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ANALYSES OF ROCKS AND MINERALS

FROM THE

LABORATORY OF THE UNITED STATES GEOLOGICAL SURVEY

1914–36

TABULATED BY

ROGER C. WELLS
Chief Chemist

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INTRODUCTION

This bulletin is a supplement to Bulletin 591. Although that bulletin included all the material in several earlier publications, thus being complete from 1880 to 1914, it was already so large that an attempt to incorporate it with newer material appeared unwise. Anyone wishing to make an exhaustive search for analyses will therefore have to consult both bulletins. Although many of the analyses here given have already been published and others are still in manuscript form, a considerable number are not on record elsewhere. Moreover, as the figures that have been published are widely scattered in different scientific journals and Government publications, it is impossible to find them without a great expenditure of time. Here the rock analyses are tabulated by locality and the minerals by name, and record numbers are given so that even the projects involved can be located.

The present United States Geological Survey was organized in 1879. In 1880, in connection with the Colorado work, a chemical laboratory was established at Denver in charge of W. F. Hillebrand, with whom were associated Antony Guyard and, later, L. G. Eakins. In 1882 W. H. Melville was placed in charge of a second laboratory at San Francisco, and in the autumn of 1883 a central laboratory was started in Washington, with F. W. Clarke as chief chemist. In 1885 Dr. Hillebrand was transferred to Washington, followed by Mr. Eakins in 1888, and the Denver laboratory was discontinued. In the spring of 1890 Dr. Melville also was transferred to Washington, and since then the geochemical work of the Survey has been concentrated at headquarters. The laboratory was in charge of George Steiger from 1917 until my appointment in 1930.

The special laboratories of the water-resources and technologic branches of the Geological Survey are not included in this statement, and their work is not represented in this bulletin, nor are the large

number of determinations of potash in drill cores and cuttings made in connection with the Government's search for potash, which constituted in effect a special line of investigation for many years, especially from 1926 to 1931. Determinations of phosphate, assays for gold and silver, tests of clays, and similar routine tests are also omitted.

Analyses of rocks and minerals made in the laboratory at Washington up to January 1, 1914, are tabulated in Bulletin 591. Water analyses are given in many water-supply papers, indexed in Water-Supply Papers 560–C and 659–C. Since Bulletin 591 was published 1,533 more rocks and minerals have been analyzed, and considerable research work on mineralogic and geochemical problems has been done. In this work the following chemists have been engaged: G. R. Backus, R. K. Bailey, G. V. Brown, A. A. Chambers, E. T. Erickson, J. G. Fairchild, J. J. Fahey, E. P. Henderson, W. B. Hicks, R. M. Kamm, Charles Milton, Chase Palmer, L. T. Richardson, B. Salkover, W. T. Schaller, George Steiger, R. E. Stevens, R. C. Wells, and W. C. Wheeler. At present (Jan. 1, 1936) nine of these chemists are employed. Other members of the Survey have been occupied more or less with chemical questions, but the men named in this list were connected directly with the laboratory.

It may be interesting to compare the number of analyses made in the Survey laboratory since 1914 with those previously made, as follows:

	1880–1914	1914–36
Igneous and crystalline rocks	1,407	444
Sandstones, cherts, and sinters	79	64
Carbonate rocks	315	215
Slates and shales	65	24
Clays, soils, etc.	147	115
Ores and gangue material	----------	156
Meteorites	62	None
Minerals	714	515
Total	2,789	1,533

This makes a total of 4,322 quantitative analyses made since the organization of the laboratory, not including a vast number of partial routine determinations and numerous analyses made in connection with research problems and the development of methods.

The object here is mainly to put on record the additional analyses made since 1914. Other publications, chiefly by Clarke and Washington, deal fully with the classification of rocks, the average composition of different kinds of rocks and of the earth's crust, and the distribution and abundance of the elements.[1] A recalculation of

[1] See U. S. Geol. Survey Prof. Papers 14, 18, 28, 99, 127, and 132–D; Bulls. 148, 168, 176, 228, 305, 330, 419, 422, 491, 591, 616, 695, 700, and 770.

these figures to include later analyses would require much labor and probably introduce but few significant changes. Several chemists in this and other countries, however, have recently studied in more detail the distribution of certain ore-forming and rare elements.

THE ELEMENTS AND THEIR RELATIVE ABUNDANCE

Spectroscopic studies have shown a wide distribution of tin and germanium, previously unsuspected. Hafnium has been found in zirconium minerals, and columbium and tantalum in titanium minerals. Fluorine and selenium have been found in many surface waters, and many minor constituents have been determined in certain ores and rare minerals. The determination of such minor constituents has generally been accomplished by physical methods rather than by chemical separations. It results from the very meager knowledge of the proportion of rare minerals in the earth's crust that estimates of the distribution of the elements by different investigators differ widely, sometimes by several decimal places. Contributions to the knowledge of the subject have been made especially by Goldschmidt,[2] the Noddacks,[3] Schneiderhöhn,[4] and Fersman.[5] Fersman gives an excellent bibliography of the subject. He has also proposed the term "clarke" to designate a unit for indicating the relative abundance of an element either by weight or by number of atoms in any particular kind of rock or in the earth's crust, in honor of F. W. Clarke, who did so much for geochemical statistics. As Fersman's study of 1932 assembles figures for the abundance of all the elements based on all preceding work, it seems advisable to give his results, which are shown in the sixth and seventh columns of the following table. The sixth column gives percentages by weight, the seventh column percentages by atoms for the relative abundance of each element in the 10-mile crust of the earth, based on the estimates of Clarke, Washington, Goldschmidt, Vogt, Niggli, Noddack, Vernadski, Hevesy, Paneth, and others.

The table also gives the atomic number of each element, the latest figure for its atomic weight, and the number of its isotopes, if this has been determined. Schneiderhöhn's figures for the relative abundance of certain elements (1934) differ considerably from those of Fersman, but, as previously remarked, such differences seem unavoidable in the present very scanty knowledge of the subject.

[2] Goldschmidt, V. M., Geochemische Verteilungsgesetze und kosmiche Häufigkeit der Elemente: Die Naturwissenschaften, Band 18, pp. 999–1013, 1930.

[3] Noddack, Ida and Walter, Die Häufigkeit der chemischen Elemente: Die Naturwissenschaften, Band 18, p. 757, 1930.

[4] Schneiderhöhn, H., Die Ausnutzungsmöglichkeiten der deutschen Erzlagerstätten: Metallwirtschaft, Band 13, pp. 151–157, 1934.

[5] Fersman, A. E., Geochemistry, Leningrad, 1933.

The elements and their relative abundance

Element	Symbol	Atomic number	Atomic weight	Number of isotopes	Abundance	
					Percent by weight	Percent by atoms
Actinium	Ac	89	227			
Alabamine	Ab	85				
Aluminum	Al	13	26.97	1	7.45	4.80
Antimony	Sb	51	121.76	2	5×10^{-5}	7×10^{-6}
Argon	A	18	39.944	2	4×10^{-4}	1.7×10^{-4}
Arsenic	As	33	74.91	1	5×10^{-4}	1×10^{-4}
Barium	Ba	56	137.36	4	0.05	6×10^{-3}
Beryllium	Be	4	9.02	3	0.003	6×10^{-3}
Bismuth	Bi	83	209.00	14	1×10^{-5}	8×10^{-7}
Boron	B	5	10.82	2	0.01	0.015
Bromine	Br	35	79.916	2	0.001	2×10^{-4}
Cadmium	Cd	48	112.41	6	5×10^{-4}	8×10^{-5}
Calcium	Ca	20	40.08	3	3.25	1.41
Carbon	C	6	12.00	3	0.35	0.51
Cerium	Ce	58	140.13	2	2.9×10^{-3}	4×10^{-4}
Cesium	Cs	55	132.91	1	5×10^{-4}	7×10^{-5}
Chlorine	Cl	17	35.457	3	0.20	0.10
Chromium	Cr	24	52.01	4	0.03	9×10^{-3}
Cobalt	Co	27	58.94	1	0.002	9×10^{-4}
Columbium	Cb	41	92.91		3.2×10^{-5}	6×10^{-6}
Copper	Cu	29	63.57	2	0.01	3×10^{-3}
Dysprosium	Dy	66	162.46		7.5×10^{-4}	8×10^{-5}
Erbium	Er	68	167.64	2	6.5×10^{-4}	7×10^{-5}
Europium	Eu	63	152.0		2×10^{-5}	$3\times10^{-}$
Fluorine	F	9	19.00	1	0.08	0.07
Gadolinium	Gd	64	157.3		7.5×10^{-4}	8×10^{-5}
Gallium	Ga	31	69.72	2	1×10^{-3}	2.5×10^{-4}
Germanium	Ge	32	72.60	8	1×10^{-4}	2.5×10^{-5}
Gold	Au	79	197.2		5×10^{-4}	4×10^{-7}
Hafnium	Hf	72	178.6		4×10^{-4}	4×10^{-5}
Helium	He	2	4.002	2	1×10^{-6}	4×10^{-6}
Holmium	Ho	67	163.5		1×10^{-4}	1×10^{-5}
Hydrogen	H	1	1.0078	3	1.00	17.25
Illinium	Il	61				
Indium	In	49	114.76	1	1×10^{-5}	1.5×10^{-6}
Iodine	I	53	126.92	1	1×10^{-4}	1.5×10^{-5}
Iridium	Ir	77	193.1		1×10^{-6}	1×10^{-7}
Iron	Fe	26	55.84	2	4.20	1.31
Krypton	Kr	36	83.7	6	2×10^{-5}	4×10^{-9}
Lanthanum	La	57	138.92	1	6.5×10^{-4}	8×10^{-5}
Lead	Pb	82	207.22	16	1.6×10^{-3}	1×10^{-4}
Lithium	Li	3	6.940	2	0.005	0.012
Lutecium	Lu	71	175.0		1.75×10^{-4}	1.7×10^{-5}
Magnesium	Mg	12	24.32	3	2.35	1.72
Manganese	Mn	25	54.93	1	0.10	0.03
Masurium	Ma	43	96		1×10^{-7}	1.5×10^{-8}
Mercury	Hg	80	200.61	9	1×10^{-4}	7×10^{-6}
Molybdenum	Mo	42	96.0	7	1×10^{-3}	2×10^{-4}
Neodymium	Nd	60	144.27	4	1.75×10^{-3}	2×10^{-4}
Neon	Ne	10	20.183	4	5×10^{-7}	4×10^{-7}
Nickel	Ni	28	58.69	3	0.02	6×10^{-3}
Nitrogen	N	7	14.008	2	0.04	0.05
Osmium	Os	76	191.5	6	5×10^{-6}	5×10^{-7}
Oxygen	O	8	16.0000	3	49.13	53.30
Palladium	Pd	46	106.7		8×10^{-6}	1.5×8^{-6}
Phosphorus	P	15	31.02	1	0.12	0.07
Platinum	Pt	78	195.23		5×10^{-6}	4×10^{-7}
Polonium	Po	84	210		5×10^{-6}	4×10^{-7}
Potassium	K	19	39.096	5	2.35	1.05
Protactinium	Pa	91	231		7×10^{-11}	5×10^{-12}
Praseodymium	Pr	59	140.92	1	4.5×10^{-4}	6×10^{-5}
Radium	Ra	88	226.05	4	3×10^{-10}	2.0×10^{-11}
Radon	Rn	86	222	3	1.2×10^{-15}	1×10^{-19}
Rhenium	Re	75	186.31	2	1×10^{-7}	1×10^{-8}
Rhodium	Rh	45	102.91		1×10^{-6}	1.5×10^{-7}
Rubidium	Rb	37	85.44	2	0.008	2×10^{-3}
Ruthenium	Ru	44	101.7	7	5×10^{-6}	1×10^{-6}
Samarium	Sm	62	150.43		7×10^{-4}	8×10^{-5}
Scandium	Sc	21	45.10	1	6×10^{-4}	2.5×10^{-4}
Selenium	Se	34	78.96	8	8×10^{-5}	1.5×10^{-5}
Silicon	Si	14	28.06	3	26.00	16.10
Silver	Ag	47	107.880	2	1×10^{-5}	1.5×10^{-6}
Sodium	Na	11	22.997	4	2.40	1.82
Strontium	Sr	38	87.63	3	0.035	7×10^{-3}
Sulphur	S	16	32.06	5	0.10	0.05
Tantalum	Ta	73	180.88		2.4×10^{-5}	2.3×10^{-6}
Tellurium	Te	52	127.61	8	1×10^{-6}	1.5×10^{-7}
Terbium	Tb	65	159.2		1×10^{-4}	1×10^{-5}

The elements and their relative abundance—Continued

Element	Symbol	Atomic number	Atomic weight	Number of isotopes	Abundance	
					Percent by weight	Percent by atoms
Thallium	Tl	81	204.39	8	1×10^{-5}	8×10^{-7}
Thorium	Th	90	232.12	8	2×10^{-3}	1×10^{-4}
Thulium	Tm	69	169.4		1×10^{-4}	1×10^{-5}
Tin	Sn	50	118.70	11	6×10^{-4}	8×10^{-5}
Titanium	Ti	22	47.90	2	0.61	0.22
Tungsten	W	74	184.0	4	9×10^{-4}	9×10^{-5}
Uranium	U	92	238.14	8	9×10^{-4}	4×10^{-5}
Vanadium	V	23	50.95	1	0.02	7×10^{-3}
Virginium	Vi	87				
Xenon	Xe	54	131.3	9	3×10^{-9}	4×10^{-10}
Ytterbium	Yb	70	173.04		8×10^{-4}	8×10^{-5}
Yttrium	Y	39	88.92	3	0.005	1×10^{-3}
Zinc	Zn	30	65.38	7	0.02	5×10^{-3}
Zirconium	Zr	40	91.22	4	0.025	5×10^{-3}

ABBREVIATIONS USED

Of the abbreviations used for bibliographic reference only five need explanation, and they refer to the official publications of the Survey—"Ann." for Annual Report, "Mon." for Monograph, "Bull." for Bulletin, "Prof. Paper" for Professional Paper, and "Folio" for Folio of the Geologic Atlas. The others relate to well-known journals and are familiar to all geologists. In the tables of analyses the symbols H_2O- and H_2O+ indicate, respectively, the water lost at or near 105° and that expelled at higher temperatures.

For the information of readers in foreign countries the abbreviations used for names of States of the United States are explained below:

Ala., Alabama.
Ariz., Arizona.
Ark., Arkansas.
Calif., California.
Colo., Colorado.
Conn., Connecticut.
Del., Delaware.
D. C., District of Columbia.
Fla., Florida.
Ga., Georgia.
Ill., Illinois.
Ind., Indiana.
Kans., Kansas.
Ky., Kentucky.
La., Louisiana.
Md., Maryland.
Mass., Massachusetts.
Mich., Michigan.
Minn., Minnesota.
Miss., Mississippi.
Mo., Missouri.
Mont., Montana.
Nebr., Nebraska.
Nev., Nevada.
N. H., New Hampshire.
N. J., New Jersey.
N. Mex., New Mexico.
N. Y., New York.
N. C., North Carolina.
N. Dak., North Dakota.
Okla., Oklahoma.
Oreg., Oregon.
Pa., Pennsylvania.
R. I., Rhode Island.
S. C., South Carolina.
S. Dak., South Dakota.
Tenn., Tennessee.
Tex., Texas.
Vt., Vermont.
Va., Virginia.
Wash., Washington.
W. Va., West Virginia.
Wis., Wisconsin.
Wyo., Wyoming.

CLASSIFICATION

The classifications used in this bulletin are essentially similar to those used by F. W. Clarke in Bulletin 591. However, I am indebted to T. W. Stanton, formerly chief geologist, for suggesting the addition of the class "Ores and gangue material" for substances that fall

better under that head than under any of the others. I am also indebted to many other members of the Survey for suggestions and assistance in naming the specimens analyzed, particularly to C. S. Ross in connection with the igneous rocks and clay minerals and for critically reading the whole manuscript, and to W. T. Schaller for mineralogic criticism. Opinions will naturally differ somewhat as to the exact classification of many of the substances whose analyses are given in the following pages, depending on the purpose for which the analyses were made or the viewpoint of the reader. The arrangement has been adopted for convenience; consequently, for example, a substance like vanoxite is listed as an oxide rather than a vanadate, and the garnets are all listed under the group name. Undetermined or impure clays will be found under the heading "Clays", whereas well-identified species will be found under "Minerals." Samples representing material in the mass are classified mainly as rocks, pure single specimens as minerals, and materials containing common metals of commercial interest generally as ores.

ANALYSES OF IGNEOUS AND CRYSTALLINE ROCKS

ALASKA

CENTRAL ALASKA

Samples of granodiorite rocks collected by J. B. Mertie, Jr. Analysis A by Charles Milton, B–F by J. G. Fairchild, record D–117.

A. Composite sample of four specimens from Roughtop (Moose) Mountain, 14 miles N. 20° W. from Hot Springs.

B. Composite sample of four specimens from Elephant Mountain, 26 miles N. 41° E. from Hot Springs.

C. From Wolverine Mountain, 15 miles S. 35° E. from Rampart.

D. From mountain 17 miles S. 41° E. from Rampart.

E. Specimen from Sawtooth (Lynx) Mountain, 21 miles S. 68° E. from Rampart.

F. Composite sample of five specimens, Hot Springs Dome, 3 miles northwest of Hot Springs.

	A	B	C	D	E	F
SiO_2	54.20	56.89	67.44	64.52	53.11	73.92
Al_2O_3	18.43	14.59	15.45	14.90	16.45	13.46
Fe_2O_3	.55	.45	.65	.42	.76	.94
FeO	6.38	6.13	2.68	3.72	8.29	1.26
MgO	3.08	4.23	.88	1.85	3.28	.53
CaO	7.20	6.10	2.38	3.52	5.65	1.11
Na_2O	2.64	2.10	3.26	2.62	2.02	2.42
K_2O	5.31	6.32	5.97	5.98	6.38	5.18
H_2O-	.05	.14	.06	.09	.20	.20
H_2O+	.28	.74	.51	.76	1.15	.36
TiO_2	.81	1.00	.41	.45	1.40	.35
CO_2	.23	.55	.32	.71	.95	.15
P_2O_5	.60	.40	.16	.20	.55	.10
MnO	.12	.11	.03	.09	.08	.04
Total	99.88	99.75	100.20	99.83	100.27	100.02

Four granitic rocks collected from central Alaska by Mertie and analyzed by E. T. Erickson, record D–415.

G. Summit of ridge at head of Monument and Flint Creeks, in the Ruby district, 7 miles S. 20° E. of Long.

H. Southeast side of Mammoth Creek, opposite mouth of Miller Creek, 38 miles S. 38° W. of Circle.

I. Head of Hidden Creek, in the Nixon Fork district, 32 miles N. 57° E. of McGrath.

J. Composite sample from head of Flat Creek, in the Iditarod district, 3½ miles due south of Flat.

	G	H	I	J		G	H	I	J
SiO_2	74.02	75.98	64.84	57.16	H_2O-	0.09	0.05	0.04	0.04
Al_2O_3	12.02	11.70	15.20	16.88	H_2O+	.28	.42	.41	.69
Fe_2O_3	.92	.39	.73	.26	TiO_2	.26	.22	.30	.30
FeO	2.72	2.24	4.18	5.36	CO_2	.04	Trace	.48	.11
MgO	.69	.30	2.02	4.78	P_2O_5				
CaO	1.46	.58	3.04	4.08	MnO	.05	None	.06	.08
Na_2O	3.22	2.73	4.03	4.67					
K_2O	4.28	5.46	4.55	5.32		100.05	100.07	99.88	99.73

SOUTHEASTERN ALASKA

Rocks collected by A. F. Buddington. Analyses by J. G. Fairchild, record C–858. Described by Buddington and Chapin in Bull. 800, 1929.

A. Quartz monzonite, average of 6 samples from the Hyder district.

B. Granodiorite, average of 6 samples from the Hyder district.

C. Quartz diorite, average of 14 samples from the western border of the Coast Range batholith.

D. Diorite, Etolin Island.

	A	B	C	D		A	B	C	D
SiO_2	70.86	64.87	59.55	50.24	K_2O	4.60	3.30	2.62	1.40
Al_2O_3	14.96	16.26	16.18	17.86	H_2O-	None	None	.04	.03
Fe_2O_3	1.06	1.51	1.94	2.00	H_2O+	.40	.28	.82	1.39
FeO	1.43	2.89	5.61	6.56	TiO_2	.34	.70	.96	1.32
MgO	.41	1.72	2.86	5.47	P_2O_5	.11	.19	.26	.24
CaO	2.23	4.72	6.26	10.59					
Na_2O	3.90	3.82	3.40	3.51		100.30	100.26	100.50	100.61

Eocene lavas from southeastern Alaska, collected by A. F. Buddington and described in Am. Jour. Sci., 5th ser., vol. 23, pp. 490–496, 1932. Analyses E, F by R. C. Wells, C–M by J. G. Fairchild, records D–18 and D–41.

