces; in the neck is fixed horizontally a graduated circle, which is pierced in the centre by a vertical axis, which carries a vernier at its upper end, and the substance of which the refractive index is to be determined, with one polished plane in a vertical and centred position, at the lower one. A small horizontal telescope, with a hair-cross in the focus, is placed in front of the glass plate. In order to make the point of total-reflection visible, the substance must be immersed in a fluid of greater refractive power than itself; for this purpose the bottle is filled with bisulphide of carbon (coeff. 1, 6.) If diffused monochromatic light be now allowed to fall on the bottle, the angle between the two positions, at which total reflection takes place, can be accurately measured. The size of half this angle multiplied

by the coefficient of refraction of bisulphide of carbon gives the index of refraction of the substance under examination. This method gives extremely exact results up to the fourth decimal, and is equally applicable to amorphous substances, as to regular and uniaxial and biaxial crystals, provided in the two latter cases the polished plane be parallel to two axes of optical elasticity, and a Nicol prism be connected with the telescope.

An appended comparative list of indices demonstrates satisfactorily the reliability of this easy method.

C. O. T.

THURINGITE IN CARINTHIA, by Prof. V. von Zepharovich (*Report of the Imp. Geol. Inst., Vienna, Oct. 31, 1877*).—In 1876, Mr. Seeland ascertained the presence of a chloritoid mineral, very nearly allied to Thuringite, in a gold mine, near the Zirm Lake, at an altitude of 2484 mètres. It occurred in crystalline groups, within the cavity of a felspathic vein running through central Alpine gneiss. It is either regularly rhombohedral in form, or quite indistinct. Both these varieties present many fissures as if cut through with a knife; and, on a triangular surface-plane, striæ crossing each other under angles 60°. These forms take their origin from cellules of lamellar calcite, having filled up the interstices, and having subsequently disappeared from the action of a solvent. The form of the Thuringite is occasionally exactly coincident with the combination OR, R, resulting from the union of four lamellæ of calcite. Anatase in extremely minute crystals is here and there interspersed through the feldspathic matrix.

T. R. J.

ON THE ORIGIN OF SOME ORES OF COPPER, by C. A. Burghardt, Ph. D.—The author has prepared *Cuprite* by both dry and wet methods, and *Chalcotrichite* and *Malachite* by wet methods.

J. H. C.

PYROPHOSPHORITE (Chas. U. Shephard, junr., *Am. Journ. Science*, Jan. 1878).—This is a new anhydrous phosphate of lime from the west Indies. Snow-white to bluish-gray and opaque. Sp. gr. 2·5—2·53, H 3—3·5 B.B. fuses with difficulty on the edges to a white enamel.

The mean of several analyses gave—

Loss on ignition	.. ..	0·390
Lime	.. ..	44·462
Magnesia	.. ..	3·090
Sulphuric acid	.. ..	0·628
Phosphoric acid	.. ..	50·799
Silica	.. ..	0·367
Oxide of iron and alumina	.. ..	0·437

The mineral is (essentially) anhydrous ortho-pyrophosphate of lime with pyrophosphate of magnesia. The proportion of phosphoric acid exceeds that of any known calcic-phosphate.

J. H. C.

TRIDYMITÉ.—Prof. A. von Lasaulx reports the discovery of tridymite, in the trachyte-porphry of Co. Antrim, Ireland.

J. H. C.

VARISCITE from Arkansas (*Am. Journ. Science*, March, 1878).—Figures of maced crystals belonging to the rhombic system, are given by Albert H. Chester.

J. H. C.

TANTALITE, from Coosa County, Alabama, by J. Lawrence Smith (*Am. Journ. Science*, March, 1878).—This is the first recorded occurrence in the United States, although the related mineral, Columbite, occurs in many places.

The analysis is as follows:—

Tantallic acid	79.65
Tungstic acid	1.10
Stannic acid .. .. .	.87
Manganous oxide	3.72
Ferrous oxide	13.51
Oxide of copper .. .. .	.89
	99.74

Sp. Gr. 7.305 to 7.401.

Occurs in irregular masses, more or less rounded, ready cleavage in one direction. Some masses weighed 1½ lbs.