	E	F	G	H	I	J	K	L	M
SiO_2	52.05	53.40	51.45	48.66	72.62	75.47	76.18	67.01	57.70
Al_2O_3	15.03	13.35	16.30	13.40	10.17	9.39	12.95	13.94	16.28
Fe_2O_3	2.78	2.58	2.43	1.29	4.60	1.21	None?	1.00	2.88
FeO	5.54	11.25	7.20	11.58	1.88	3.31	2.05	3.47	6.00
MgO	4.94	2.33	3.16	8.72	.10	.10	Trace?	.45	1.55
CaO	9.27	6.58	7.45	8.92	.10	.10	.05	1.90	5.30
Na_2O	2.33	3.80	2.77	3.34	4.53	2.49	3.33	5.63	4.90
K_2O	1.01	1.36	2.33	.80	4.78	4.46	4.59	2.92	.89
H_2O-	1.18	.68	.50	.10	.08	.03	.02	.32	.45
H_2O+	2.66	1.50	2.52	.17	.37	1.21	.85	2.51	1.35
TiO_2	1.42	2.03	2.38	2.77	.35	.65	.15	.40	.91
CO_2	1.86	.61	.66	None	Trace	Trace	Trace	.65	1.08
P_2O_5	.28	.75	.35	.35	Trace	.05	Trace	.08	.56
F	.06	None	.05	.05				.08	.02
S	None	.07	.02	Trace?	Trace?		.03		
SO_3						.10		.07	.04
V_2O_3	.02	Trace	.03	.03	None	None	None		
MnO	.07	.13	.12	.12	Trace?	None	None	.08	.16
BaO	.05	.06	None	None	None	None	None	.09	.07
SrO	Trace	None	None	None	None	None	None	None	.02
ZrO_2	.02	Trace							
FeS_2			None	None	None	.97	None		
Cr_2O_3	.03	None							
	100.60	100.48	99.72	100.30	99.58	99.54	100.20	100.60	100.16
Less O	.03	.04	.02	.02				.03	.01
	100.57	100.44	99.70	100.28				100.57	100.15

ARIZONA

AJO DISTRICT

Six rocks collected by James Gilluly. Analyses by J. G. Fairchild, record D–281.

A. Micaceous quartz diorite, 700 feet southwest of mine office, Ajo copper mine. Quartz, andesine-oligoclase, biotite, chlorite, epidote, apatite, magnetite, sericite.

B. Quartz monzonite. East spur of hill south of manager's residence, Ajo mine. Quartz, albite, orthoclase(?), chlorite, muscovite, clay(?), barite(?), titanite, ilmenite, zircon.

C. Hornblende-biotite-quartz monzonite, almost fresh, 600 feet south of east crest of Camelback Mountain, southwest of Ajo. Oligoclase-andesine, orthoclase, quartz, hornblende, biotite, chlorite, sericite, epidote, apatite, titanite, magnetite.

D. Albitized quartz diorite, west side of approach cut to Ajo copper mine, 1,000 feet south of drill-sharpening house. Albite, sericite, epidote, quartz, chlorite, magnetite, apatite.

E. Albitized sericitic quartz monzonite, southwest side of mine pit, due east of crest of Arkansas Mountain. Albite, sericite, orthoclase, quartz, chlorite, apatite, epidote, titanite(?), calcite.

F. Quartz monzonite, 2,890-foot peak west of Gibson Gulch, about 2 miles west of Ajo. Oligoclase-andesine, orthoclase, quartz, hornblende, biotite, chlorite, sericite, epidote, apatite, magnetite, zircon, titanite.

	A	B	C	D	E	F
SiO_2	60.59	66.92	66.23	62.27	65.66	65.29
Al_2O_3	17.39	15.78	15.71	17.40	15.98	15.74
Fe_2O_3	1.60	1.30	2.20	2.35	1.45	2.05
FeO	1.98	1.08	1.98	2.79	2.70	2.03
MgO	2.38	1.40	1.58	2.86	2.14	1.84
CaO	5.06	.76	3.78	1.19	1.88	3.66
Na_2O	4.09	3.46	3.89	4.10	3.55	3.77
K_2O	1.63	5.26	3.22	2.76	3.70	4.11
H_2O-	.78	.71	.03	.50	.20	.14
H_2O+	3.29	1.92	.67	2.65	1.52	.62
TiO_2	.61	.56	.47	.84	.60	.54
P_2O_5	.36	.28	.24	.30	.31	.24
MnO	.08	.05	.08	.05	.02	.07
CO_2	----	----	----	----	.47	----
F	----	.03	----	----	----	----
Cl	----	None	----	----	----	----
SO_3	----	.30	----	----	----	----
BaO	----	.11	----	----	----	----
B_2O_3	----	None	----	----	----	----
	99.84	99.92	100.08	100.06	100.18	100.10

Five samples of gneiss from the Ajo quadrangle, collected by James Gilluly and analyzed by Charles Milton, record D–421.

G. Albite-chlorite gneiss, NE ¼ sec. 29, T. 12 S., R. 6 W. Pre-Tertiary, possibly pre-Cambrian. Quartz, albite, epidote, chlorite, muscovite, magnetite, and titanite.

H. Quartz diorite gneiss, same locality. Andesine, quartz, sericite, epidote, orthoclase, chlorite, biotite, and magnetite.

I. Quartz-albite gneiss, same locality. Quartz, albite, sericite, andesine, calcite, orthoclase, chlorite, biotite, zircon, titanite, magnetite, and apatite.

J. Biotite diorite gneiss, same locality. Quartz, andesine, biotite, chlorite, muscovite, magnetite, titanite, zircon, and apatite.

K. Porphyritic albite gneiss, SW ¼ sec. 28, T. 12 S., R. 6 W. Albite, sericite, quartz, epidote, chlorite, hornblende, titanite, apatite, and magnetite.

	G	H	I	J	K		G	H	I	J	K
SiO_2	70.78	62.13	65.48	77.23	68.21	CO_2	0.15	0.13	0.54	0.05	0.12
Al_2O_3	14.15	18.59	16.39	8.61	15.15	TiO_2	1.08	.79	.80	1.19	.90
Fe_2O_3	3.19	2.09	1.31	4.25	3.14	ZrO_2	.03	.04	Trace	.07	.02
FeO	2.00	3.24	2.32	1.97	2.26	P_2O_5	.04	.04	.10	.04	.06
MgO	1.60	1.72	1.56	1.11	1.88	S	.06	.12	.12	.01	.05
CaO	.71	3.10	2.93	1.57	2.57	MnO	.02	.04	.01	.03	.03
Na_2O	2.16	4.09	3.63	2.20	3.47	BaO	.03	.07	.07	.02	.06
K_2O	2.95	2.36	3.14	.81	1.44						
H_2O-	1.33	1.67	1.40	.81	1.32		100.42	100.51	100.00	100.04	100.85
H_2O+	.14	.29	.20	.07	.17						

Five volcanic rocks from the Ajo quadrangle, collected by James Gilluly. Analyses L, M by R. E. Stevens; N–P by J. G. Fairchild, record D–427.

L. Andesitic basalt, north spur of Black Mountain, north center sec. 36, T. 12 S., R. 6 W. Plagioclase, augite, glass, magnetite.

M. Augite andesite, SE¼ sec. 14, T. 13 S., R. 6 W. Augite, plagioclase, glass.

N. Olivine basalt, crest of Black Mountain, sec. 1, T. 13 S., R. 6 W. Olivine, iddingsite, augite, plagioclase, glass, magnetite.

O. Hornblende basalt, Childs Mountain, northwest corner sec. 6, T. 12 S., R. 6 W. Basaltic hornblende, augite, plagioclase, magnetite, glass.

P. Augite andesite, northwest spur of Childs Mountain, 5 miles west of Batamote Well. Augite, plagioclase, magnetite, glass.

	L	M	N	O	P		L	M	N	O	P
SiO_2	59.88	56.66	54.79	58.42	55.61	TiO_2	0.81	1.09	1.40	0.90	1.55
Al_2O_3	15.75	18.14	15.69	17.20	17.48	ZrO_2	.04	.04	------	------	------
Fe_2O_3	3.10	5.61	3.92	4.29	5.09	CO_2	.07	Trace	------	.70	------
FeO	3.31	1.65	4.19	1.41	2.81	P_2O_5	.36	.40	.21	.17	.61
MgO	2.76	1.05	5.85	3.08	1.46	S	.06	.05	------	------	------
CaO	5.31	5.01	7.31	7.75	6.38	Cr_2O_3	None	None	------	------	------
Na_2O	3.62	4.39	3.30	3.48	3.40	V_2O_3	------	------	------	.22	------
K_2O	3.25	4.00	2.05	1.94	3.65	MnO	.13	.10	.09	.09	.10
Rb_2O	None	None	------	------	------	BaO	.08	.09	------	------	------
Cs_2O	None	None	------	------	------		99.99	99.69	100.50	100.93	99.89
H_2O-	.74	.77	.63	.18	.50						
H_2O+	.72	.64	1.07	1.10	1.25						

OATMAN DISTRICT

Rocks collected by F. L. Ransome and described in part in Bull. 743, 1923. Analyses by R. C. Wells, record C–336.

A. Biotite-augite andesite (Oatman andesite). Between shaft 1 of the United Eastern mine and the main road in northern part of Oatman. No unusual minerals. A little free quartz, possibly an inclusion.

B. Biotite andesite, 0.8 mile north of Sitgreaves Pass. Small phenocrysts of plagioclase and biotite in microlitic glassy groundmass.

C. Biotite-hornblende andesite, 0.8 mile east-northeast of Sitgreaves Pass. Much like B but it is a distinct body and has larger phenocrysts of plagioclase and phenocrysts of hornblende.

D. Biotite andesite (?), 1.9 miles north-northeast of Sitgreaves Pass. Fresh perlitic and spherulitic glass with phenocrysts of plagioclase, biotite, titanite, and magnetite.

E. Doubtful rock apparently between andesite and rhyolite, 0.5 mile southeast of Elephant's Tooth. Small phenocrysts of plagioclase, biotite, quartz, andesite, and apatite in a groundmass of glass and obscure feldspars.

F. Biotite latite vitrophyre ("older andesite" of Schrader and of field notes), 0.3 mile west of summit of Leland Hill. Typical. As usual in this rock, biotite is chloritized. Originally glassy groundmass devitrified.

G. Biotite-pyroxene andesite, 0.75 mile southwest of Sunnyside mine, forming high cliffs. Perfectly fresh rock. Phenocrysts plagioclase, pyroxene, and biotite, with some magnetite and apatite, in a microlitic glassy groundmass.

H. Biotite-pyroxene andesite, 0.2 mile southeast of Sitgreaves Pass. Perfectly fresh. Same constituents as G.

I. Biotite-pyroxene andesite vitrophyre, 0.6 mile south of Sitgreaves Pass. Phenocrysts of plagioclase, biotite, and pyroxene, with magnetite and apatite, in a glassy groundmass. Perfectly fresh.

J. Biotite-pyroxene andesite vitrophyre, 1¼ miles east-southeast of Sunnyside mine. Evidently a perfectly fresh rock and probably like I.

K. Biotite-augite andesite (Oatman andesite), "green chloritic andesite" of Schrader, dump of abandoned shaft 0.9 mile south of Oatman. Phenocrysts plagioclase, biotite, and augite. Groundmass mainly feldspar, magnetite, and glass. A little calcite and chlorite.

L. Biotite latite vitrophyre ("older andesite"), 0.75 mile west-southwest of Moss mine. Phenocrysts of plagioclase and biotite in glassy, partly devitrified groundmass. Some apatite. A little chlorite and calcite.

M. Biotite latite vitrophyre ("older andesite"), 1 mile west-northwest of Mount Hardy. Like L.

N. Biotite latite, 0.25 mile east of Highland Cliff mine. Small phenocrysts of biotite and magnetite in a very fine-grained feldspathic groundmass. Some apatite.

O. Biotite-augite andesite, 0.2 mile southeast of Arizona-Rex mine. Phenocrysts plagioclase, biotite, magnetite, and quartz in glassy groundmass. Pyroxene very slightly altered to calcite. Fairly abundant apatite.

P. Granite porphyry, representative of large intrusive mass, north side of Times Gulch, 1¾ miles south of Cathedral Rock. Consists of micrographic intergrowth of quartz and orthoclase, with biotite and a little magnetite, titanite, and apatite.

Q. Quartz monzonite porphyry, representative of large intrusive mass, 0.75 mile north of Moss mine. Orthoclase, quartz, plagioclase, biotite, amphibole, magnetite, apatite, and titanite.

R. Rhyolite, Boundary Cone. An intrusive plug. Phenocrysts quartz and orthoclase in very fine-grained granular groundmass, probably quartz and orthoclase.

S. Biotite andesite (Oatman andesite), dump of lower west tunnel of Leland mine. Usual andesite composition. Some chlorite and calcite.

	A	B	C	D	E	F	G	H	I	J
SiO_2	56.37	66.94	66.06	71.94	67.97	63.73	62.96	61.61	68.94	68.25
Al_2O_3	15.99	15.85	16.17	13.52	14.73	15.38	15.36	15.62	13.36	13.67
Fe_2O_3	2.56	3.14	4.23	1.09	2.34	3.05	2.57	3.46	1.29	1.93
FeO	3.41	.32	Trace	.37	.47	1.11	2.09	1.82	1.04	.91
MgO	2.97	.30	.69	.16	1.05	.78	2.50	2.13	.79	1.02
CaO	6.81	2.31	3.04	.95	1.52	1.82	4.26	4.55	2.02	2.30
Na_2O	2.99	4.69	3.98	3.98	3.19	3.68	3.84	3.50	2.20	3.10
K_2O	2.89	4.65	4.84	5.70	5.37	7.11	3.96	3.59	5.89	5.40
H_2O-	.38	.75	.16	.57	1.65	.52	.23	1.13	.28	.29
H_2O+	1.66	.32	.27	1.65	1.29	.83	1.37	1.71	3.43	2.58
TiO_2	1.16	.53	.60	.23	.48	.69	.72	.91	.47	.51
P_2O_5	.41	.17	.24	.04	.11	.37	.28	.28	.12	.45
MnO	.07	.05	.04	.06	.05	.03	.04	.04	.03	.04
CO_2	2.18	None	None	None	None	.67	None	Trace	None	Trace
	99.85	100.02	100.32	100.26	100.22	99.77	100.18	100.35	99.86	100.45

	K	L	M	N	O	P	Q	R	S
SiO_2	53.71	65.44	65.26	63.80	61.32	72.85	62.54	77.50	58.50
Al_2O_3	16.63	15.96	16.39	16.92	16.33	13.45	14.42	11.29	15.75
Fe_2O_3	3.97	1.63	1.98	3.35	2.85	1.11	3.51	.19	1.70
FeO	3.88	1.63	1.21	.47	1.75	.54	2.57	.34	3.95
MgO	3.69	.83	.83	.79	2.15	.24	2.41	.09	2.89
CaO	6.82	2.04	2.16	2.47	4.76	1.13	4.26	.25	5.54
Na_2O	2.87	3.78	4.23	4.36	3.84	4.01	3.83	.37	2.68
K_2O	2.30	6.49	6.30	5.05	4.17	5.40	3.98	8.96	4.13
H_2O-	.78	.11	.34	.72	.74	.08	.29	.22	.45
H_2O+	2.01	.53	.47	.93	.65	.40	.84	.48	1.64
TiO_2	1.40	.52	.55	.55	.75	.39	1.05	.14	1.21
P_2O_5	.44	.18	.14	.30	.37	.04	.36	.04	.37
MnO	.07	.05	.05	.07	.05	.06	.07	None	.05
CO_2	1.39	.54	.14	.02	.25	.27	None	.02	1.19
	99.96	99.73	100.05	99.80	99.98	99.97	100.13	99.89	100.05

MISCELLANEOUS ROCKS

A–C. Collected by F. L. Ransome and described in Prof. Paper 115, 1919. Analyses A and B by George Steiger, record 3173.

A. Pinal schist, Ray district, from south slope of Red Hills. Quartz, sericite, biotite, magnetite.

B. From dump of Prospect mine, Webster Gulch, Miami. Sericite prominent.

C. Leached rock, Miami mine, Miami. Analysis by Chase Palmer, record 3048.

D. Rock from Mascot mine, Dos Cabezos Range, collected by E. L. Jones, Jr. Analysis by R. C. Wells, record 3019.

E. "Schist" or possibly pinite, Glendale. Partial analysis by A. A. Chambers, record 3076.

	A	B	C	D	E		A	B	C	D	E
SiO_2	65.58	66.84	68.30	73.35	46.10	H_2O-	0.22	0.17	0.15	2.14	-----
Al_2O_3	16.47	17.46	17.41	15.14	36.34	H_2O+	2.27	2.61	2.44		-----
Fe_2O_3	4.19	4.88	3.80		2.48	TiO_2	.83	.67	.66	-----	-----
FeO	2.25	.74	.15	-----	-----	CO_2	-----	-----	None	-----	-----
MgO	1.29	1.14	.83	.14	-----	P_2O_5	.06	.03	.47	-----	-----
CaO	1.29	.37	.04	2.06	-----	MnO	.06	.02	Trace	-----	-----
Na_2O	1.42	.53	.53	3.36	1.11						
K_2O	4.58	4.65	5.71	3.91	10.01		100.51	100.11	100.49	100.10	96.04

ARKANSAS

Two samples submitted by C. S. Ross, from Howard County. Analyses by George Steiger, record C–600.

A. Phonolite low in femic minerals from Mine Creek, 4 miles north of Nashville.
B. Trachyte from Temperance Branch, 3 miles northwest of Nashville.

	A	B		A	B		A	B
SiO_2	58.77	62.97	K_2O	5.71	10.80	BaO	Trace	-----
Al_2O_3	20.60	19.00	H_2O-	.89	.72	SrO	0.01	-----
Fe_2O_3	1.40	1.13	H_2O+	2.19	1.26	CO_2	None	None
FeO	1.36		TiO_2	.37	.26	ZrO_2	.08	None
MgO	.54	.26	P_2O_5	.03	.10		100.18	99.90
CaO	.79	.54	S	.04	-----			
Na_2O	7.16	2.86	MnO	.24	-----			

AUSTRIA

Serpentine of the picrolite type from Carnot (?), Tyrol. Submitted by C. S. Ross. Analysis by J. G. Fairchild, record C–993.

SiO_2	40.97	FeO	Trace	H_2O	13.80
Al_2O_3	None	MgO	40.43	TiO_2	None
Fe_2O_3	5.55	CaO	None		100.75

BERMUDA

Altered lava, augite andesite, from well 1,110 feet deep, collected by L. V. Pirsson. Analysis by R. C. Wells, record 2871. Association of the rock described by Pirsson and Vaughan, Am. Jour. Sci., 4th ser., vol. 36, pp. 70–71, 1913.

SiO_2	38.79	CaO	14.65	TiO_2	0.80
Al_2O_3	14.55	Na_2O	2.78	CO_2	3.56
Fe_2O_3	5.67	K_2O	2.54		100.46
FeO	6.68	H_2O-	.67		
MgO	7.78	H_2O+	1.99		

CALIFORNIA

IVANPAH QUADRANGLE

Granites and latites collected by D. F. Hewett. Analyses by J. G. Fairchild, record C–999.

A. Kingston laccolith.
B. Granite, Erie Crater.
C. Volcanic neck east of Erie.
D. Rhyolite, Devils Peak.
E. Granite, Columbia Well.
F. Granite, Leiser Ray mine.
G. Piute Mountain.

	A	B	C	D	E	F	G
SiO_2	71.50	66.81	68.53	73.58	67.04	71.77	69.01
Al_2O_3	-----	16.16	-----	-----	15.37	14.60	-----
Fe_2O_3	-----	2.01	-----	-----	1.06	.77	-----
FeO	-----	1.25	-----	-----	2.51	1.77	-----
MgO	-----	.72	-----	-----	1.33	.20	-----
CaO	1.00	2.62	.51	.05	3.64	1.95	2.31
Na_2O	4.17	3.42	3.48	2.99	3.10	3.85	3.91
K_2O	5.91	5.66	6.19	5.52	4.61	4.31	4.76
H_2O-	-----	.10	-----	-----	.12	None	-----
H_2O+	-----	.48	-----	-----	.40	.53	-----
TiO_2	-----	.35	-----	-----	.45	.20	-----
	-----	99.58	-----	-----	99.63	99.85	-----

LASSEN PEAK

Rocks collected by J. S. Diller. A to D analyzed by W. C. Wheeler, record 2966.
A. Basalt, 7 miles southeast of Peak, Lake Tartarus.
B. Volcanic ash, collected September 14, 1914.
C. Solfataric mud, 6 miles southeast of Peak, Devil's Kitchen.
D. Solfataric mud, Lake Tartarus.
E. Dacite lava, Devil's Kitchen. Analysis by George Steiger, record 3084.