J. H. C.

VERMICULITE (Geo. H. Parke, Proc. Geol. and Polytech. Soc., Yorks., iv. 1877, p. 254).—This mineral has been found in Britain for the first time at Walney Island, North Lancashire, by Mr. C. E. Manby. It occurs in blocks of red and grey granite taking the place of mica, forming part of the boulder clay deposits of that locality. The mineral exfoliates very characteristically.

The following analyses are given—

	BEFORE IGNITION.	AFTER IGNITION
Ferric oxide	22·78	26·00
Manganic oxide ..	1·50	1·72
Alumina	6·24	7·12
Titanic oxide	1·15	1·32
Lime.. .. .	2·19	2·50
Magnesia	11·83	13·50
Phosphoric acid ..	0·49	0·56
Soda	3·19	3·64
Insoluble residuc ..	38·23	43·64
Water, combined ..	12·00	none.
	100·00	100·00

The insoluble residue was also analysed with the following result—

Silica.. .. .	85·00
Alumina	10·20
Soda	4·80
Magnesia	trace.
Sulphuric acid ..	trace.

J. H. C.

The General Principles of Mineralogy, by J. H. Collins, F.G.S. (Post 8vo, pp. 206. W. Collins and Co., London and Glasgow, 1878.)

MR. Collins' new work is mainly a treatise on Crystallography, for two-thirds of the book are devoted to this branch of mineralogy. This stumbling block of the student is dealt with in a very clear manner; and, aided by more than five hundred woodcuts, he ought to have very little difficulty in acquiring a good knowledge of the subject. Mr. Collins gives the symbols used by Mitchell, Miller, and Naumann, so the student can choose whichever system happens to be adopted by his teacher. The latter chapters of the book give an account of the physical and chemical characters of minerals, blowpipe analysis, paragenesis, and artificial minerals.

There are a few omissions and errors, to which we cannot help calling attention. It surely would have been better to have given a figure of a regular specific gravity bottle, than the beaker shown in fig. 550.* No mention is made of Jolly's spring balance for determining specific gravities, which was recommended by von Kobell many years ago. We regret that Mr. Collins should not have thought it worth while inserting Werner's list

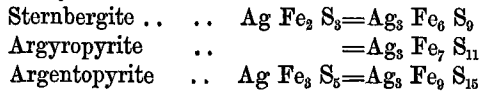
* The special convenience of the small beaker for determining the specific gravity of comparatively large crystals is a good reason for its introduction,—the ordinary sp. gr. bottle is well-known.—Ed.

of colours. Of course it is too much to expect a plate with colours in a small work on mineralogy, but in a large volume we believe that a chromolithographed plate, showing the various tints, would be of considerable value. In describing the blowpipe test for sulphur, p. 186, Mr. Collins forgets to tell the student to add a drop of water.

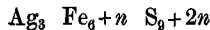
In speaking of the age of tin deposits, p. 190, the word "older" seems to have been accidentally printed instead of "younger;" and in a list of the minerals usually accompanying gold, iron pyrites ought scarcely to have been omitted. A few typographical errors have escaped notice, such as "independant," p. 188; "splendant," p. 162. In spite of these few defects, there can be no question about the value of Mr. Collins' work; it is certainly a marvel of cheapness, for the woodcuts alone are well worth the price of the book. We are glad to note that it is soon to be completed by a second volume devoted to descriptive mineralogy.

C. L. N. F.

SILBERKIES.—(*Jahrbuch für das Berg-und Hüttenwesen ins Königreiche Sachsen auf das Jahr, 1878.*) Under this head Prof. A. Weisbach describes the crystallized argentopyrite, lately found near Freiberg and at Marienberg; and argyropyrite, a new variety, also from the neighbourhood of Freiberg. The latter is intermediate between argentopyrite and sternbergite, as shown by the formulæ:



A general formula for the three minerals would be:



n varying from 0 to 3.

C. L. N. F.

MIARGYRITE.—(*Ibidem.*) Prof. Weisbach and his pupils have made some new goniometric measurements of miargyrite crystals, and their results do not altogether agree with those of Prof. Naumann.

C. L. N. F.

THE MINES OF THE PARYS MOUNTAIN, ANGLESEY.—By T. F. Evans. (*Trans. Geol. Soc., Manchester, 1878.*) Beds of iron pyrites, copper pyrites and "bluestone" (mixed sulphides of iron, zinc, lead and copper) occur intercalated between bands of felstone, shale, and quartz. The author considers that the ores were deposited in the same way as the copper pyrites in the *kupferschiefer*, and that the enclosing rocks are purely altered sedimentary strata.