	A	B	C	D	E		A	B	C	D	E
SiO_2	57.25	63.86	54.97	47.51	64.52	TiO_2	0.42	0.45	0.83	0.65	0.59
Al_2O_3	18.25	16.07	27.72	34.08	16.77	ZrO_2	.01	.04	.03	.09	None
Fe_2O_3	1.44	1.56	.88	1.17	1.19	P_2O_5	.18	.12	.11	.81	.12
FeO	4.73	2.31	.32	.52	2.82	S	None	.84	1.11	.63	.02
MgO	4.57	2.11	.20	.28	2.60	MnO	.11	.05	None	Trace	.06
CaO	8.12	4.94	.39	.08	5.09	BaO	.05	.03	.03	.05	.04
Na_2O	2.85	3.59	.41	.21	3.78	SrO	.08	[1]	[1]	[1]	.02
K_2O	.99	1.91	.46	.11	2.09	Li_2O	Trace	Trace	Trace	Trace	------
H_2O-	.31	1.47	2.54	1.89	.12		100.01	100.16	99.93	99.68	100.34
H_2O+	.65	.81	9.93	11.60	.51						

[1] Undetermined.

A series of rocks collected by Howel Williams in the Lassen National Park. Analyses by George Steiger, record D–29.
F. Recent pyroxene basalt.
G. Recent basalt, northeast of Buttle lake.
H. Augite andesite, east slope of Mount Harkness.
I. Pyroxene andesite, Crystal Cliff, east of Juniper Lake.
J. Pyroxene andesite, Saddle Mountain, Warren Valley.
K. Black andesite of central plateau, east of Hat Mountain.
L. Old pyroxene basalt, Badger Mountain.
M. Hornblende-mica dacite, Divide Peak.
N. Augite andesite, Divide Peak, near Hat Creek.
O. Augite andesite, south slope of Brockeoff Mountain, above Huckleberry Lake.

	F	G	H	I	J	K	L	M	N	O
SiO_2	57.00	54.83	47.43	63.50	62.75	59.85	61.93	70.93	57.85	59.50
Al_2O_3	16.66	17.05	13.19	16.76	16.94	16.68	16.37	14.31	16.71	17.16
Fe_2O_3	.94	1.47	5.63	1.49	1.99	1.23	1.15	1.30	.88	2.27
FeO	5.40	5.79	7.04	2.80	2.46	4.40	3.90	1.26	4.93	3.94
MgO	5.12	5.47	5.20	2.90	3.27	3.85	3.26	.94	6.07	3.66
CaO	7.90	7.72	9.39	5.80	6.00	7.66	6.24	3.24	8.30	7.07
Na_2O	3.46	3.60	2.58	3.59	3.55	3.62	3.37	4.30	3.04	3.63
K_2O	1.22	1.77	1.79	2.22	2.46	1.46	2.00	2.76	1.18	1.50
H_2O-	.29	.27	2.02	.21	.28	.20	.18	.16	.16	.27
H_2O+	.64	.73	1.38	.35	.13	.53	.74	.65	.32	.41
TiO_2	90	1.25	4.00	.65	.62	.65	.60	.26	.60	.89
P_2O_5	.29	.42	.55	.18	.11	.15	.16	.12	.13	.17
MnO	.12	.11	.12	.07	.07	.12	.08	.06	.09	.08
BaO	.02	.03	.04	.03	.04	.03	.04	.05	.02	.02
	99.96	100.51	100.36	100.55	100.67	100.43	100.02	100.34	100.28	100.57

MOUNT WHITNEY QUADRANGLE

Three rocks collected and described by Adolph Knopf, Prof. Paper 110, 1918. Analyses by R. C. Wells, record 2892.
A. Granite, Ransom Creek, altitude 6,000 feet. Quartz, orthoclase, albite, anorthite, biotite.
B. Quartz monzonite, Lone Pine Creek, altitude 6,700 feet. Plagioclase, orthoclase, quartz, biotite, hornblende, titanite.
C. Quartz monzonite, altitude 13,000 feet. Quartz, orthoclase, plagioclase, biotite, hornblende, magnetite, titanite, apatite.

	A	B	C		A	B	C
SiO_2	76.28	66.68	69.01	TiO_2		0.64	0.49
Al_2O_3		15.12	15.44	CO_2		None	Trace
Fe_2O_3		1.66	1.28	P_2O_5		.21	.24
FeO		2.49	1.28	S		Trace	Trace
CaO	.47	4.09	2.54	MnO		.01	.01
MgO		1.38	.62	SrO		Trace	Trace
Na_2O	4.72	2.23	3.85			100.30	100.17
K_2O	4.73	4.97	4.52				
H_2O-		.31	.33				
H_2O+		.51	.56	Specific gravity	2.615	2.715	2.664

PALA DISTRICT

Rocks collected and analyzed by W. T. Schaller, record 2869.
A. Albitite dike near Pala.
B. Graphic granite, Anita gem tourmaline mine, Riverside County.

	A	B		A	B		A	B
SiO_2	59.71	73.93	MgO	None	0.08	Ignition	0.86	0.16
Al_2O_3	25.47	13.77	CaO	8.24	.48	CO_2	Trace	Trace
Fe_2O_3	.17	.25	K_2O	.22	9.16	P_2O_5	Trace	None
FeO	.22	.19	Na_2O	5.48	2.00			
MnO	None	.03	Li_2O	None	Trace	Total	100.37	100.05

MISCELLANEOUS ROCKS

A. Volcanic ash from north flank of Santa Monica Mountains, Los Angeles County, collected by M. N. Bramlette. , Analysis by Charles Milton, record D–180. For bentonite resulting from the decomposition of this rock see "Clays."

B. Hydrothermally altered greenstone from Mother Lode district, collected by Adolph Knopf and described in Prof. Paper 157, 1929. Analysis by J. G. Fairchild, record C–699. Ankerite, sericite, quartz, albite, rutile, pyrite, and minor arsenopyrite.

	A	B		A	B		A	B
SiO_2	65.66	34.17	Na_2O	1.10	1.65	P_2O_5	0.06	
Al_2O_3	12.71	[1] 15.82	K_2O	1.73	4.63	MnO	None	
Fe_2O_3	1.94	.69	H_2O-	4.34	None	BaO	.17	
FeO	1.60	7.61	H_2O+	8.03	1.94	FeS_2		2.74
MgO	.71	5.77	TiO_2	.40	1.49		99.89	100.76
CaO	1.44	8.75	CO_2		15.50			

[1] Includes P_2O_5 if present.

C–H. Graphitic schists. Determinations of graphite by George Steiger, records 3021, 3027, and 2880. C, 11.90; D, 17.48; E, 12.00; F, 7.29; G, 16.2; H, 10.4.
C. Eighty miles northeast of San Diego.
D–F. Twenty miles northeast of Saugus.
G. Leyeo prospect, San Diego County.
H. Mine of California Graphite Co., Saugus.

COLORADO

BONANZA DISTRICT

Rocks collected by W. S. Burbank and described in Prof. Paper 169, 1932. Analyses by J. G. Fairchild, record C–1010.
A. Augite-biotite andesite from ridge just below Superior mine.
B. Similar latite near top of Rawley andesite near mine.
C. Altered andesite, Rawley drainage tunnel, 4,450 feet from portal.
D. Same, 4,070 feet from portal. Red jasper type of alteration.
E. Same with pyrite crystals, 2,600 feet from portal.
F. Silicified andesite, ridge north of Express Gulch.
G. Volcanic rock with kaolin mineral from Greenback Gulch.
H. Same from hill between Greenback and Chloride Gulches.

	A	B	C	D	E	F	G	H
SiO_2	57.62	59.66	61.28	88.73	66.48	95.18	82.57	93.17
Al_2O_3	15.84	16.09	2.42	.97	1.64	1.20	11.44	2.52
Fe_2O_3	3.05	2.57	31.49	3.50	.64	.77	.16	.19
FeO	3.90	3.53	2.49	3.56	2.74	2.27	.65	1.92
MgO	2.14	2.29	.05	.05	Trace	-------	Trace?	.03
CaO	4.81	4.48	.28	.24	.20	-------	None	.05
Na_2O	3.07	3.08	Trace	-------	Trace	Trace	Trace	Trace
K_2O	4.95	4.92	.19	-------	.27	Trace	1.89	.15
H_2O-	.24	.25	.05	.02	Trace	None	.43	.09
H_2O+	1.39	1.84	.58	.69	1.64	.40	2.98	1.03
TiO_2	1.30	1.00	.50	1.50	1.45	.25	.35	.63
CO_2	1.06	.10	None	-------	-------	-------	-------	-------
P_2O_5	.44	.35	.20	.20	.43	.06	.09	.10
SO_3	.05	-------	.28	(1)	None	Trace	.12	.20
Cl	-------	-------	Trace	(1)	.09	-------	-------	-------
S	-------	-------	.06	-------	Present	-------	-------	-------
MnO	.15	-------	-------	-------	-------	-------	-------	-------
BaO	.04	-------	.30	None	Trace?	None	.06	.07
FeS_2	-------	-------	Trace	-------	24.96	-------	-------	-------
ZnS	-------	-------	None	-------	.05	-------	-------	-------
	100.05	100.16	100.17	99.46	100.59	100.13	100.74	100.15
Specific gravity of particles	2.732	2.723	3.227	2.786	3.106	2.688	-------	-------
Specific gravity of lump	2.713	2.686	3.072	2.667	2.998	2.598	-------	-------

[1] Undetermined.

BRECKENRIDGE DISTRICT

Rocks described by F. L. Ransome in Prof. Paper 75, 1911. Analyses by R. C. Wells, record 2426, with corrected fluorine determinations by J. G. Fairchild.

A. Quartz monzonite porphyry, Brewery Hill. Plagioclase, orthoclase, quartz, biotite, magnetite, pyrite, apatite, titanite, zircon, and allanite, with very little calcite and chlorite.

B. Quartz monzonite porphyry, Browns Gulch. Orthoclase, plagioclase, quartz, biotite, apatite, rarely allanite, and secondary epidote, calcite, chlorite, and pyrite.

C. Quartz monzonite porphyry, Mount Guyot. Labradorite, orthoclase, quartz, biotite, hornblende, titanite, and magnetite.

	A	B	C		A	B	C
SiO_2	67.53	68.14	64.28	F	0.07	0.04	0.02
Al_2O_3	15.46	15.29	16.99	S	.05	.81	None
Fe_2O_3	2.24	1.36	2.59	V_2O_3	-------	-------	.03
FeO	2.42	1.66	2.64	Cr_2O_3	None	-------	-------
MgO	.16	.26	1.13	NiO	None	.01	None
CaO	3.24	3.03	3.95	MnO	.10	.12	.14
Na_2O	3.24	3.59	3.78	BaO	.07	.03	.10
K_2O	3.86	4.07	3.51	SrO	None	.03	.04
H_2O-	.23	.40	.07	Li_2O	-------	-------	None
H_2O+	.55	.39	.25				
TiO_2	.41	.36	.49		99.69	99.99	100.34
ZrO_2	.02	.01	.01	Less O	.05	.32	.01
CO_2	.03	.22	None				
P_2O_5	.01	.17	.32		99.64	99.67	100.33

COCHETOPA QUADRANGLE

Rocks collected by E. S. Larsen. Analyses by J. G. Fairchild, record C–663.

A. Augite-hornblende andesite of the middle horizon, north of the Saguache River, on trail near head of Spanish Creek, 1 mile from point where trail leaves creek.

B. Sheep Mountain andesite, upper horizon, Continental Divide, 0.75 mile east of point where long branch trail crosses divide. Chemically rhyolite.

	A	B		A	B		A	B
SiO_2	58.31	70.93	CaO	6.07	1.28	TiO_2	1.00	0.30
Al_2O_3	16.55	15.87	Na_2O	4.00	4.21	P_2O_5	.33	Trace
Fe_2O_3	5.30	.85	K_2O	3.52	5.33			
FeO	1.36	.33	H_2O-	1.02	.15		99.94	100.52
MgO	2.12	.08	H_2O+	.36	1.19			

CONEJOS QUADRANGLE

Rocks collected by E. S. Larsen.

A. Fine-grained olivine andesite, northeast shoulder of Green Mountain, halfway up to the top. Less than 1 percent of olivine phenocrysts, augite 18 percent, a little hypersthene, much andesine, and considerable magnetite. Analysis by Glenn V. Brown, record 3270.

B. Similar rock analyzed by George Steiger, record 3252.

C. Pyroxene andesite from the Conejos River 4 miles southeast of west border of quadrangle, at an altitude of 11,000 feet. Analysis by R. K. Bailey, record C–421–a.

D. Hornblende andesite from north base of McIntyre Mountain. Analysis by J. G. Fairchild, record C–421–b.

E. Felsitic quartz latite from east slope of Caldwell Mountain at an altitude of 10,500 feet. Analysis by J. G. Fairchild, record C–663.

F. Biotite-quartz latite from northwestern part of the quadrangle, along trail from the Alamosa River to the head of Cat Creek and 2 miles north of Alamosa ranger station. Analyses F and G by J. G. Fairchild, record C–421–b.

G. Pyroxene-hornblende andesite, low in dark minerals, from saddle 1 mile south of Bennet Peak.

H. Rhyolite tuff from west slope of McIntyre Point at an altitude of 9,650 feet. Analysis by J. G. Fairchild, record C–493.

I. Treasure Mountain quartz latite from west slope of McIntyre Point at an altitude of 9,840 feet. Analyses I to L by J. G. Fairchild, records C–614 and C–663.

J. Biotite-augite latite from same locality at an altitude of 10,000 feet.

K. Latite of Chiquita Peak, northeast slope of Green Mountains along the ridge at an altitude of 8,750 feet.

L. Andesite-basalt of Hinsdale formation, cliffs north of Mogote Peak.

M. Basalt, intrusive phase, Las Mogotes Peak. Plagioclase, 62 percent; augite, 20 percent; olivine, iron oxide, 5 percent each, and secondary minerals, 8 percent. Analysis by G. V. Brown, record 3270.

	A	B	C	D	E	F	G
SiO_2	55.21	55.55	60.41	59.85	64.60	64.28	64.21
Al_2O_3	15.72	14.89	16.20	17.31	16.71	17.16	16.31
Fe_2O_3	4.56	4.28	4.80	5.36	3.67	3.84	2.87
FeO	4.58	4.22	2.24	.55	.30	.52	1.23
MgO	4.17	3.90	2.21	1.96	1.05	.55	1.17
CaO	6.67	6.35	6.37	5.60	3.45	1.85	3.61
Na_2O	2.89	4.35	4.02	3.16	4.35	3.94	2.76
K_2O	4.14	3.36	2.64	2.90	4.41	5.38	4.26
H_2O-	.61	.42	.44	.46	.20	1.03	.44
H_2O+	.13	.72	.12	1.64	1.06	1.05	2.69
TiO_2	1.45	1.40	1.00	.63	.60	.90	.57
P_2O_5	None	.98	None	.31	.20	.20	.20
MnO	.06	.12	.10	.11	----------	Trace	.06
SrO	.04	.07	----------	----------	----------	----------	----------
BaO	----------	.07	----------	----------	----------	----------	----------
CO_2	----------	----------	None	----------	Trace	----------	----------
	100.23	100.68	100.55	99.84	100.60	100.70	100.38

	H	I	J	K	L	M
SiO_2	61.76	68.40	66.96	61.52	50.95	50.18
Al_2O_3	15.42	14.90	16.19	16.12	16.10	16.47
Fe_2O_3	4.25	2.74	2.99	3.36	6.01	8.92
FeO	.51	.36	.49	2.32	4.23	2.60
MgO	1.95	.12	.16	2.03	7.02	6.98
CaO	3.50	2.21	2.86	4.73	8.24	9.30
Na_2O	2.66	4.24	4.65	3.72	3.59	2.74
K_2O	3.84	5.21	4.88	3.70	1.73	1.04
H_2O-	2.08	.43	.26	.12	.05	.08
H_2O+	2.90	.47	.10	1.84	.61	.35
TiO_2	.63	.68	.63	1.00	1.62	1.60
P_2O_5	.27	.14	.17	.27	.13	.29
MnO	Trace	----------	.14	----------	.11	None
SrO	----------	----------	Trace	----------	----------	.03
BaO	----------	----------	.13	----------	----------	----------
CO_2	----------	----------	----------	----------	----------	----------
ZrO_2	----------	----------	.03	----------	----------	----------
	99.77	99.90	100.64	100.73	100.39	100.58

CREEDE QUADRANGLE

Latite-andesites collected by E. S. Larsen. Analyses A–C by George Steiger, record C–651; D–E and H–J by J. G. Fairchild, records C–547, C–474, and C–663; F–G by R. K. Bailey, record C–474.

A. Table Mountain.

B. East of Farmers Creek.

C. Under benchmark 12029, Nelson Mountain, Creede and vicinity quadrangle.

D. Nearly black hornblende-pyroxene andesite from shoulder of Mount Hope, at 12,500 feet.

E. Hornblende-pyroxene andesite from ridge east of Table Mountain, at 12,350 feet.

F. Quartz-biotite-pyroxene latite-andesite from west edge of mesa between forks of Bellows Creek, north of the Rio Grande, a little north of point 11,511 of topographic map.

G. Biotite-hornblende-quartz latite from draw on west slope of hill 9740, north of the Rio Grande, between Farmers and Bellows Creeks, at 9,100 feet.

H. Quartz latite from eastern part of quadrangle about 2 miles east of the village of South Fork, south of the Rio Grande, at 8,800 feet, in the small gulch on the road to the head of Willow Creek.

I. Latite from Alder Creek, Alboroto type.

J. Fisher latite-andesite from southeast slope of McClelland Mountain, at 1,065 feet.

	A	B	C	D	E	F	G	H	I	J
SiO_2	69.66	64.27	65.34	59.26	59.95	60.54	64.59	61.80	64.93	65.29
Al_2O_3	14.92	17.89	16.00	17.27	16.92	16.01	15.22	16.13	15.59	15.56
Fe_2O_3	2.10	2.38	3.96	3.63	4.70	3.63	2.73	6.40	3.46	4.13
FeO	.36	.58	.61	3.30	2.42	2.34	1.79	.32	.94	.55
MgO	.74	.57	.78	2.01	1.64	2.49	1.83	1.32	1.41	.78
CaO	1.89	2.82	3.61	6.01	5.83	5.44	3.91	4.08	3.68	3.41
Na_2O	4.24	4.32	3.96	3.32	3.12	2.40	3.52	3.50	3.60	3.66
K_2O	4.55	4.67	3.59	2.50	2.78	3.68	3.72	3.82	4.05	4.61
H_2O-	.17	.46	.52	.17	.60	.23	.59	.79	.81	.60
H_2O+	.31	.75	.38	.71	.88	1.07	1.27	.89	.57	.94
TiO_2	.42	.48	.59	.91	.91	1.10	.70	1.00	.70	.85
ZrO_2	.05	.05	.04	------	------	------	------	------	------	------
CO_2	None	.15	None	------	------	------	------	------	------	------
P_2O_5	.09	.10	.18	.32	.31	.51	.29	.32	.23	.26
MnO	.10	.07	.09	------	.08	------	------	------	------	------
BaO	.12	.29	.08	------	------	------	------	------	------	------
SrO	------	.02	------	------	------	------	------	------	------	------
	99.72	99.87	99.73	99.41	100.14	99.44	100.16	100.37	99.97	100.64

Tridymite latite collected by Whitman Cross 100 yards north of schoolhouse at Bachelor and described by Emmons and Larsen in Bull. 718, p. 45, 1923. A third consists of phenocrysts of orthoclase, andesine, some biotite, and accessory apatite, magnetite, and zircon. The fluidal ground mass is made up of felsitic intergrowths of alkali feldspar and tridymite. Analysis by George Steiger, record 2875.

SiO_2	67.76	K_2O	4.91	S	0.02
Al_2O_3	16.08	H_2O-	.94	MnO	.04
Fe_2O_3	2.22	H_2O+	.54	BaO	.12
FeO	.23	TiO_2	.45	SrO	.03
MgO	.43	ZrO_2	.02		
CaO	2.59	CO_2	None	Total	100.55
Na_2O	4.06	P_2O_5	.11		

DEL NORTE QUADRANGLE

Rocks collected by E. S. Larsen.