C. L. N. F.

ZUR THEORIE DER BILDUNG DER ERZGÄNGE.—By Fridolin Sandberger. (*Berg- und hüttenmännische Zeitung*, Nos. 44 and 45, 1877). Prof. Sandberger has arrived at the conclusion that the contents of lodes are in the main derived from minerals existing in the enclosing rocks. Veins of heavy spar may have received the baryta from felspars containing that earth; fluor spar may have been deposited by the action of potassium fluoride dissolved out of mica on calcium carbonate, derived from the decomposition of oligoclase.

The most important part of the paper relates to proving the existence of valuable metals in silicates. Olivine always contains nickel and cobalt; the olivine from Nauroth, near Wiesbaden, contains 0.307 per cent. of oxide of nickel, and 0.006 per cent. of oxide of cobalt. In the palæopierite, or olivine rock of Dittenburg, there is from 0.162 to 0.666 per cent. of oxide of nickel, which is further accompanied by copper, cobalt, and bismuth.

Prof. Sandberger has tested many varieties of hornblende and has frequently found copper and cobalt. The same metals are often present in augite, and specimens of that mineral in diabase from Andreasberg, afforded in addition, lead, nickel, antimony, and arsenic.

Mica obtained from gneiss and granite, has yielded one or more of the following metals, silver, lead, copper, nickel, cobalt, bismuth, arsenic, and zinc.

Prof. Sandberger's investigations are, undoubtedly, of the greatest importance, and deserve the earnest consideration of geologists and mineralogists.

C. L. N. F.

PRIZE BLOWPIPE APPARATUS.—The prize of £10 and the silver medal offered by the Society of Arts for the best guinea blowpipe apparatus, have been awarded to Messrs. Letcher Brothers, of St. Day and Camborne. Their box, which is only 10½ ins. long by 4¾ wide and 3½ in. deep, contains no less than 42 different articles, and these are all packed in a highly ingenious manner. Each article fits into its own little recess and consequently neither paper nor wadding are required. The apparatus contains the necessary appliances for testing most minerals and ores, and the Messrs. Letchers' box will be found most useful to mineralogists, as well as to miners, chemists, and metallurgists. It undoubtedly far excels any set that has been sold here or abroad for the money, and the Society of Arts deserves the cordial thanks of students and practical men for having enabled them to get such a compact, portable, well filled, and well arranged blowpipe apparatus for so little money. We quite believe that if the Messrs. Letcher were to apply their ingenuity to the sets for

quantitative work, that they would soon produce an apparatus far better packed and in much smaller compass than those supplied by Herr Lingke, the well-known Freiberg maker.

C. L. N. F.

GUANAJUATITE (J. W. Mallet, *Am. Journ. Sci.*, Ap. 1878.)—This is the *Frenzelite* of Dana's Mineralogy, 5th Ed., 2nd appendix—it was first noticed by Senor Castillo in March, 1873, as a sulpho-selenide of bismuth from Guanajuato, Mexico.

The analysis now given is as follows :—

Selenium	31·64
Sulphur	·61
Bismuth	59·92
Alumina	2·53
Ferric Oxide	tr
Silica.. .. .	3·47
Water	1·46

99·63

This agrees very fairly with the formula $\text{Bi}_2 \text{S}_3$.

J. H. C.

HOMILITE (*Ann. Chem. et Phys.* v. xii. 1877).—This mineral described by Parjkill in Dec. 1876 as a silicoborate of iron and lime occurring with meliphanite and erdmannite on the island of Stockoë, near Brevig, is regarded by M. M. Damour and Descloiseaux as a mixture, on chemical and optical grounds.

Correspondence and Notes.

To the Editor of the Mineralogical Magazine.

Sir,

Mineralogists, Physicists, and I conceive, also, Geologists, must alike be grateful to Professor Church for introducing to their notice what we may for a time call *Sonstadt's specific gravity solution*.

The application of this, though clearly restricted, will be at one and the same time rapid and precise. Two of the properties of this solution cannot however be too soon impressed upon those who purpose to apply it.

It is a rapid and powerful vesicant, and it is frightfully poisonous.

It so happened that while preparing a quantity of this so called "solution," some drops thereof fell upon one of my hands; these drops were too hastily rubbed off, before drawing on my gloves to run to catch a train.