A. Quartz latite from Carnero Creek, 200 yards north of the main forks. Analysis by George Steiger, record C–651.

B. Tridymite latite-andesite from canyon of Carnero Creek about 3 miles above La Garita post office. Phenocrysts of andesine, hornblende, biotite, augite, hypersthene, magnetite, and apatite, in ground mass of oligoclase, orthoclase, quartz, and hematite. Analysis by R. K. Bailey, record C–474.

C. Tabular feldspar-pyroxene andesite from a flow 0.75 mile east of west boundary of quadrangle on north bank of La Garita Creek. Analysis by J. G. Fairchild, record 3293.

D. Vitreous hornblende-augite-quartz latite from locality near head of Bear Creek in northwestern part of quadrangle. Fragment from breccia bed near the base of the section. Analysis by George Steiger, record C–651.

E. Soda rhyolite from dike west of center of quadrangle, southwest of diorite stock of Summer Creek. Analysis by George Steiger, record 3252.

	A	B	C	D	E
SiO_2	64.66	59.95	54.84	65.29	71.21
Al_2O_3	15.46	14.62	18.28	16.17	15.24
Fe_2O_3	4.05	5.30	3.98	1.54	1.46
FeO	.78	1.26	2.97	1.70	.33
MgO	1.56	2.76	2.55	1.23	.20
CaO	4.12	5.35	7.24	3.00	1.56
Na_2O	4.42	4.06	4.10	3.76	4.41
K_2O	2.45	3.52	3.38	3.93	4.75
H_2O-	.54	.55	.99	.22	.44
H_2O+	.56	1.13	.41	2.24	.64
TiO_2	.71	1.38	1.40	.62	.24
ZrO_2	None			.05	
CO_2				None	
P_2O_5	.32	.45	.49	.10	.10
MnO	.03		.08	.08	(1)
BaO	.08			.15	(1)
SrO					.03
Total	99.74	100.33	100.71	100.08	100.61

[1] Undetermined.

LEADVILLE DISTRICT

Fresh Mount Zion porphyry collected by G. F. Loughlin and described in Prof. Paper 148, 1927. Oligoclase-andesine 35 percent, orthoclase 28 percent, quartz 17 percent, chlorite 10 percent, magnetite 5 percent, calcite 5 percent, apatite less than 1 percent. Analysis by J. G. Fairchild, record C–519.

SiO_2	63.25	CaO	2.99	CO_2	0.88
Al_2O_3	16.16	Na_2O	3.54	TiO_2	.50
Fe_2O_3	2.60	K_2O	3.26	P_2O_5	.30
FeO	2.44	H_2O-	.63		
MgO	1.62	H_2O+	1.85		100.02

NEDERLAND DISTRICT

Granitic gneiss collected by T. S. Lovering. Analyses by J. G. Fairchild, record D–35.

A–D from fifth level of Coldspring mine close to new shaft, about 3 miles northeast of Nederland.

E–F from vein near breast of Lilly tunnel, 2 miles northeast of Nederland.

	A	B	C	D	E	F
SiO_2	65.67	63.34	66.61	68.71	65.08	66.31
Al_2O_3	16.52	18.21	15.13	14.93	15.26	15.07
Fe_2O_3	1.21	.79	1.40	1.02	1.30	1.35
FeO	2.53	2.44	2.26	2.07	2.90	2.71
MgO	1.00	1.08	1.45	1.50	.93	1.03
CaO	.08	.40	1.23	2.01	.43	2.06
Na_2O	.81	.41	1.20	2.85	.94	2.48
K_2O	6.70	6.11	5.02	5.14	8.63	5.96
H_2O-	.94	.71	1.45	.14	.17	.06
H_2O+	2.34	4.07	2.08	.56	1.38	.90
TiO_2	.33	.75	.54	.62	.75	.66
CO_2	1.70	1.16	1.09	.46	1.75	.98
P_2O_5	.22	.24	.19	.16	.31	.32
SO_3					.64	
S (total)	.02	.04	.02	Trace?		.04
Total	100.07	99.75	99.67	100.17	100.47	99.93

Three igneous rocks from Boulder County, collected by E. N. Goddard. Analyses by R. E. Stevens, record D–455.

G. Biotite-sillimanite schist, 2½ miles S. 60° E. of Jamestown. Biotite, sillimanite, quartz, and muscovite.

H. Augite porphyry, 0.9 mile S. 80° E. of Sugarloaf Mountain, Nederland district. Augite, olivine, magnetite, and glass.

I. Hornblende monzonite, 1,700 feet west of Silver Queen mine, Nederland district. Large phenocrysts of oligoclase, hornblende, and some magnetite in a fine-grained groundmass of quartz and orthoclase.

	G	H	I		G	H	I
SiO_2	42.20	37.83	63.39	H_2O-	0.19	1.24	0.13
Al_2O_3	35.45	8.52	16.75	H_2O+	3.29	2.56	.93
Fe_2O_3	1.70	6.48	1.83	TiO_2	1.25	1.35	.35
FeO	8.18	5.52	3.05	CO_2	Trace	6.08	.09
MgO	2.80	11.44	.90	P_2O_5	.06	1.02	.39
CaO	.18	13.80	3.85	MnO	.09	.21	.14
Na_2O	.62	2.82	4.26				
K_2O	4.32	1.15	3.61		100.33	100.02	99.67

SAGUACHE QUADRANGLE

Sheep Mountain andesite, lower horizon, collected by E. S. Larsen from south side of Saguache Creek, about 0.25 mile below mouth of Ford Creek, altitude 8,400 feet. Analysis by J. G. Fairchild, record C–663.

SiO_2	60.67	CaO	4.05	TiO_2	0.80
Al_2O_3	17.50	Na_2O	4.45	P_2O_5	.38
Fe_2O_3	3.86	K_2O	4.19		100.16
FeO	.95	H_2O-	1.09		
MgO	1.79	H_2O+	.43		

SAN CRISTOBAL QUADRANGLE

A–H. Rocks collected by E. S. Larsen. Analyses by J. G. Fairchild, records C–954, C–474a, C–547, and C–614.

A. Hornblende-quartz latite from first ridge south of Powderhorn Gulch, at 10,900 feet. About 20 percent of phenocrysts, chiefly labradorite, some green-brown hornblende, in a groundmass clouded with hematite and carrying minute oligoclase laths in glass.

B. Quartz-bearing hornblende-pyroxene andesite from mesa between Red Mountain and Middle Creek, 4 miles north of Piedra Peak.

C. Biotite-pyroxene latite-andesite from west slope of Mineral Creek, near head, at an altitude of 11,400 feet.

D. Quartz latite with large phenocrysts from ridge south of Grassy Mountain, west of Lake San Cristobal, at an altitude of 10,400 feet.

E. Huerto andesite, 2 miles northwest of Cache Lake at top of hill, altitude 12,355 feet.

F. Latite of Alboroto quartz latite type from Texas Creek.

G. Piedra rhyolite from crest west of Bennett Creek.

H. Treasure Mountain quartz latite, saddle between Vete and Bear Creeks.

I. Alboroto quartz latite, canyon of Texas Creek. Collected by Whitman Cross. Contains phenocrysts of andesine-labradorite, quartz, orthoclase, hornblende, augite, biotite, and sphene in a groundmass of quartz and alkali feldspar. Apatite, zircon, and iron oxides are present. Analysis by W. T. Schaller, revised by J. G. Fairchild in 1925, record 2864.

	A	B	C	D	E	F	G	H	I
SiO_2	66.28	57.56	58.73	66.18	53.65	66.51	74.07	69.07	66.39
Al_2O_3	16.14	15.06	15.73	14.41	16.68	15.58	13.38	14.98	15.45
Fe_2O_3	2.46	6.75	4.14	2.35	4.81	2.43	.97	3.06	2.50
FeO	1.11	1.59	2.85	1.26	4.48	1.38	.33	.30	1.13
MgO	.50	3.43	2.69	.90	2.77	1.03	Trace?	.12	.85
CaO	3.19	6.01	5.29	3.20	7.44	3.40	.76	1.79	3.71
Na_2O	3.89	3.12	3.08	3.72	3.01	3.61	3.72	3.48	3.65
K_2O	5.16	2.84	3.34	4.76	2.71	4.74	5.60	4.93	4.59
H_2O-	.18	.31	.76	.07	.99	.49	.18	.58	.66
H_2O+	.65	.61	1.32	.60	.81	.61	.44	1.10	.56
TiO_2	.60	1.50	1.10	1.20	1.80	.50	.20	.50	.50
ZrO_2									.03
P_2O_5	.22	.38	.32	.13	.45	.20	Trace	.16	.36
CO_2		.07		.94					None
SO_3		.10							
S		None							.03
MnO		.09	.14	.06	.27				.06
BaO		.06							.07
SrO		.14							.02
Total	100.38	99.62	99.49	99.78	99.87	100.48	99.65	100.07	100.56

SAN JUAN REGION

Rocks collected by E. S. Larsen. See Bull. 843, 1935. Analyses by J. G. Fairchild: A–B, record 3293; C, C–726; D–G, C–804.

A. Soda syenite from north flank of Mesa Angostulla, 6 miles east of Manassa.

B. Diorite, same locality. Feldspars largely andesine, but some orthoclase and albite are present. Biotite, augite, and magnetite.

C. Sheep Mountain andesite 0.5 mile west-southwest of bench mark in Carson Pass.

D. Glassy matrix rhyolite from Valles Mountain, N. Mex.

E. Spherulites enclosed in glassy matrix rhyolite from Valles Mountain, N. Mex.

F. Andesite from east side of Boot Mountain, northeast corner of Creede quadrangle.

G. Rhyolite from altitude of 9,170 feet in canyon 0.5 mile northeast of hill 10,315, which is midway between Old Woman Creek and west line of quadrangle.

	A	B	C	D	E	F	G
SiO_2	59.68	58.45	56.40	71.57	67.04	76.04	76.46
Al_2O_3	18.40	16.61	16.17	15.10	15.88	12.32	12.60
Fe_2O_3	2.54	2.74	4.19	1.04	3.05	.32	.51
FeO	1.05	3.44	4.30	.29	.77	.80	.51
MgO	1.14	2.58	3.55	.36	.75	.20	.36
CaO	4.24	4.66	7.07	1.19	2.37	.52	Trace
Na_2O	6.40	4.16	3.22	3.88	3.86	3.51	4.60
K_2O	4.42	4.66	2.79	5.80	5.48	6.64	4.32
H_2O-	Trace	.14	.51	.26	.23	.01	.06
H_2O+	.36	.46	.47	.46	.53	.05	.84
TiO_2	1.28	1.38	1.31	.15	.55	.10	.10
P_2O_5	.45	.51	.29	.06	.17	Trace	None
MnO	Trace	.08	.12				
Total	99.96	99.87	100.39	100.16	100.68	100.51	100.36

SPANISH PEAKS DISTRICT

Seven rocks collected by Adolph Knopf. Analyses by George Steiger, record D–266.

A. Augite diorite porphyry from dike on Bear Creek. Contains large and abundant phenocrysts of labradorite and some augite in a groundmass of plagioclase, augite, and biotite, with minor quartz, magnetite, and apatite.

B. Shonkinite porphyry from Walsen dike, at intersection with Walsenburg-Gardner road, Walsenburg quadrangle. Consists of phenocrysts of augite, biotite, and olivine in a groundmass of augite, biotite, and sanidine, with abundant magnetite.

C. Shonkinite from dike near Walsenburg-La Veta road, Walsenburg quadrangle. Consists mainly of augite, biotite, olivine and sanidine, with some nosean (?) and abundant magnetite and apatite.

D. Monchiquite from Unfug dike, south of Walsenburg, Walsenburg quadrangle. Contains abundant phenocrysts of olivine and augite in a groundmass of biotite, magnetite, apatite, analcite, plagioclase, and sanidine.

E. Granite porphyry, east flank of East Spanish Peak, Spanish Peaks quadrangel. A white porphyry crowded with phenocrysts of oligoclase and orthoclase and minor hornblende and biotite in a groundmass of feldspar and quartz.

F. Olivine essexite from Huerfano Butte, Walsenburg quadrangle. Consists of augite, biotite, olivine, and plagioclase, with minor magnetite, apatite, analcite, and titanite.

G. Pyroxene diorite from summit of West Spanish Peak, Spanish Peaks quadrangle. Consists of andesine, augite, hypersthene, biotite, and minor quartz, magnetite, and apatite.

	A	B	C	D	E	F	G
SiO_2	54.46	46.37	52.90	45.18	73.47	46.73	59.18
Al_2O_3	17.47	11.98	10.20	12.36	13.74	13.04	15.95
Fe_2O_3	4.25	5.05	3.61	4.44	1.15	3.62	3.00
FeO	2.83	5.16	4.44	5.72	.70	7.35	3.88
MgO	2.90	8.38	9.06	10.25	.35	9.66	2.74
CaO	5.91	9.33	6.91	10.37	1.24	10.22	4.73
Na_2O	4.37	2.84	2.20	2.64	4.39	3.06	4.42
K_2O	3.06	4.34	6.36	3.08	4.52	1.93	3.63
H_2O-	.53	.71	.14	.27	.22	.33	.13
H_2O+	1.61	2.17	1.73	2.89	.18	1.50	.56
TiO_2	1.48	1.80	1.17	1.63	.34	1.76	1.36
CO_2	.37	.24	None	Trace	None	Trace	.16
P_2O_5	.69	1.34	.63	1.02	.08	.76	.52
MnO	.08	.10	.11	.11	.06	.16	.10
BaO	----------	----------	.07	.17	----------	----------	----------
Cl	----------	----------	None	.10	----------	----------	----------
S	----------	----------	None	None	----------	----------	----------
SO_3	----------	----------	.07	.25	----------	----------	----------
ZrO_2	----------	----------	None	----------	----------	----------	----------
	100.01	99.81	99.60	100.48	100.44	100.12	100.36
Less $O=Cl_2$	----------	----------	----------	.03	----------	----------	----------
	----------	----------	----------	100.45	----------	----------	----------

SUMMITVILLE QUADRANGLE

A. Tabular feldspar-pyroxene andesite from Carnero Canyon, collected by E. S. Larsen. Analyses A and B by R. K. Bailey, record C–474–b. Phenocrysts of calcic labradorite 20 percent, augite 10 percent, hypersthene a little; in the groundmass, andesine 40 percent, orthoclase 10 percent, quartz 6 percent, augite 5 percent, magnetite 7 percent.

B. Similar rock from west slope of Summit Peak, at an altitude of 12,800 feet. Carries somewhat more quartz and alkali feldspar and less mafites.

C. Gabbro-diorite southeast of Buckle Lake, at an altitude of 10,500 feet. Analyses C to F by J. G. Fairchild, record C–493.

D. Gabbro-diorite from Gold Creek at an altitude of 11,400 feet on northwest slope of peak, 400 feet from summit.

E. Basaltic pyroxene andesite near head of the Alamosa River and 1 mile southeast of Summit Peak.

F. Latite from west slope of Treasure Mountain.

G. Treasure Mountain quartz latite from northwest slope of Sheep Mountain. Analysis by J. G. Fairchild, record C–614.

	A	B	C	D	E	F	G
SiO_2	55.86	60.21	55.77	55.47	57.76	67.03	70.80
Al_2O_3	13.71	15.34	15.04	16.86	16.24	15.71	14.48
Fe_2O_3	5.55	3.23	3.77	4.34	3.87	2.74	2.14
FeO	3.67	3.10	4.38	3.33	3.54	.69	.16
MgO	4.26	2.57	4.44	2.82	2.76	.60	.14
CaO	6.34	4.95	6.58	6.20	6.45	2.15	1.24
Na_2O	3.40	4.06	2.85	3.34	3.31	3.94	3.24
K_2O	2.94	3.54	2.82	2.82	2.59	4.72	6.58
H_2O-	.99	.43	.70	.63	.80	.47	.13
H_2O+	.60	.83	.58	.86	.72	.75	.57
TiO_2	1.66	1.05	1.14	1.33	1.00	.64	.45
P_2O_5	.82	.74	.28	.35	.35	.20	.11
ZrO_2	----------	----------	Trace	----------	----------	----------	----------
CO_2	----------	----------	.89	1.45	None	Trace?	----------
S	----------	----------	.03	----------	----------	----------	----------
MnO	----------	----------	.07	Trace	.11	Trace	----------
BaO	----------	----------	.06	.13	----------	----------	----------
SrO	----------	----------	.13	.04	----------	----------	----------
	99.80	100.05	99.53	99.97	99.50	99.64	100.04

UNCOMPAHGRE QUADRANGLE

Rocks collected by E. S. Larsen. Analyses by George Steiger, record 2982.

A. Biotite rock associated with pyroxenite, collected on the north side of Beaver Creek about half a mile southwest of the forks. Rather coarse-grained and made up chiefly of biotite with considerable apatite.

B. "Iron ore", variety of pyroxenite. North side of gully passing bench mark 8104, just below 8,300-foot contour. Rather coarse-grained rock made up of about equal amounts of magnetite and perofskite with a little mica, apatite, and pyroxene.

C. Garnet-nepheline rock. South of Beaver Creek and south of the mouth of North Beaver Creek, at an altitude of 8,540 feet. Coarse-grained, about equal quantities of garnet (schorlomite) and nepheline with little pyroxene and apatite.

D. Uncompahgrite. Between Beaver and North Beaver Creeks. Medium-grained rock made up about half of melilite with considerable pyroxene, biotite, apatite, magnetite, perofskite, and amphibole.

E. Altered uncompahgrite. South of Beaver Creek, just south of hill 8600. Contains a little pyroxene in altered melilite. The melilite is altered to garnet, diopside, and vesuvianite.

F. Titanite-rich pyroxenite. South of North Beaver Creek about a mile above its junction with Beaver Creek. Made up of nearly equal quantities of pyroxene and titanite with a little apatite and altered nepheline.

	A	B	C	D	E	F
SiO_2	22.02	0.99	35.82	38.04	40.01	43.50
Al_2O_3	10.80	2.80	18.04	6.34	5.41	3.97
Fe_2O_3	8.82	24.03	9.92	8.45	7.12	3.42
FeO	6.44	14.26	2.02	5.90	1.08	4.41
MgO	13.02	1.90	.77	7.81	8.89	8.12
CaO	13.58	19.86	17.18	27.19	30.99	24.69
Na_2O	.70	None	6.30	2.16	.60	1.55
K_2O	4.75	None	3.04	.12	None	.14
H_2O-	1.51	.39	.42	.22	.52	.34
H_2O+	2.70	.37	.82	.48	2.00	.58
TiO_2	8.79	35.05	4.61	1.98	1.00	5.35
ZrO_2	None	None	.05	None	None	None
CO_2	None	.08	.48	.30	1.51	.66
P_2O_5	6.35	.58	.08	.24	.88	3.11
S	.02	.01	.03	.02	.06	.03
F	.07					
Cl	.04					
Cr_2O_3	.01	None	None	None	None	None
V_2O_3	.03	.06	.05	None	None	None
NiO	.02	None	None	None		None
MnO	.15	.24	.19	.23	.11	.19
BaO	.48	None	None	None	None	None
SrO	.17	.06	None	.26	.21	.13
	100.47	100.68	99.82	99.74	100.39	100.19
Less O	.04					
	100.43					
Specific gravity	3.386	4.335	3.151	3.257	3.165	3.298

G–K. Rocks collected by E. S. Larsen.

G. Shonkinite from Wildcat Gulch, altitude 8,100 feet. Orthoclase, augite, olivine, biotite, magnetite, apatite.

H. Augite-microcline syenite, south side of Wildcat Gulch, altitude 8,300 feet. Microperthite, augite, biotite, amphibole, magnetite, apatite, little quartz, titanite, zircon, and rutile. These two rocks described by J. Fred Hunter in Bulletin 777, 1925.

I. Soda syenite, north fork of Beaver Creek. About 90 percent microperthite, 10 percent aegirine-diopside, and minor apatite, titanite, zircon, and fluorite. Analyses G–I by George Steiger, record 2900.

J. Alteration product of melilite, Iron Hill. Analysis by George Steiger, record 2909.

K. Alboroto quartz latite from base of the formation, northwest part of quadrangle. Analysis by J. G. Fairchild, record C–954.

	G	H	I	J	K
SiO_2	50.86	54.99	65.08	33.70	72.94
Al_2O_3	11.14	12.98	16.65	29.40	13.06
Fe_2O_3	2.93	3.13	2.01	----------	.72
FeO	5.21	3.92	1.08	----------	1.45
MgO	11.26	5.50	.21	None	.21
CaO	6.97	5.67	1.49	4.18	1.08
Na_2O	1.73	2.83	7.31	18.52	3.70
K_2O	5.85	7.08	5.14	1.45	6.15
H_2O-	.64	.41	.32	.72	.39
H_2O+	.95	.58	.30	4.24	.69
TiO_2	.84	.99	.20	.07	.25
SrO_2	.02	.04	.03	----------	----------
CO_2	None	None	None	3.18	----------
P_2O_5	.79	1.00	.04	----------	.05
S	.02	.05	.02	----------	----------
Cr_2O_3	.11	.01	None	----------	----------
V_2O_3	None	None	None	----------	----------
NiO	.04	.04	None	----------	----------
MnO	.13	.13	.13	----------	----------
BaO	.31	.47	.03	----------	----------
SrO	.22	.17	.03	.08	----------
SO_3	----------	----------	----------	4.65	----------
Cl	----------	----------	----------	None	----------
	100.02	99.99	100.07	100.19	100.69
Specific gravity	----------	----------	----------	2.443	----------

MISCELLANEOUS ROCKS

Five intrusives, Eocene, from Gunnison County, collected by J. W. Vanderwilt. Analysis A by J. G. Fairchild, B–E by Charles Milton, record D–172.

A. Granite from Treasure Mountain. Orthoclase (perthitic), quartz, biotite, a little magnetite, apatite, and titanite.

B. Intrusive from Snowmass Mountain. Orthoclase, oligoclase-andesine, quartz, brown biotite, calcite; minor green hornblende, magnetite, apatite, titanite, sericite, clinozoisite, chlorite replacing biotite, zircon, a grain or two of strongly pleochroic allanite, and possibly leucoxene (dark-brown semiopaque alteration product).

C. Intrusive from Snowmass Mountain. Orthoclase, oligoclase-andesine, quartz, brown biotite, green hornblende, magnetite, minor apatite, titanite, sericite, zircon.

D. Intrusive from Snowmass Mountain. Minerals similar to B. Much calcite replacing mafic minerals. Feldspars albitized.

E. Similar to C.

	A	B	C	D	E
SiO_2	76.46	66.19	59.68	60.67	56.83
Al_2O_3	12.58	15.72	16.31	16.76	16.67
Fe_2O_3	.52	2.36	4.11	1.52	4.62
FeO	.59	2.13	4.11	3.64	4.48
MgO	.13	1.26	2.51	1.98	2.75
CaO	.52	2.58	6.36	2.96	6.45
Na_2O	3.78	3.87	3.42	6.48	3.56
K_2O	5.45	3.60	2.12	.60	1.82
H_2O-	None	.93	.05	1.98	.88
H_2O+	.48		.65		
TiO_2	.05	.49	.60	.50	.58
CO_2	Trace	.20	----------	2.03	.07
P_2O_5	.06	.40	.42	.40	.59
MnO	.04	.02	.17	.04	.21
BaO	----------	.21	.18	.06	.09
	100.66	99.96	100.69	99.62	99.60

F. Dike from Fortification Rocks, sec. 12, T. 9 N., R. 91 W., 1 mile north of Craig, submitted by C. S. Ross. Olivine, augite, and biotite in glass. Analysis by George Steiger, record C–600.

G. Interior of dike.

H. Analcite basalt from top of Breeze Mountain, near Craig. Analyses G and H by George Steiger, record C–677.

I–K. Three granites from Climax, collected by J. W. Vanderwilt and described in Bull. 846–C, 1933. Analyses by J. G. Fairchild, record C–1129.

	F	G	H	I	J	K
SiO_2	53.48	52.83	48.31	80.78	78.62	70.83
Al_2O_3	11.54	11.87	14.32	9.26	10.80	14.41
Fe_2O_3	2.84	3.44	3.48	Trace	.05	.35
FeO	3.50	3.03	6.13	1.34	1.13	2.94
MgO	8.14	8.38	7.72	.10	.05	.56
CaO	5.45	6.64	9.12	.10	.05	.64
Na_2O	3.38	2.68	3.19	.31	.76	2.44
K_2O	3.82	4.95	2.10	7.68	8.11	6.21
H_2O-	.47	1.35	.79	.01	.10	.04
H_2O+	3.68	1.43	2.75	.46	.43	1.34
TiO_2	1.47	1.42	1.38	Trace	.04	.24
P_2O_5	.95	.87	.64	.08	.10	.15
S	.09	----	----	.03	.06	.01
Cr_2O_3	.05	----	----	----	----	----
MnO	.08	.06	.11	----	----	----
BaO	.43	----	----	.01	.03	.02
SrO	.23	----	----	----	----	----
CO_2	None	.88	None	----	----	----
ZrO_2	None	----	----	----	----	----
Cl	----	----	----	.04	.04	.04
F	----	----	----	.05	None	None
Mo	----	----	----	.12	.10	None
	99.60	99.83	100.04	100.37	100.47	100.22
Specific gravity:						
Lump	----	----	----	2.25	2.23	2.52
Particles	----	----	----	2.57	2.60	2.68

L–R. Volcanic rocks collected by E. N. Goddard and T. S. Lovering, mainly in Boulder County.

L. Rhyolite from Lawson arkose 2.8 miles S. 45° E. of Castle Rock, Douglas County. Feldspar, biotite, and quartz phenocrysts in a pink felsitic ground mass. Sanidine, a little oligoclase and microcline. Analysis by R. C. Wells, record D–405.

M. Biotite latite intrusive breccia from the Mud vein in the lower tunnel of the Yellow Pine mine, 5¼ miles northwest of Boulder. Microlites of oligoclase-andesine with minute shreds of muscovite and a glassy ground mass.

N. Biotite monzonite from the same locality as B. Small phenocrysts of feldspar, biotite, and hornblende in a dark-gray ground mass.

O. Quartz monzonite porphyry from the breast of Skunk tunnel on the south slope of Porphyry Mountain, Jamestown. Analyses M–O by J. G. Fairchild, record D–475.

P. Granodiorite 4,500 feet S. 25° W. from Jamestown. Plagioclase, orthoclase, quartz, hornblende, with magnetite, titanite, apatite, zircon, calcite, chlorite, epidote, and kaolinite in minor amounts.

Q. Granite, South St. Vrain Creek, 3½ miles N. 50° W. of Jamestown. Microcline, quartz, orthoclase, biotite, muscovite, with magnetite, apatite, zircon.

R. Biotite schist from old mill site, 0.5 mile southeast of Springdale. Quartz, biotite, muscovite, oligoclase, microcline, sillimanite, with apatite, zircon, calcite, rutile, and sericite. Analyses P–R by Charles Milton, record D–375.

	L	M	N	O	P	Q	R
SiO_2	82.16	68.23	57.65	64.14	57.37	68.33	62.04
Al_2O_3	8.27	13.59	15.64	17.14	16.12	14.77	17.43
Fe_2O_3	.75	1.95	3.08	1.09	4.32	1.28	.95
FeO	.16	.98	2.78	1.04	3.47	2.68	7.12
MgO	.15	1.39	1.17	.41	2.89	.80	2.07
CaO	.59	1.11	4.33	2.19	5.74	2.30	.52
Na_2O	2.19	.18	3.80	4.91	3.00	2.72	.68
K_2O	3.94	3.74	4.28	5.41	4.40	5.04	4.10
Li, Rb	None	----	----	----	----	----	----
H_2O-	.89	3.59	1.44	.62	.18	.01	.12
H_2O+	1.04	3.48	1.68	1.44	1.11	1.07	2.97
TiO_2	.28	.43	.75	.13	1.06	.77	1.16
CO_2	None	1.20	3.31	1.45	.12	.05	.88
P_2O_5	.02	.16	.45	.05	.20	.11	.05
MnO	.034	.05	.11	.03	.09	.04	.06
F	----	----	----	.15	.18	.20	.17
BaO	----	.03	.11	.13	.10	.14	.09
WO_3	----	None	None	----	----	----	----
	100.474	100.11	100.58	100.33	100.35	100.31	100.41
Less O=F_2	----	----	----	.06	.07	.08	.07
	----	----	----	100.27	100.28	100.24	100.34

CONNECTICUT

GUILFORD QUADRANGLE

Eight rocks submitted by Arthur Keith. Analysis A by R. K. Bailey, B–H by J. G. Fairchild, record 3273.

A. Haddam granite gneiss.
B. Same, contact.
C. Hornblende gneiss.
D. Stony Creek granite gneiss.
E. Conglomerate.
F. Metaconglomerate.
G. Quartzitic gneiss.
H. Amphibolite.

	A	B	C	D	E	F	G	H
SiO_2	72.73	74.14	66.91	73.56	59.20	67.56	76.90	47.90
Al_2O_3	15.53	12.07	15.47	13.30	19.18	15.00	12.10	18.32
Fe_2O_3	.83	2.10	1.57	.91	Trace	1.43	1.21	1.20
FeO	1.12	2.48	3.74	2.60	6.51	4.64	1.37	7.48
MgO	.72	1.05	1.80	.81	2.45	2.34	1.86	9.19
CaO	4.31	3.88	4.78	1.88	1.06	4.76	.40	11.64
K_2O	.49	.39	1.29	1.94	5.41	1.54	Trace	1.13
Na_2O	2.17	2.53	1.70	2.44	1.61	1.70	5.30	2.35
H_2O-	.06	.07	.03	.05	.45	.02	.02	.02
H_2O+	1.19	1.11	1.16	.92	1.79	.50	.50	.49
TiO_2	.16	.34	.54	.59	1.25	.40	.20	.48
ZrO_2	None	.02	None	.05	.05	None	None	None
P_2O_5	.16	.20	.26	.20	.21	.08	Trace	.02
Cl	None	None	.05	.03	Trace	Trace	----	Trace
F	None	None	None	Trace	None	None	----	None
MnO	.05	Trace	.14	.04	.25	----	----	.18
BaO	None	None	.10	.03	.17	Trace	----	Trace
SrO	Trace	None	None	Trace	None	None	----	None
Li_2O	Trace	Trace	Trace	Trace	.40	Trace	----	None
Cr_2O_3	----	----	----	----	----	----	----	.06
S	None	None	None	None	None	None	----	None
	99.52	100.38	99.54	99.35	99.99	99.97	99.86	100.46

MISCELLANEOUS ROCKS

Pegmatites described by F. J. Katz in Mineral Resources for 1915, pt. 2, pp. 43–55, 1917. Analyses by R. C. Wells, record 3135.

A. Howe quarry, South Glastonbury, east wall. Some muscovite and quartz.
B. Strickland quarry, Portland, sampled across the dike.
C. Eureka quarries, Middle Haddam.
D. Gildersleeve prospect, Portland.

	A	B	C	D		A	B	C	D
SiO_2	72.42	71.00	75.20	74.42	K_2O	6.24	7.65	4.55	3.49
Al_2O_3	15.88	16.06	13.81	15.13	H_2O (total)	.46	.34	.45	.39
Fe_2O_3 (total Fe)	.54	.63	.86	.52	TiO_2	.05	.04	.17	.02
MgO	Trace	.02	None	None					
CaO	.65	.32	.62	.44		99.98	99.81	99.71	99.81
Na_2O	3.74	3.75	4.05	5.40					

DOMINICAN REPUBLIC AND VIRGIN ISLANDS

Five specimens related to andesite, submitted by T. W. Vaughan. Analyses by R. C. Wells, record C–300.

A. Western foothills of Loma de los Palos, Province of Santo Domingo.
B. Loma Pegado, near Maimón, Province of La Vega. A and B collected by C. P. Ross.
C. Andesite hill opposite Arroyo Salado, left bank of Rio Yaque del Sur, Province of Azua. Collected by D. D. Condit and C. P. Ross.
D. Island of Vieques, Virgin Islands, western edge of Mosquito. Collected by T. W. Vaughan.
E. Culebra Island, northwest peninsula, west of southwest corner of Flamingo Bay, east side of divide, on road to abandoned radio station.

	A	B	C	D	E		A	B	C	D	E
SiO_2	51.58	42.82	60.31	61.22	58.47	CO_2	Trace	None	0.21	None	Trace
Al_2O_3	15.15	14.41	15.57	16.47	15.21	P_2O_5	0.03	0.18	.23	None	0.22
Fe_2O_3	3.07	1.53	3.41	2.97	2.65	S	None	None	.03	None	Trace
FeO	8.68	10.13	1.92	3.47	5.88	Cr_2O_3	.01	.02	------	------	------
MgO	5.76	8.34	2.72	2.54	2.55	V_2O_3	.06	.06	------	------	------
CaO	10.08	11.95	5.78	6.18	3.71	MnO	.17	.11	.05	0.13	.11
Na_2O	1.75	2.76	4.50	3.81	4.82	BaO	None	None	.43	.04	.10
K_2O	.17	.27	3.34	1.77	2.55	SrO	Trace	None	.06	.06	.09
H_2O-	.32	1.37	.28	.19	.37	Rare earths	------	None	None	------	None
H_2O+	2.86	4.70	.50	1.12	1.94						
TiO_2	.71	1.87	.57	.48	1.09		100.40	100.52	99.91	100.45	99.76
ZrO_2	None	None	None	None	Trace						

GEORGIA

Sericite schist, Jasper. Submitted by P. S. Smith. Analysis by R. K. Bailey, record 3114.

SiO_2	52.96	MgO	1.21	MnO	Trace
Al_2O_3	29.16	K_2O	9.82	CO_2	None
Fe_2O_3	2.86	Na_2O	1.15		
FeO	.33	H_2O	2.27		100.16
CaO	.40				

HAWAII

A–D. Four lavas collected by W. O. Clark, Pahala, Kau. Analyses by R. K. Bailey, record C–398.

A. Post-Pahala basalt. Pahoehoe on floor of Makanao Valley at southwest end of Pakua graben fault, at an altitude of 1,400 feet.

B. Pre-Pahala basalt. Lava overflowing ash bed at Pahala water-supply spring, in the east face of Kaumaikeohu Peak, at an altitude of 2,780 feet. (This is called "Kaumaikeohu Spring" on label with specimen. Cross.)

C. Pre-Pahala basalt. Makai slope of Clover Hill, at an altitude of 1,250 feet, N. 30° W. from Naalehu. (The name "Kapuna or Kapuua" is given in parentheses after "Clover Hill" on label with specimen. Cross.)

D. Lava covering a considerable area in the Pahala basalt on the slopes back of Naalehu. Specimen from gulch N. 10° W. of Naalehu, at an altitude of 1,100 feet.

	A	B	C	D		A	B	C	D
SiO_2	45.97	48.60	49.24	49.24	H_2O-	0.04	0.06	1.15	0.47
Al_2O_3	5.98	10.75	12.72	13.51	H_2O+	.64	.22	1.57	.70
Fe_2O_3	5.86	3.92	4.27	3.86	TiO_2	1.75	3.37	3.40	3.70
FeO	7.39	9.38	8.44	8.88	MnO	.11	.05	.10	.12
MgO	23.55	9.80	7.10	5.90	P_2O_5	.21	.18	.08	.17
CaO	6.47	10.38	9.74	10.44	CO_2	None	None	None	None
Na_2O	1.50	2.54	1.87	2.40					
K_2O	.42	.34	.28	.46		99.89	99.59	99.96	99.85

E–L. Lavas collected by H. A. Powers. Analyses E–J by J. J. Fahey, K by L. T. Richardson, L by R. E. Stevens, record D–89.

E. Olaa. Mauna Loa aa flow, road cut on Government road at south boundary of Waiakea National Forest.

F. Reservoir, Mauna Loa pahoehoe flow, from reservoir at Piihonua.

G. Quarry, Kilauea pahoehoe flow, National Park quarry, on Hilo road 1 mile from observatory.

H. Halemaumau, splash from lava lake, 1917.

I. Halemaumau, splash from lava lake during eruption of Alika flow from Mauna Loa, 1919.

J. Halemaumau, pahoehoe flow from northeast edge of floor of Kilauea Crater, 1919.

K. Halemaumau, pahoehoe flow from south edge of floor of Kilauea Crater, 1921.

L. Halemaumau, scoria from lava fountain, July 1929.

	E	F	G	H	I	J	K	L
SiO_2	50.41	52.14	51.35	50.14	50.37	50.52	50.85	51.00
Al_2O_3	12.37	13.60	13.36	13.93	14.20	13.85	15.30	13.03
Fe_2O_3	1.94	2.31	1.32	.57	1.28	.98	.28	1.83
FeO	9.56	8.80	9.85	10.07	10.10	9.77	10.42	10.02
MgO	7.68	7.26	7.62	8.25	7.75	7.07	7.80	6.76
CaO	12.56	10.14	10.74	11.17	11.24	11.33	11.45	12.40
Na_2O	1.68	2.02	1.93	1.29	2.20	1.51	.70	2.02
K_2O	.40	.48	.50	.41	.56	.47	.58	.73
H_2O-	None	.06	None	None	None	None	Trace	None
H_2O+	.22	.16	.29	.03	.06	.04	.18	.35
TiO_2	2.26	2.20	2.50	3.20	2.33	3.63	1.55	2.33
P_2O_5	.57	.29	.28	.23	.02	.22	.22	.14
Cr_2O_3	.05	.02	.03	.07	.05	.06	.05	[1].008
NiO	.004	.005	.025	.002	.008	.001	>.002	Trace
MnO	.06	.07	.07	.06	.14	.14	.10	.18
	99.76	99.55	99.86	99.42	100.30	99.59	99.48	100.79

[1] Quantity of sample insufficient.

M–S. Seven rocks from island of Hawaii, collected by C. K. Wentworth. Analyses M–O by J. G. Fairchild; P, Q by J. J. Fahey; R, S by Charles Milton, record D–128.

M. From Ka Lae shore about 0.5 mile east of lighthouse.

N. Red tuff from Ninole basalt from altitude of about 850 feet, a few rods north of Kepue, Hilea.

O. Yellowish-brown tuff from altitude of 5,175 feet at Aukaiakeakua Gulch, southeast of Waikii.

P. Red basalt tuff from altitude of about 3,500 feet in Kemole Gulch.

Q. Yellow tuff beneath lava flow at altitude of 2,900 feet in Popoo Gulch, north of Keamuku.

R. Yellow tuff from altitude of about 600 feet in face of Puu Kapukapu, 0.5 mile east of summit.

S. Red palagonite tuff 5 feet below top of road cut 0.25 mile south of Pepeekeo.

	M	N	O	P	Q	R	S
SiO_2	45.34	33.33	37.16	50.73	55.58	46.03	3.39
Al_2O_3	12.56	16.36	18.94	19.06	19.13	13.38	31.72
Fe_2O_3	12.20	16.32	7.37	7.48	6.40	9.28	24.90
FeO	1.14	.54	5.93	1.03	.50	4.22	.84
MgO	2.72	2.36	3.72	1.55	.52	3.45	.12
CaO	2.10	.82	5.58	1.92	.44	5.67	.03
Na_2O	2.44	.12	2.67	1.79	4.59	1.04	.44
K_2O	1.27	.04	1.00	1.98	2.84	.38	.30
H_2O-	7.02	14.20	6.51	5.14	2.74	6.05	8.22
H_2O+	9.20	11.94	6.33	6.60	5.58	6.62	24.27
TiO_2	3.54	3.92	3.51	1.79	1.46	2.93	5.01
CO_2			.10				
P_2O_5	.12	.10	1.02	.13	.10	.58	1.15
MnO	.12	.20	.12	.11	.31	.34	.13
Organic matter			Trace				
	99.77	100.25	99.96	99.31	100.19	99.97	100.52

IDAHO

CASTO QUADRANGLE

Volcanic rocks collected by C. P. Ross and described in Bull. 854, 1935. Analyses by J. G. Fairchild, records C–983 and C–1003.

A. Pink granite from Loon Creek, of post-Eocene age. A doubtful trace of cassiterite may be present.

B. Gray granite, Idaho batholith, 1 mile above mouth of Mayfield Creek.

C. Spherulitic rhyolite, near Sleeping Deer Park.

D. Yankee Fork rhyolite member of Challis volcanics, head of Salmon River.

E. Tuff below Yankee Fork rhyolite member.

F. Typical lava, Mayfield Peak. F–J, partial analyses only.

G. Above Forge Creek.

H. Trachyte. East of Mayfield railroad.

I. Lava near Meyers Cove.

J. Lava at top of measured section above Merino Creek.

	A	B	C	D	E	F	G	H	I	J
SiO_2	71.85	69.15	73.74	76.62	73.70	57.46	63.92	76.81	67.90	62.12
Al_2O_3	13.55	14.49	12.29	11.04	13.58	14.40	14.02	------	------	14.62
Fe_2O_3	.67	.93	1.31	1.14	1.60	5.40	6.07	------	------	5.81
FeO	2.66	2.62	1.25	1.40	.66	------	------	------	------	------
MgO	.09	.41	.39	.05	.09	------	------	------	------	------
CaO	1.00	2.14	.38	.06	.20	------	------	------	------	------
Na_2O	3.53	3.84	1.91	1.70	.91	3.58	3.44	3.63	3.30	2.69
K_2O	5.89	3.98	5.17	6.86	5.02	3.33	4.36	5.51	5.14	3.91
H_2O-	.05	.20	.86	.20	.85	------	------	------	------	------
H_2O+	.58	1.47	2.06	.78	3.53	------	------	------	------	------
TiO_2	.20	.30	.20	.12	.12	.30	.95	------	------	.70
P_2O_5	.02	.10	------	------	------	------	------	------	------	------
	100.09	99.63	99.56	99.97	100.26	------	------	------	------	------

EDWARDSBURG DISTRICT

Seven rocks collected by P. J. Shenon and analyzed by J. G. Fairchild, record D–423.

A. Rhyolite, 600 feet south and 35 feet west from center of Crater Lake, Profile Gap. Plagioclase (Ab_{92}), quartz, orthoclase, chlorite and calcite, sericite, a little apatite.

B. Quartz diorite, about 250 feet N. 35° W. of Big Creek Point, Profile Gap. Plagioclase (Ab_{63}), orthoclase, quartz, biotite, epidote, chlorite, sericite, apatite, magnetite.

C. Kersantite (Rosenbusch), 390 feet N. 18° W. from southwest corner of Glasgow claim corner, Profile Gap. Plagioclase (Ab_{70}), biotite, quartz, orthoclase, calcite, chlorite, epidote, magnetite, apatite.

D. Quartz diorite, 300 feet N. 10° E. from southwest corner Glasgow claim, Profile Gap. Plagioclase (Ab_{65}), quartz, calcite, chlorite, sericite, epidote, leucoxene, magnetite, apatite.

E. Granodiorite, 3,250 feet west of Red Metal Cabin, Profile Gap. Plagioclase (Ab_{67}), orthoclase, quartz, biotite, hornblende, epidote, chlorite, magnetite, zircon, apatite.

F. Quartz latite porphyry from sharp point, 2,150 feet S. 85° W. from Red Metal Cabin. Plagioclase (Ab_{60}), quartz, orthoclase, biotite, epidote and chlorite in biotite, calcite, apatite, zircon, magnetite.

G. Kersantite, 2,200 feet S. 88° W. from New Glasgow Cabin, Profile Gap. Plagioclase (Ab_{55}), quartz, biotite, calcite, magnetite.

	A	B	C	D	E	F	G
SiO_2	72.65	67.17	55.03	46.46	68.76	68.81	45.94
Al_2O_3	13.79	15.80	14.43	13.27	16.23	14.82	14.15
Fe_2O_3	.30	.70	4.20	2.60	.30	.75	2.80
FeO	1.80	2.79	3.69	7.20	2.21	2.34	6.21
MgO	.35	1.52	3.59	7.32	1.16	.90	5.79
CaO	.53	3.79	5.25	8.20	3.31	2.36	7.48
Na_2O	3.31	3.54	3.20	1.68	3.87	3.45	2.52
K_2O	5.22	2.75	2.71	1.71	2.71	4.55	2.24
H_2O-	None	.14	.65	.41	.04	.06	.46
H_2O+	1.27	.86	1.96	3.25	.62	.94	.82
TiO_2	.12	.64	2.00	1.50	.47	.45	1.80
CO_2	.67	.05	1.92	5.50	.05	.19	9.64
P_2O_5	.04	.17	.79	.25	.09	.09	.19
MnO	.02	.06	.11	.20	.05	.07	.13
FeS_2	------	------	------	.37	------	------	------
	100.07	99.98	99.53	99.92	99.87	99.78	100.17

PEND OREILLE DISTRICT

A–C. Three granodiorites collected by J. L. Gillson and described in Jour. Geology, vol. 35, p. 1, 1927. Analyses by George Steiger, record C–685. All these rocks consist of plagioclase, quartz, microcline, biotite, and hornblende, with minor apatite, magnetite, ilmenite, zircon, titanite, allanite, and rutile.

A. Bayview, composite sample.

B. Packsaddle Mountain.

C. Granite Creek.

	A	B	C		A	B	C
SiO_2	62.62	66.40	65.61	H_2O-	0.20	0.20	0.32
Al_2O_3	15.63	14.40	16.10	H_2O+	1.27	1.07	1.05
Fe_2O_3	.97	1.05	1.21	TiO_2	.88	.68	.60
FeO	5.21	3.62	3.17	P_2O_5	.23	.19	.21
MgO	2.56	2.40	1.42	MnO	.10	.09	.09
CaO	5.79	4.38	4.86				
Na_2O	2.48	2.42	2.40		100.73	100.20	100.08
K_2O	2.79	3.30	3.04				

D–H. Five rocks from the Pend Oreille district, collected by J. L. Gillson and described in Prof. Paper 158, pp. 111–121, 1930. Analyses by J. G. Fairchild, record C–405.

D. Garnet vesuvianite, metamorphosed magnesian limestone, Cape Horn, near Bayview.

E. Sandy argillite from Prichard formation, north of Kilroy Bay.

F. Metamorphosed argillite from Prichard formation.

G. Metamorphosed lower sandstone of Blacktail formation, Chilco Mountain.

H. Same as D but with extreme metamorphism.

	D	E	F	G	H		D	E	F	G	H
SiO_2	40.97	69.06	66.95	------	------	CO_2	0.89	------	------	------	------
Al_2O_3	13.89	15.88	15.35	------	------	P_2O_5	.25	Trace	0.30	------	------
Fe_2O_3	4.56	1.21	.63	------	------	Cl	.15	------	------	------	------
FeO	2.87	3.17	4.19	------	------	F	Trace	------	------	------	------
MgO	3.06	1.09	2.01	------	------	MnO [1]	.12	Trace	.05	------	------
CaO	31.99	None	.62	------	------	BaO	None	0.10	None	0.02	0.02
Na_2O	.08	1.62	6.57	0.28	0.88	ZrO_2	Trace	.03	.07	.03	.05
K_2O	.08	3 96	Trace	2.38	2.38						
H_2O-	.04	None	None	------	------		99.81	[2] 98.85	99.70	------	------
H_2O+	.38	1.98	1.96	------	------						
TiO_2	.48	.75	1.00	.12	.14	Less O=Cl	99.78	------	------	------	------

[1] Approximate determination.
[2] Sample contains organic carbon, probably graphitic.

MISCELLANEOUS ROCKS

A. Nephelite basalt, Fort Hall Indian Reservation, described by Mansfield and Larsen, Washington Acad. Sci. Jour., vol. 5, p. 463, 1915. Diopside, nephelite, forsterite, biotite, magnetite, ilmenite, apatite. Analysis by W. C. Wheeler, record 2902.

B–F. Lavas from Bayhorse region, Custer County, submitted by C. P. Ross. Partial analyses by George Steiger, record D–158.

B. Mill Creek, station 111.

C. South side of old Mackay stage road, station 132.

D. Twin Bridge Creek, station 12.

E. Near Howell's ranch, station 57.

F. On ridge above station 126, at head of Garden Creek.

	A	B	C	D	E	F
SiO_2	45.17	70.52	62.35	53.53	67.26	63.54
Al_2O_3	10.02	------	------	------	------	------
Fe_2O_3	3.55	------	------	------	------	------
FeO	5.03	------	------	------	------	------
MgO	19.84	------	------	------	------	------
CaO	8.57	1.07	4.98	7.42	3.70	3.11
Na_2O	3.11	3.48	3.44	2.62	4.02	3.34
K_2O	1.61	4.90	2.74	3.94	3.44	5.16
H_2O-	.69	------	------	------	------	------
H_2O+	1.58	------	------	------	------	------
TiO_2	.54	------	------	------	------	------
CO_2	None	------	------	------	------	------
P_2O_5	.28	------	------	------	------	------
S	.06	------	------	------	------	------
Cr_2O_3	.11	------	------	------	------	------
MnO	.13	------	------	------	------	------
BaO	.07	------	------	------	------	------
SrO	.06	------	------	------	------	------
	100.42	------	------	------	------	------

MAINE

A. Amphibole schist, Scarboro.
B. Same, south of Portland Heights.
C. Granite porphyry, Long Island.
D. Same, Steve Island. All four analyses by W. C. Wheeler, record 2896.

	A	B	C	D		A	B	C	D
SiO_2	54.51	58.46	69.90	66.74	H_2O-	0.24	0.19	0.28	0.29
Al_2O_3	17.82	19.88	16.78	16.67	H_2O+	1.03	4.55	.78	.78
Fe_2O_3	.67	.97	.47	.67	TiO_2	1.29	.41	.39	.31
FeO	8.59	8.42	2.00	2.99	CO_2	.90	.15	.17	.11
MgO	2.61	1.65	.48	1.14	P_2O_5	.31	Trace	.09	.10
CaO	7.18	2.13	.74	3.55	MnO	.14	.03	.06	.01
Na_2O	4.03	1.17	4.84	4.46					
K_2O	.43	1.15	3.64	2.16		99.75	99.16	100.62	99.98

MARYLAND

Pegmatite, Wright quarry, 2 miles from Marriotsville station, collected by F. J. Katz and described in Mineral Resources for 1915, pt. 2, pp. 43–49, 1917. Analysis by George Steiger, record 3160.

SiO_2	64.08	Na_2O	2.14	TiO_2	0.08
Al_2O_3	18.63	K_2O	12.32	CO_2	.40
Fe_2O_3	.44	H_2O-	None		99.89
MgO	.17	H_2O+	.69		
CaO	.94				

MASSACHUSETTS

A. Composite sample of Berkshire schist, section across Mount Washington, Sheffield quadrangle. Quartz, muscovite, biotite, plagioclase, feldspar, garnet, staurolite, calcite, magnetite, and graphite. Collected by Joseph Barrell. Analysis by R. C. Wells, with corrected fluorine determinations by J. G. Fairchild, record 2431.

B–D. Three rocks collected by B. K. Emerson. Analyses by Chase Palmer, record 3146.

B. Oakdale quartzite, Groton cemetery. Carboniferous. Quartz, biotite, traces of muscovite, garnet, graphite.
C. Same, Pepperill Bridge. Minerals as in B, with tourmaline.
D. Same, Dunstable. Same minerals as in B, with titanite.

	A	B	C	D		A	B	C	D
SiO_2	59.29	62.67	66.94	71.77	P_2O_5	0.17	0.20	0.18	0.01
Al_2O_3	19.54	17.15	13.18	12.40	F	.05	------	------	------
Fe_2O_3	1.82	.72	.79	.37	S	.04	.07	.11	.07
FeO	5.65	3.75	4.73	4.17	Cr_2O_3	.02	------	------	------
MgO	1.75	2.89	3.25	3.31	V_2O_3	.03	------	------	------
CaO	1.16	2.85	2.21	2.94	MnO	.25	.02	.09	.03
Na_2O	1.25	2.38	2.38	1.26	BaO	.05	------	------	------
K_2O	3.25	4.03	2.58	2.48	SrO	Trace	------	------	------
H_2O-	.13	.04	.08	.09					
H_2O+	4.06	1.28	1.88	.98		99.71	99.37	99.37	100.56
TiO_2	.99	.75	.67	.68	Less O	.02	------	------	------
ZrO_2	.01	------	------	------					
CO_2	.20	.57	.30	None		99.69	------	------	------

E. Granite from Cape Ann, Essex County.
F. Material dissolved from same by nitric acid (2,000 cc of specific gravity 1.20) standing in a hole 15 cm in diameter and 15 cm deep for 2½ years, covered. Volume of final solution, 1,400 cc. Results in grams found in 1,400 cc.
G. Residual granite 15 mm from outer surface.
H. Residual granite 15 to 38 mm from outer surface. Analyses E–H by George Steiger, record C–420.

	E	F	G	H		E	F	G	H
SiO_2	74.37	.08	76.02	74.34	H_2O+	0.32	------	0.30	0.27
Al_2O_3	12.61	5.84	12.53	12.70	TiO_2	.17	0.24	.07	.18
Fe_2O_3	.57	13.24	.60	.53	CO_2	.04	------	None	.03
FeO	2.01	------	.99	1.91	P_2O_5	Trace	------	Trace	(1)
MgO	.04	.21	.05	.05	MnO	.04	.26	.03	(1)
CaO	.77	10.64	.46	.74	Li_2O	.04	(1)	(1)	.02
Na_2O	4.39	2.50	4.50	4.65					
K_2O	4.38	2.59	4.39	4.42		99.88	35.60	100.21	99.91
H_2O-	.13	------	.27	.07					

[1] Not determined.

MISSISSIPPI

Nephelite syenite from Rankin County, depth 4,027 feet, submitted by S. H. Rook through C. S. Ross. Analysis by J. J. Fahey, record D–80.

SiO_2	46.97	K_2O	5.44	MnO	0.13
Al_2O_3	19.97	H_2O-	.06	BaO	.21
Fe_2O_3	3.78	H_2O+	1.06	SrO	.47
FeO	1.91	TiO_2	.93		99.94
MgO	.65	CO_2	1.49		
CaO	7.22	P_2O_5	.21		
Na_2O	9.04	SO_3	.40		

MONTANA

A–C. Porphyritic rocks from Flathead mine, collected by P. J. Shenon. Analyses by George Steiger, record D–250.

A. Latite with large phenocrysts of sanidine and smaller ones of oligoclase in a microcrystalline groundmass.

B. Dense gray rock with flow structure and few phenocrysts.

C. Porphyry similar to A but finer-grained. Some zircon, titanite, and magnetite.

D. Igneous rock collected by Frank Reeves from a sill 11 miles west of Winnett, sec. 6, T. 14 N., R. 25 E. Described as nephelite-haüynite-alnoite by C. S. Ross in Am. Jour. Sci., 5th ser., vol. 11, p. 218, 1924. Olivine, phlogopite, haüynite, melilite, nephelite, augite, magnetite, apatite. Analysis by J. G. Fairchild, record C–312–b.

	A	B	C	D		A	B	C	D
SiO_2	67.11	64.96	67.16	39.19	BaO	0.18			
Al_2O_3	17.17	17.80	16.50	8.41	MnO				0.24
Fe_2O_3	1.71	2.32	2.52	3.47	SO_3	.38			1.34
FeO	.35	.55	.35	5.51	S	1.12			Trace
MgO	None	.38	.21	22.78	Cr_2O_3				.11
CaO	1.32	2.10	2.32	8.90	ZrO_2	.04			
K_2O	3.26	3.93	3.63	3.23		100.35	99.78	99.73	100.47
Na_2O	3.46	5.27	5.26	2.14	Less O=S	.42			
H_2O-	1.10	.95	.84	.56		99.93			
H_2O+	2.40	.87	.33	3.66					
TiO_2	.52	.51	.41	.40					
P_2O_5	.23	.14	.20	.53					

NEVADA

DELAMAR MINING DISTRICT

Rocks collected by Eugene Callaghan. Analyses by J. J. Fahey, record D–233.

A. Lava overlying rhyolite dikes.

B. Intrusive granodiorite porphyry.

C. Coarse phase of B.

D. Rhyolite dike mineralized in the Magnolia mine.

E. Sills earlier than some of the faulting.

F. "Black porphyry" of dikes.

G. Late rhyolite dike traversing ore shoot.

	A	B	C	D	E	F	G
SiO_2	71.42	56.85	60.68	76.67	47.67	50.68	77.28
Al_2O_3	13.70	17.78	15.29	12.23	13.45	14.97	13.15
Fe_2O_3	.81	2.20	2.57	1.08	3.35	2.06	.43
FeO	1.70	4.32	3.68	.57	11.40	5.71	.53
TiO_2	.36	.97	.99	.10	2.18	.47	.18
CaO	1.87	5.75	4.06	None	3.40	6.01	None
MgO	.89	3.72	3.24	None	8.77	7.04	.02
Na_2O	2.24	2.89	2.88	2.42	1.28	1.59	.09
K_2O	4.52	2.80	4.10	5.74	.99	2.62	6.26
H_2O	1.58	1.78	2.15	.97	5.00	3.01	1.76
CO_2	1.14	.89	None	None	2.42	4.99	None
P_2O_5	None	.40	.51	None	.52	.55	.30
MnO	.03	.06	.08	.06	.06	.11	.02
	100.26	100.41	100.23	99.84	100.47	99.81	100.02

ROCHESTER DISTRICT

Three rocks collected by Adolph Knopf and described in Bull. 762, 1924. Analyses by R. C. Wells, record 3187.

A. Soft white rock carrying cinnabar, American Canyon. Sericite and quartz.

B. Aplite, Black Range. Feldspar and quartz. Cuts Triassic rocks.

C. Trachyte from Gold Mountain. Phenocrysts of microcline in a groundmass of spherulites of feldspar.

	A	B	C		A	B	C
SiO_2	74.58	77.10	67.01	K_2O	4.47	6.17	11.42
Al_2O_3	17.24	12.28	15.97	H_2O	2.72	.76	.28
Fe_2O_3	.65	1.04	2.54	TiO_2	.17	.03	.39
FeO			.44	CO_2	Trace	Trace	
MgO	Trace	.04	Trace		100.28	99.93	100.16
CaO	.18	.24	.19				
Na_2O	.27	2.27	1.92				

YERINGTON DISTRICT

Rocks collected by Adolph Knopf and described in U. S. Geol. Survey Prof. Paper 114, 1918. A–C, analyses by George Steiger, record 3059. D–E, partial analyses by R. C. Wells, record 3044. F, analysis by W. B. Hicks, record 3124. G–H, analyses by R. C. Wells, record 3022.

A. Quartz monzonite. Orthoclase, microperthite, microcline, plagioclase, quartz, biotite, hornblende, and accessory titanite, magnetite, apatite, and zircon.

B. Granodiorite. Plagioclase, orthoclase, quartz, biotite, and hornblende.

C. Vitrophyre. Phenocrysts of biotite, augite, and plagioclase.

D–E. Two felsites with cryptocrystalline aggregates of feldspars and quartz.

F. Matrix of garnet.

G. Keratophyre.

H. Pyroxene from gangue of Mason mine.

	A	B	C	D	E	F	G	H
SiO_2	68.35	57.90	66.03	77.17	70.18	40.89	72.73	50.59
Al_2O_3	14.71	16.38	14.98	[1] 13.84	[1] 18.43	7.63	14.42	.11
Fe_2O_3	1.69	3.02	1.65			[2] 15.39	73	1.18
FeO	1.47	3.66	1.67				.94	13.05
MgO	1.11	3.13	.99			1.26	.32	9.19
CaO	3.11	6.33	2.62	1.47	2.55	30.61	.87	23.03
Na_2O	4.28	4.10	3.60	6.05	7.46		4.66	.15
K_2O	3.54	2.52	4.34	.38	.44		4.50	.16
H_2O-	.31	.18	.44				.36	.71
H_2O+	.46	.89	2.46				.36	.58
TiO_2	.57	1.12	.48				.22	.13
ZrO_2	None	None	None				.04	.02
CO_2	.14	.08	.07				.19	1.52
P_2O_5	.20	.42	.11				.07	Trace
S								.02
Cr_2O_3								None
V_2O_3								Trace
MnO	.04	.09	.07				.01	.26
BaO	.06	.06	.11				.09	None
SrO	.07	.08	.08					
	100.11	99.96	99.70				100.51	100.70

[1] Al_2O_3, etc. [2] Total Fe.

Matrix of garnet. Partial analysis by W. B. Hicks, record 3124.

SiO_2	40.89	MgO	1.26
Al_2O_3	7.63	CaO	30.61
Fe_2O_3 (total Fe)	15.39		

MISCELLANEOUS ROCKS

A–C. Three samples collected by A. C. Spencer near Reipetown, Ely district, described in Prof. Paper 96, 1917. Analyses by R. C. Wells, with corrected fluorine determination by J. G. Fairchild, record 2592.

A. Monzonite from Weary Flat. Orthoclase, plagioclase, hornblende, sphene, magnetite, apatite, zircon.

B. Siliceous porphyry ore, Copper Flat mine.

C. Capping porphyry, Copper Flat mine.

D. Quartz monzonite collected by J. L. Gillson in the Pioche district and described in Prof. Paper 171, 1932. Subporphyritic. Quartz, feldspars, biotite, hornblende, accessories. Analysis by J. G. Fairchild, record C–712.

E–F. Two rocks collected by T. B. Nolan from the Mountain City district. Analyses by J. G. Fairchild, record D–209.

E. Keratophyre 1,000 feet west of portal of main tunnel of Silver Banner mine. Phenocrysts of calcic albite, augite, and sparse quartz with some apatite in a glass matrix.

F. Granite from Point of Rocks, across California Gulch from mine. Calcic oligoclase, perthitic orthoclase, quartz, biotite, hornblende, and accessory apatite and rutile.

G. Latite of recent age collected by Adolph Knopf and described in Bull. 715, 1921. Partial analysis by R. C. Wells, record 3257. Plagioclase, biotite, and hornblende.

H. Altered rock from Tuscarora, collected by T. B. Nolan. Analysis by Charles Milton, record D–464. Boiling with 5 percent sodium carbonate for 15 minutes dissolved about 1 percent of SiO_2 and a little Al_2O_3.

	A	B	C	D	E	F	G	H
SiO_2	57.26	74.62	80.58	65.84	69.59	66.80	69.97	75.47
Al_2O_3	17.79	10.23	8.51	15.29	13.17	------	------	14.48
Fe_2O_3	3.39	------	1.15	2.48	1.75	------	------	1.08
FeO	3.45	.55	(1)	2.26	2.30	------	------	------
MgO	2.02	.83	None	1.06	.15	------	------	.74
CaO	6.58	Trace	.15	3.05	1.49	3.26	1.77	.20
Na_2O	3.06	.33	.41	3.47	2.82	3.47	4.20	.03
K_2O	4.15	6.57	5.33	4.53	5.55	4.45	5.02	3.02
H_2O-	.53	.26	.45	.01	.74	------	------	1.63
H_2O+	.55	.69	1.29	.67	2.09	------	------	3.37
TiO_2	.71	.42	.29	1.00	.80	------	------	.21
CO_2	.04	------	None	------	------	------	------	------
P_2O_5	.21	.06	------	.19	.05	------	------	------
F	.12	------	------	------	------	------	------	------
Cl	Trace	------	------	------	------	------	------	------
MnO	.29	------	None	.09	.09	------	------	------
BaO	.07	------	.06	------	------	------	------	------
SrO	Trace	------	------	------	------	------	------	------
Cu	Trace	------	------	------	------	------	------	------
FeS_2	.13	2.32	1.54	------	------	------	------	------
$CuFeS_2$	------	2.25	.29	------	------	------	------	------
Cu_2S	------	.98	.13	------	------	------	------	------
	100.35	100.11	100.18	99.94	100.59	------	------	100.23
Less O	.05	------	------	------	------	------	------	------
	100.30	------	------	------	------	------	------	------

[1] Undetermined.

I–M. Rocks collected in the Paradise Range, Mineral County, by Eugene Callaghan. Samples I, J described in Nevada Univ. Bull., vol. 27, no. 1, pp. 1–33, 1933. Analyses by George Steiger, record D–157. Analyses K–M also by Steiger, record D–424.

I. Diorite dike in lower brucite deposit. Feldspar, quartz, pyroxene, titanite, apatite, mica, carbonates.

J. Granodiorite from east side of hill northwest of upper brucite deposit. Andesine, oligoclase, orthoclase, quartz, biotite, hornblende, magnetite, apatite, titanite, sericite, green biotite.

K. Granodiorite aplite, brucite deposit, Paradise Range.

L. Lamprophyre, brucite deposit, Paradise Range.

M. Andesite porphyry, brucite deposit, Paradise Range.

N. A rock from Tuscarora, consisting of adularia and quartz, collected by T. B. Nolan. Analysis by J. J. Fahey, record D–275.

O. Volcanic ash from Kaolin, Wash., collected by W. W. Rubey. Analysis by Charles Milton, record D–305.

	I	J	K	L	M	N	O
SiO_2	58.52	65.33	73.69	53.11	61.72	74.75	57.72
Al_2O_3	14.55	15.75	13.92	16.78	17.10	13.61	17.18
Fe_2O_3	.50	1.92	.73	2.06	1.78	.83	1.40
FeO	1.50	2.42	.55	4.98	3.10	----------	.87
MgO	6.79	1.82	.61	3.84	2.90	.21	3.10
CaO	4.16	4.17	1.55	6.31	5.04	.02	1.90
Na_2O	3.79	3.92	3.59	3.28	5.03	.82	3.12
K_2O	5.74	2.61	4.00	2.25	1.50	7.70	3.71
H_2O-	.83	.18	.28	.44	.17	1.58	4.90
H_2O+	2.25	.76	.91	2.90	.95		4.95
P_2O_5	.14	.20	.08	.56	.25	----------	.06
TiO_2	.38	.51	.24	1.13	.63	.40	.40
MnO	.06	.07	.02	.10	.10	----------	----------
SO_3	----------	----------	----------	----------	----------	----------	Trace
CO_2	.69	.08	.13	2.33	.10	----------	.56
	99.90	99.74	100.30	100.07	100.37	99.92	99.87

NEW JERSEY

Altered syenite from Rutan Hill, Beemerville, collected and analyzed by Charles Milton, record D-264. Calcite, biotite, albite, magnetite, apatite, ilmenite, pyrite.

SiO_2	14.87	MnO	.25	F	0.20
Al_2O_3	6.28	Na_2O	2.40	Cl	.02
Fe_2O_3	5.68	K_2O	2.12	S	.12
TiO_2	2.44	P_2O_5	2.38		100.59
FeO	8.14	CO_2	21.28	$O=F_2$	.13
CaO	29.78	H_2O-	.07		100.46
MgO	3.53	H_2O+	1.03		

NEW MEXICO

ABIQUIU QUADRANGLE

Rocks collected by E. S. Larsen. Analyses by J. G. Fairchild, record C-253.

A. Quartz-olivine-pyroxene andesite, from upper floor on north slope of Santa Clara Canyon, just south of road to Bear Creek. Feldspar 60 percent, augite 19 percent, olivine 10 percent, quartz 6 percent, iron ores 5 percent.

B. Olivine-augite andesite from Cerro Aire, near Tres Piedras. Cristobalite conspicuous.

C. Quartz basalt from Jemez Mountains, 18 miles northeast of Española. Augite, olivine, magnetite.

	A	B	C		A	B	C
SiO_2	56.90	57.58	56.62	H_2O-	0.09	0.12	0.10
Al_2O_3	15.60	15.76	15.62	H_2O+	.39	.37	.61
Fe_2O_3	3.12	4.03	3.24	TiO_2	1.45	1.50	1.41
FeO	3.97	3.76	3.92	P_2O_5	.32	.51	.34
MgO	5.36	3.30	5.32	MnO	.15	.15	.14
CaO	7.04	6.26	7.28		100.51	100.60	100.72
Na_2O	3.97	4.44	3.24				
K_2O	2.15	2.82	2.88				

SAN JUAN REGION

A–H. Rocks collected by E. S. Larsen. Analyses A–G by George Steiger, record 3289; H by R. K. Bailey, record C-421-a.

A. Basalt from Buffalo Buttes, 20 miles south of Antonio, Colo. Augite 60 percent, plagioclase ($Ab_{32}An_{68}$) 33 percent, magnetite 4 percent, olivine 3 percent.

B. Cristobalite dacite from Antonio Peak, 16 miles south of Antonio, Colo. Augite and hypersthene 13 percent, magnetite 3.5 percent, plagioclase ($Ab_{45}An_{55}$) 83.5 percent, orthoclase and cristobalite.

C. Rhyolite obsidian from Cerro No Agua, 1 mile west of Tres Piedras. Some feldspar phenocrysts.

D. Latite from mountain north of Hermit Lake.

E. Basalt near Taos Junction, SW¼ sec. 20, T. 26 N., R. 10 E. Plagioclase ($Ab_{40}An_{60}$) 60 percent, augite 24 percent, olivine 11 percent, magnetite and ilmenite 3 percent.

F. Glassy basalt pumice from volcanic cone on Tusas Creek, near San Pablo, containing a few crystals of augite. The iron in the pumice is mostly oxidized. Resembles the rock from Ortiz Peak (DD, p. 35) in composition.

G. Basalt from volcanic cone 2 miles southeast of Brazos Peak. Andesine, a few ferromagnesian minerals, and iron oxides.

H. Quartz latite 2¼ miles southeast of Brazos Peak, Rio Arriba County.

	A	B	C	D	E	F	G	H
SiO_2	50.38	63.74	73.51	72.02	49.65	56.60	51.94	73.39
Al_2O_3	16.55	15.38	12.86	15.28	16.95	15.05	17.74	14.82
Fe_2O_3	1.45	2.63	.35	.97	2.11	7.57	4.95	.67
FeO	9.78	2.76	.42	.74	8.54	1.36	6.20	.44
MgO	7.54	1.90	.15	.26	7.44	5.29	3.40	.34
CaO	9.27	4.57	.60	2.00	8.92	6.84	6.65	1.87
Na_2O	2.88	3.84	4.38	3.79	3.21	3.37	4.08	4.40
K_2O	.50	3.15	4.32	4.35	1.13	1.82	2.02	4.20
H_2O-	.18	.64	.24	.45	.40	.47	.15	.40
H_2O+	.44	.35	3.26	.40	.35	.51	.31	.04
TiO_2	1.04	.81	None	.22	1.49	1.05	2.32	.14
ZrO_2	None	------	.02	------	------	------	------	------
CO_2	None	None	None	None	None	------	None	None
P_2O_5	.12	.20	.01	.02	.30	.12	.42	None
MnO	.13	.07	.02	.11	.13	.12	.15	.04
BaO	None	None	None	------	------	------	------	------
SrO	None	.06	None	None	------	.07	.11	------
	100.26	100.15	100.14	100.61	100.62	100.24	100.44	100.75

I–AA. Nineteen specimens of volcanic rocks from the San Juan district, submitted by C. S. Ross, including three submitted by E. S. Larsen. Analyses by J. G. Fairchild, record C–1090.

I. Rhyolite from head of Vallecitos Creek, near divide above Boyd's ranch, 30 miles northwest of Santa Fe.

J. Rhyolite pumice north of Palado Creek, 2 miles northwest of Boyd's ranch.

K. Andesite of basaltic habit from head of Vallecitos Creek, near divide above Boyd's ranch.

L. Andesite from gulch of Pipe Line Canyon about 1½ miles east of Boyd's ranch.

M. Rhyolite tuff from scarp above Bennett mine, Jemez Canyon, 45 miles west of Santa Fe.

N. Rhyolite from east flank of Redondo Peak, 36 miles northwest of Santa Fe.

O. Hornblende andesite from east slope of Tetilla Peak, 14 miles southwest of Santa Fe.

P. Obsidian from top of Bearface Mountain, 32 miles west of Santa Fe.

Q. Spherulites from obsidian, Valle de los Pozos, near head of San Antonio Creek, 34 miles northwest of Santa Fe.

R. Obsidian enclosing spherulites.

S. Basalt from Polvaderas Creek, 3 miles south of Canones and 42 miles northwest of Santa Fe.

T. Obsidian from La Cueva, Jemez Creek, 42 miles west of Santa Fe.

U. Obsidian fragments (later volcanic series) from lower white tuff on Peralta Creek.

V. Andesite from east slope of Cerro Montoya, about 10 miles west of Santa Fe.

W. Rhyolite, banded rock 2 miles southeast of La Cueva and about 18 miles north of Jemez.

X. Stony material from cliff east of creek and near road; same locality as O.

Y. Latite of Valles Mountain, north side of Santa Clara Creek, 0.5 mile above lower contact, Rio Arriba County.

Z. Younger volcanic series, Valles Mountain, hornblende andesite west base of peak 8,500, between Bear Creek and Santa Clara, Rio Arriba County.

AA. Andesite from Valles Mountain.

	I	J	K	L	M	N	O	P	Q
SiO_2	76.16	68.87	59.51	64.13	76.75	73.04	62.05	73.75	77.14
Al_2O_3	12.71	12.69	15.39	14.96	12.08	13.49	15.48	12.00	12.19
Fe_2O_3	.87	2.47	2.61	3.34	1.25	1.70	3.59	.49	.62
FeO	.51	1.59	3.97	.85	.80	.79	1.78	.73	.76
MgO	.05	.73	2.81	1.21	.12	.10	2.09	.10	.45
CaO	.41	2.06	5.89	3.43	.17	.47	4.95	.45	.02
Na_2O	3.55	3.31	3.84	3.49	3.94	3.71	4.10	3.44	5.44
K_2O	5.35	4.59	2.93	4.45	5.11	5.60	3.56	5.22	3.20
H_2O-	.05	.20	.13	.56	.05	.05	.21	.05	None
H_2O+	.36	3.60	1.47	1.44	.11	.63	.81	4.25	.45
TiO_2	.14	.35	1.60	.60	.10	.35	.60	.05	.10
P_2O_5	.07	.12	.43	.27	.05	.12	.74	.05	Trace
CO_2				1.09					
	100.23	100.58	100.58	99.82	100.53	100.05	99.96	100.58	100.37

	R	S	T	U	V	W	X	Y	Z	AA
SiO_2	76.17	49.58	72.56	76.59	60.95	73.29	75.31	68.32	63.61	57.30
Al_2O_3	12.38	15.77	13.30	12.36	15.30	12.63	12.38	15.59	15.69	15.48
Fe_2O_3	.58	2.92	.88	.41	1.98	.84	.98	2.79	3.71	2.67
FeO	1.07	8.40	1.74	1.00	4.04	2.25	1.60	.30	.51	3.41
MgO	.13	6.38	.81	Trace	2.84	.10	.10	1.34	1.85	1.49
CaO	.37	10.22	1.77	.40	5.19	1.78	1.01	3.14	4.23	5.19
Na_2O	3.92	3.02	3.01	3.49	3.76	3.32	3.66	3.34	3.82	3.41
K_2O	5.49	1.26	5.13	5.27	3.23	5.16	4.46	3.70	2.99	4.32
H_2O-	None	None	.05	.05	.07	None	None	.02	1.28	.42
H_2O+	.17	.26	.31	.32	1.11	.34	.13	.15	1.74	1.28
TiO_2	.10	2.52	.35	.14	1.00	.40	.23	.50	.75	.83
P_2O_5	Trace	.27	.10	.07	.50	.14	.13	.22	.22	.48
BaO					.15			.03	.05	
SrO								None		
CO_2										4.34
	100.38	100.60	100.01	100.10	100.51	100.25	99.99	99.44	100.45	100.62

BB–II. Various rocks collected by E. S. Larsen in the San Juan region.

BB. Latite 1 mile south of big bend in San Antonio Creek, 7 miles west of San Antonio ranger station, Rio Arriba County. Phenocrysts of andesine, biotite, and lesser orthoclase in a glassy groundmass. Analysis by J. G. Fairchild, record C–421–b.

CC. Olivine andesite from sec. 4, T. 29 N., R. 6 E., 4 miles southeast of Brazos Peak and 0.5 mile from the Brazos River. Analysis by J. G. Fairchild, record C–547.

DD. Quartz andesite from Ortiz Peak. Analysis by G. V. Brown, record 3270. Plagioclase ($Ab_{35}An_{65}$), augite, magnetite, olivine, christobalite, orthoclase, and quartz.

EE. Basalt 6 miles east of the Rio Grande. About 30 percent femic minerals.

FF. From Brazos Canyon. Same minerals as EE.

GG. Basalt from Montosa, top of Cerro. Augite more abundant than olivine. Analyses EE–GG by J. G. Fairchild, record C–253.

HH, II. Volcanic glass from Valle de los Pozos, near head of San Antonio Creek, 34 miles northwest of Santa Fe, submitted by C. S. Ross. Analyses by J. G. Fairchild, record D–8.

HH. Glass immediately surrounding spherulites.

II. Normal glass, same specimen.

	BB	CC	DD	EE	FF	GG	HH	II
SiO_2	75.79	58.08	54.76	57.58	48.72	57.08	74.39	75.50
Al_2O_3	11.63	15.30	16.38	15.76	14.00	15.32	12.80	12.60
Fe_2O_3	1.99	6.11	4.66	4.03	5.31	3.94	.39	.43
FeO	.25	1.35	4.88	3.76	7.55	3.84	1.42	1.33
MgO	.49	2.29	4.96	3.30	7.98	3.71	.05	.05
CaO	1.70	5.50	7.40	6.26	9.34	6.34	.82	.56
Na_2O	2.42	3.42	3.04	4.44	3.02	4.52	3.82	3.86
K_2O	4.04	4.48	2.18	2.82	.97	2.65	5.80	5.19
H_2O-	.46	.89	.15	.12	.03	.12	.49	.30
H_2O+	.73	.71	.34	.37	.55	.74		
TiO_2	.35	1.50	1.46	1.50	2.31	1.65	.12	.12
SrO			None					
P_2O_5	Trace	.45	Trace	.51	.25	.54		
BaO							.05	.05
MnO	.04		None	.15	.22	.14		
	99.89	100.08	100.21	100.60	100.25	100.59	100.15	99.99

MISCELLANEOUS ROCKS

Monzonite from the Magdalena district, collected by A. H. Koschmann. Analysis by J. G. Fairchild, record D–20. Plagioclase, orthoclase, augite, biotite, hypersthene, quartz, hornblende, accessory magnetite, apatite, zircon.

SiO_2	57.06	H_2O-	Trace	MnO	None
Al_2O_3	14.60	H_2O+	0.53	BaO	0.20
Fe_2O_3	2.46	TiO_2	1.59	SrO	Trace
FeO	5.02	CO_2	Trace		100.25
MgO	4.21	P_2O_5	.60	Less O	.06
CaO	6.26	F	.14		100.18
Na_2O	3.45	S	.03		
K_2O	4.04	V_2O_3	.06		

Three latites, Deming quadrangle. Determinations by Chase Palmer, record 2895, gave SiO_2 only: 64.75, 58.93, 60.94.

NEW YORK

Pegmatite, Kinkle's "back" quarry, Bedford. Described by F. J. Katz in Mineral Resources for 1915, pt. 2, pp. 43–49, 1917. Analysis by R. C. Wells, record 3135.

SiO_2	73.27	CaO	1.21	TiO_2	0.05
Al_2O_3	16.63	Na_2O	5.33		100.14
Fe_2O_3 (total Fe)	.49	K_2O	2.22		
MgO	.14	H_2O (total)	.80		

NORTH CAROLINA

A. Average sample of pegmatite at Young's quarry, 4½ miles from Spruce Pine, collected by F. J. Katz and described in Mineral Resources for 1915, pt. 2, pp. 43–49, 1917. Analysis by George Steiger, record 3160.

B. Sericite schist, 0.5 mile N. 40° E. of Steppo Gap, Gaston County, Kings Mountain quadrangle, collected by D. B. Sterrett. Analysis by R. K. Bailey, record 3046.

	A	B		A	B		A	B
SiO_2	67.93	45.47	Na_2O	2.54	4.83	TiO_2	None	
Al_2O_3	17.11	38.09	K_2O	11.25	4.63	CO_2	0.02	
Fe_2O_3	.37	2.50	H_2O-	None	4.79		99.74	101.27
MgO	None	.21	H_2O+	.20				
CaO	.32	.75						

OREGON

BAKER QUADRANGLE

A–G. Seven greenstone rocks collected by James Gilluly. Analyses by J. G. Fairchild, record D–74.

A. Saddle west of Balm Creek, in NW¼ sec. 29, T. 7 S., R. 43 E.
B. No. 2 level, Poorman mine.
C. NE¼ sec. 35, T. 7 S., R. 42 E.
D. SW¼ sec. 21, T. 7 S., R. 41 E.
E. SW¼ sec. 23, T. 7 S., R. 41 E.
F. Mesa top, NE¼ sec. 8, T. 9 S., R. 42 E.
G. NE¼ sec. 34, T. 11 S., R. 41 E.

	A	B	C	D	E	F	G
SiO_2	72.31	53.30	53.15	75.04	81.33	73.49	78.31
Al_2O_3	12.76	15.16	14.39	13.39	9.21		
Fe_2O_3	1.94	2.54	1.28	1.61	1.09		
FeO	1.26	8.71	9.33	.37	.74		
MgO	1.32	4.14	4.74	.18	.40		
CaO	.10	2.97	7.04	.40	.25	.22	.05
Na_2O	3.69	5.55	4.58	6.36	3.25	2.55	3.86
K_2O	3.82	.32	1.01	.83	1.66	5.48	3.81
H_2O-	.26	.18	.19	.24	.15		
H_2O+	1.48	3.14	2.62	1.07	1.12		
TiO_2	.40	2.41	1.50	.10	.25		
CO_2	Trace	None	.10	.10	.10		
P_2O_5	.15	.51	.19	.08	.04		
MnO	.08	.28	.14	.05	.05		
BaO	.09	None	None	None	Trace		
FeS_2	None	.40	Trace ?	None	None		
	99.66	99.61	99.66	99.82	99.64		

H–K. Four rocks collected by James Gilluly. Analyses by J. G. Fairchild, record C–1126. All from T. 8 S., R. 43 E.

H. Quartz diorite, sec. 9. Hornblende, andesine, quartz, chlorite, apatite, ilmenite.

I. Albite granite, sec. 9. Albite, epidote, hornblende, quartz, chlorite, apatite, ilmenite.

J. Pseudoporphyritic albite granite, sec. 8, contains same minerals as I.

K. Similar to J, sec. 13.

	H	I	J	K		H	I	J	K
SiO_2	54.67	67.81	73.81	77.04	H_2O+	1.26	1.24	0.90	0.54
Al_2O_3	15.95	14.13	12.36	11.88	TiO_2	1.16	.79	.70	.37
Fe_2O_3	2.08	1.50	.94	1.05	CO_2	1.24	.45	.31	.14
FeO	7.48	4.04	2.97	1.32	P_2O_5	.11	.06	.04	.04
MgO	4.09	1.56	.78	.04	MnO	.17	.13	.10	None
CaO	7.97	3.76	1.62	1.28	BaO	None	None	None	None
Na_2O	2.71	3.36	3.89	4.45	SrO	None	None	None	None
K_2O	1.16	1.62	1.47	1.64					
H_2O-	None	.06	.04	None		100.05	100.51	99.93	99.79

BOHEMIA DISTRICT

Fine-grained or altered rocks collected by A. F. Buddington and Eugene Callaghan. Analyses by George Steiger, record D–54.

A. Dark-gray porphyritic andesite, Grizzly Saddle trail.

B. Altered porphyry, Excelsior vein, Champion mine.

C. Altered felsite, Champion mine.

D. Gray-andesite, west slope South Grouse Mountain.

E. Altered andesite, tunnel on Evening Star raise.

F. Reddish andesite, near Bohemia Mountain.

G. Flow-structure felsite, Wild Hog adit, Vesuvius Basin.

H. Basalt, Gold Hill, Blue River district.

	A	B	C	D	E	F	G	H
SiO_2	53.27	64.41	74.02	62.72	63.00	55.18	69.58	54.25
Al_2O_3	17.08	16.76	14.73	15.04	16.98	15.57	13.68	16.46
Fe_2O_3	2.93	5.85	1.84	1.73	4.51	3.20	1.39	3.08
FeO	6.06	.66	.40	4.44	1.06	6.06	1.88	5.92
MgO	5.12	.38	.30	2.19	.48	4.15	.63	4.46
CaO	9.60	.27	.31	3.83	.66	7.60	2.68	8.79
Na_2O	2.28	.20	.62	4.18	.17	3.08	3.66	3.46
K_2O	.72	1.80	2.64	2.26	2.10	1.40	3.22	.80
H_2O-	.15	1.06	.45	.34	2.07	.40	.45	.26
H_2O+	1.52	4.28	3.89	1.91	4.73	2.03	1.46	1.32
TiO_2	1.04	1.18	.52	.95	1.20	1.46	.44	1.28
CO_2	.08	None	None	.38	None	.07	1.38	None
P_2O_5	.20	None	.10	.21	.03	.14	.09	.23
SO_3	------	.68	.20	------	1.21	------	------	------
S	------	4.29	1.09	------	3.03	------	------	------
Mn	.15	None	None	.10	None	.14	.07	.13
	100.20	101.82	101.11	100.28	101.23	100.48	100.61	100.44
Less O	------	1.61	.41	------	1.14	------	------	------
	------	100.21	100.70	------	100.09	------	------	------

TAKILMA REGION

Basic rocks collected by P. J. Shenon. Analyses by J. G. Fairchild, record D–64. See U. S. Geol. Survey Bull. 846, pp. 157–159, 1933.

A. Greenstone or oligoclase andesite from SE¼SW¼ sec. 36, T. 40 S., R. 8 W.

B. Greenish oligoclase diorite (metagabbro) from NW¼ sec. 16, T. 41 S., R. 8 W., bottom of Long Gulch. Both rocks fine-grained and somewhat altered.

	A	B		A	B		A	B
SiO_2	49.31	49.60	Na_2O	4.44	2.96	P_2O_5	0.19	0.18
Al_2O_3	13.72	14.10	K_2O	.53	1.05	S (total)	.21	.05
Fe_2O_3	2.84	1.77	H_2O-	.37	.34	Cr_2O_3	None	.05
FeO	10.64	8.40	H_2O+	3.29	3.37	MnO	.14	.14
MgO	5.50	8.34	TiO_2	2.57	1.25			
CaO	6.30	7.10	CO_2	None	.80		100.05	99.50

MISCELLANEOUS ROCKS

A–D. Four basaltic rocks collected by F. G. Wells. Analyses by J. J. Fahey, record D–258. See U. S. Geol. Survey Bull. 850, 1934.

A. Norite, Cozad Mountain, Douglas County, sec. 5, T. 24 S., R. 4 W. Labradorite, hypersthene, augite, magnetite, serpentine trace.

B. From Steins Mountain, Lane County, sec. 24, T. 23 S., R. 3 W. Labradorite, augite, hypersthene, magnetite.

C. Diabase dike, Douglas County, sec. 29, T. 24 S., R. 4 W. Labradorite, augite, olivine, chlorite, serpentine, magnetite.

D. Basalt flow, Douglas County, sec. 24, T. 25 S., R. 4 W. Fine-grained rock.

	A	B	C	D		A	B	C	D
SiO_2	50.23	53.63	47.90	47.51	H_2O-	0.51	1.10	0.90	2.33
Al_2O_3	15.85	17.95	13.79	12.81	H_2O+	1.67	1.12	1.13	1.91
Fe_2O_3	2.95	3.24	5.13	6.28	P_2O_5	.49	.72	.82	.76
FeO	7.22	4.84	8.26	6.86	MnO	.12	.11	.16	.19
CaO	10.16	7.88	10.69	10.84	Cr_2O_3	.02	.01	.02	.02
MgO	6.84	4.94	6.18	6.58	CO_2	None	None	.14	.05
Na_2O	1.58	2.25	1.73	2.09					
K_2O	.97	1.16	.74	.31		99.93	99.86	99.74	100.29
TiO_2	1.32	.91	2.13	1.75					

E. Granodiorite, collected by G. F. Kay, Riddle quadrangle. Analysis by R. C. Wells, record 2893.

F–G. Two basalts from southern Oregon, collected by Eugene Callaghan. Analyses by J. G. Fairchild, record D–119.

F. From western part of Cascade Range.

G. Younger olivine basalt from a few miles south of Mount Hood.

H. Igneous rock at Hole in the Ground dam site, Owyhee County. Collected by B. C. Renick. Analysis by J. G. Fairchild, record C–626.

	E	F	G	H		E	F	G	H
SiO_2	57.87	57.47	49.85	71.71	TiO_2	1.21	1.60	2.50	0.25
Al_2O_3	16.76	14.95	15.20	14.49	ZrO_2	.02	-------	-------	-------
Fe_2O_3	2.21	2.05	1.69	2.01	CO_2	None	-------	-------	-------
FeO	4.60	7.18	10.50	.30	P_2O_5	.34	.32	.40	[1]
MgO	3.29	2.74	6.25	.25	MnO	.04	.12	.16	-------
CaO	6.23	6.63	9.43	2.35	BaO	.02	-------	-------	-------
Na_2O	4.07	3.45	3.08	3.84	FeS_2	.23	-------	-------	-------
K_2O	2.17	2.15	.97	4.06					
H_2O-	.32	.45	None	-------		100.29	99.66	100.27	99.26
H_2O+	.91	.55	.24	-------					

[1] Probably contains a very small quantity of P_2O_5 reported as Al_2O_3.

I–K. Three samples of pumice, collected by B. N. Moore. Analyses by J. J. Fahey, record D–114.

I. Sec. 8, T. 27 S., R. 8 E., Willamette meridian, Klamath County.

J. Sec. 30, T. 21 S., R. 13 E., Willamette meridian, Deschutes County.

K. Sec. 17, T. 28 S., R. 8 E., Willamette meridian, Klamath County.

L–O. Four rhyolites from Sumpter quadrangle, collected by J. T. Pardee. Partial analyses by R. C. Wells, record 3058.

L. Kings Mountain.

M. Water Gulch.

N. Minersville.

O. Bridge Creek.

	I	J	K	L	M	N	O
SiO_2	68.56	71.72	69.50	76.12	73.75	75.06	72.92
Al_2O_3	14.22	13.77	15.18	----------	----------	----------	----------
Fe_2O_3	1.42	.55	1.24	----------	----------	----------	----------
FeO	1.49	1.34	1.42	----------	----------	----------	----------
MgO	.83	.52	.83	----------	----------	----------	----------
CaO	2.35	Trace	2.08	.59	.66	.50	.50
Na_2O	5.18	4.54	4.78	4.17	3.17	4.23	3.98
K_2O	2.47	3.75	2.18	3.55	4.63	3.84	3.63
H_2O	3.32	3.22	2.51	----------	----------	----------	----------
TiO_2	.58	.25	.41	----------	----------	----------	----------
CO_2	None	None	None	----------	----------	----------	----------
P_2O_5	.10	.06	.21	----------	----------	----------	----------
MnO	.03	.02	.03	----------	----------	----------	----------
	100.55	99.74	100.37	----------	----------	----------	----------

PANAMA

Rocks collected by D. F. MacDonald. Analyses A–D by R. C. Wells, record 3116; analyses E and F by R. C. Wells with corrected fluorine determinations by J. G. Fairchild, record 2799. The Cucaracha rocks are described in Nat. Acad. Sci. Mem., vol. 18, pp. 53–68, 1924, and all of them more briefly in U. S. Bur. Mines Bull. 86, 1915.

A. Greenish Cucaracha rock.
B. Red Cucaracha rock.
C. Gatun formation.
D. Gatun soil.
E. Andesite, Point Farfan. Specific gravity, 2.57.
F. Granodiorite, Cocovi Islands. Specific gravity, 2.52.

	A	B	C	D	E	F
SiO_2	53.13	50.44	37.31	35.18	57.39	63.51
Al_2O_3	16.65	17.82	13.09	28.03	15.84	18.07
Fe_2O_3	5.19	9.84	5.13	13.47	2.38	2.01
FeO	3.11	1.27	1.73		5.96	2.18
MgO	1.80	1.25	2.56	.13	2.41	2.19
CaO	2.34	1.41	14.86	.50	5.24	5.14
Na_2O	.85	.63	1.05	.21	5.23	4.08
K_2O	.59	.43	.87	.18	.84	.88
H_2O-	10.24	9.97	6.99	7.35	1.09	1.07
H_2O+	4.74	5.90	3.59	11.79	1.74	.60
TiO_2	1.04	1.10	.80	1.55	1.35	.33
ZrO_2	Trace	Trace	.02	Trace	Trace	None
CO_2	.43	.10	9.48	.08	Trace	None
P_2O_5	.06	.04	.08	.02	.68	.19
SO_3	.12	None	2.50	.33		
Cl					.05	.01
F					.07	.06
S					.01	.01
Cr_2O_3	Trace	.04	Trace	Trace		
V_2O_3	Trace	Trace	Trace	.04	Trace	Trace
MnO	.05	.02	.24	.02	.18	.06
BaO	Trace				.02	.03
C				.88		
	100.34	100.26	100.30	99.76	100.48	100.42
Less O					.03	.03
					100.45	100.39

PENNSYLVANIA

A–D. Rocks studied by Florence Bascom. Analyses A–C by R. C. Wells, record 3099. D by A. A. Chambers, record 3100.

A. Granite, west end of Furnace Hill, Boyertown quadrangle: Quartz, microcline, microperthite, biotite, muscovite.

B. Quartz diorite, 0.5 mile northwest of Seisholtzville. Quartz, orthoclase, microcline, albite, oligoclase, biotite, and accessory magnetite, titanite, and apatite.

C. Quartz gabbro, hill 1¾ miles southwest of Blandon. Quartz, labradorite, andesine, augite, hornblende, with accessory biotite, magnetite, apatite, and zircon.

D. Trachyte porphyry, east of Rittenhouse Gap iron mines, Boyertown quadrangle. Orthoclase, a little hornblende, and secondary sericite.

E. Harpers phyllite, 1 mile southeast of Mountville, Lancaster County, collected by E. B. Knopf. Partial analysis by J. G. Fairchild, record C-344.

F–G. Quarryville quadrangle. Two rocks collected by E. B. Knopf. Analyses by R. K. Bailey, record 3265.

F. †Camargo schist.[6] Albite, muscovite, quartz, calcite, tourmaline, titanite.

G. †Camargo schist. Similar to F.

[6] A dagger (†) preceding a geologic name indicates that the name has been abandoned or rejected for use in publications of the U. S. Geological Survey.

	A	B	C	D	E	F	G
SiO_2	73.64	70.54	64.42	63.40	67.38	68.40	54.99
Al_2O_3	12.82	15.32	17.33	18.30	----	12.62	18.74
Fe_2O_3	.65	.87	.59	3.18	----	1.80	2.90
FeO	1.55	1.37	3.72	1.77	----	2.54	5.49
MgO	.12	.52	1.40	.33	----	1.74	2.81
CaO	1.08	3.42	5.53	.70	----	2.20	.85
Na_2O	2.47	4.52	4.22	6.51	2.18	2.34	1.68
K_2O	6.22	1.58	1.05	5.51	5.79	5.12	5.36
H_2O-	.14	.37	.37	.05	----	1.08	5.10
H_2O+	.68	.51	.53	.86	----		
TiO_2	.17	.32	.46	.10	----	1.13	1.66
ZrO_2	----	.03	Trace	----	----	----	----
CO_2	.38	.24	Trace	Trace	----	1.34	.18
P_2O_5	.04	.11	.23	.06	----	.50	.62
S	None	Trace	Trace	----	----	----	----
MnO	.03	.02	.07	.08	----	.66	.04
BaO	.04	.03	.03	Trace	----	----	----
SrO	----	.03	.02	Trace	----	----	----
SO_3	----	----	----	None	----	----	----
	100.03	99.80	99.97	100.85	----	100.89	100.42

UTAH

FAIRFIELD QUADRANGLE

Six volcanic rocks collected and described by James Gilluly in Prof. Paper 173, 1932. Partial analyses by J. G. Fairchild, record C–1017.

A. Biotite-hornblende-augite trachyte, breccia near head of City Canyon. Biotite, augite, magnetite, orthoclase.

B. Augite-biotite-hornblende latite from Oak Canyon. Also contains plagioclase, quartz, and accessory apatite, zircon, and magnetite.

C. Quartz latite from northwest corner sec. 2, T. 5 S., R. 2 W. Biotite, hornblende, plagioclase, quartz.

D. Obsidian, Tickville Gulch. Phenocrysts of plagioclase.

E. Quartz latite, Tickville Spring. Phenocrysts of quartz, plagioclase, biotite, and hornblende.

F. Hypersthene-augite latite from 6,589-foot hill in southwest corner of sec. 8, T. 4 S., R. 2 W. With visible orthoclase.

	A	B	C	D	E	F
SiO_2	62.38	61.09	65.64	72.11	66.90	59.86
CaO	5.50	4.70	3.26	.71	2.35	4.62
Na_2O	2.68	3.60	3.26	2.53	3.34	3.31
K_2O	5.08	3.77	3.50	4.78	3.75	4.84

GOLD HILL QUADRANGLE

Rocks collected by T. B. Nolan. Analyses by J. G. Fairchild, record C–1015.

A. Hypersthene-augite andesite, 0.25 mile west of benchmark 5045 on Deep Creek. Hypersthene, augite, labradorite, hornblende, magnetite, apatite, in glass.

B. Biotite-augite andesite, west of benchmark 5030 on Deep Creek. Minerals similar to A.

C. Biotite latite 0.75 mile southeast of benchmark 5045 on Deep Creek.

D. Trachyte 1 mile east of benchmark 5120 on Deep Creek.

E. Alkali basalt 1,200 feet northeast of benchmark 5509, Overland Canyon.

	A	B	C	D	E		A	B	C	D	E
SiO_2	61.52	57.94	70.30	65.00	47.36	K_2O	3.02	8.90	4.37	5.19	2.66
Al_2O_3	15.25	16.66	14.92	14.28	------	H_2O-	.36	1.66	------	------	------
Fe_2O_3	2.20	2.73	------	------	------	H_2O+	2.23	3.82	------	------	------
FeO	3.97	.57	------	------	------	TiO_2	1.00	1.00	------	------	------
MgO	2.59	.60	------	------	------	P_2O_5	.16	.11	------	------	------
CaO	5.72	4.91	------	------	------						
Na_2O	2.31	1.29	2.66	2.23	2.80		100.33	100.19	------	------	------

SAN RAFAEL SWELL

Two basic rocks collected by James Gilluly, described in Am. Jour. Sci., 5th ser., vol. 14, p. 199, 1927. Analyses by J. G. Fairchild, record C–908.

A. Analcite diabase, forming part of 80-foot sill, just north of Starvation Wash, T. 26 S., R. 6 E. Augite, thomsonite, biotite, labradorite, olivine, soda orthoclase, amphibole, magnetite-ilmenite, analcite, apatite.

B. Analcite syenite, same locality. Soda orthoclase, amphibole, labradorite, thomsonite, augite, magnetite-ilmenite, biotite, apatite, natrolite.

	A	B		A	B		A	B
SiO_2	44.30	50.01	Na_2O	3.13	4.43	P_2O_5	0.58	0.67
Al_2O_3	13.53	17.98	K_2O	2.10	4.82	SO_3	.08	.12
Fe_2O_3	4.11	3.05	H_2O-	.23	.27	Cl	.07	None
FeO	5.46	3.26	H_2O+	2.19	2.95	MnO	.10	.10
MgO	10.48	3.13	TiO_2	2.33	2.00			
CaO	10.82	7.09	CO_2	.12	.09		99.63	99.97

MISCELLANEOUS ROCKS

A–C. Two rocks from Santaquin-Nebo district, collected by G. F. Loughlin and described in Prof. Paper 120, pages 101–109, 1919. Analyses by George Steiger, record 3154.

A. Lamprophyre dike rock. Augite, biotite, olivine, minor magnetite and apatite.

B. Part of A soluble in HCl.

C. Similar rock with a groundmass of albite. Part soluble in HCl.

D–E. Two latites, collected in the Tintic district, and described by Lindgren and Loughlin in Prof. Paper 107, 1919. Partial analyses by George Steiger, record 2993.

D. Dike 1 mile southeast of Pinyon Peak. Plagioclase, biotite, and hornblende, with accessory magnetite and apatite.

E. Volcano Ridge. Plagioclase and augite.

F. Granodiorite (Alta stock) from the Wasatch Mountains, Cottonwood special quadrangle, collected by F. C. Calkins. Analysis by Charles Milton, record D–339. Andesine, quartz, orthoclase, biotite, hornblende, titanite, apatite, magnetite, and traces of chlorite and sericite.

	A	B	C	D	E	F
SiO_2	45.59			57.27	53.75	62.16
Al_2O_3	12.02	10.13	4.10			17.17
Fe_2O_3	3.84	7.42	5.31			2.26
FeO	5.05					2.78
MgO	7.09	4.51	4.22	2.45	3.30	1.81
CaO	10.21	5.41	5.52	6.06	5.95	4.70
Na_2O	1.82			2.94	3.18	3.96
K_2O	3.90			3.23	4.13	3.58
H_2O-	1.64					.03
H_2O+	3.59					.60
TiO_2	1.67	.95	.51			.53
ZrO_2	None					.01
CO_2	1.91	1.91				None
P_2O_5	1.33					.17
S	.13					.04
MnO	.16					.06
BaO	.20					.17
SrO	.16					
	100.31					100.03
Specific gravity	2.755		2.680			

VIRGINIA

A–G. Seven samples of soapstone and chloritic schist sent in by Scott Turner. Mineral analysis by W. T. Schaller, record D–149.

A–E. From Virginia Alberene Corporation, Schuyler.

F–G. From Lynchburg.

	A	B	C	D	E	F	G
Talc	15	20	35	5	50	----------	----------
Actinolite	25	5	5	15	5	75	70
Chlorite	50	35	35	65	20	20	25
Calcite	3	30	20	5	20	----------	----------
Iron oxide	2	8	5	8	5	3	2
Other material	5	2	----------	2	----------	2	3
	100	100	100	100	100	100	100

H. Emery ore rock 1½ miles west of Whittles station, Pittsylvania County, collected by T. L. Watson. Analysis by George Steiger, record 3197. This rock has also been termed "spinellite" and consists chiefly of an aggregate of corundum, magnetite, spinel, and ilmenite. It is described by Watson and Steiger in Washington Acad. Sci. Jour., vol. 8, pp. 665–670, 1918. Zr, P, S, Ba, Sr absent.

I–J. Two altered gangue rocks with an ilmenite vein near Bedford, collected by C. S. Ross. Analyses by J. G. Fairchild, record D–286. I, Feldspar partly altered to muscovite; J, feldspar partly altered to zoisite.

K. Manganese ore near Suiter, collected by H. D. Miser. Partial analysis by J. G. Fairchild, record C–240.

	H	I	J	K		H	I	J	K
SiO_2	2.53	60.30	59.62	-------	TiO_2	3.72	0.05	0.09	-------
Al_2O_3	45.38	24.06	24.06	-------	CO_2	.07	Trace	Trace	-------
Fe_2O_3	23.33	.15	.49	-------	Cr_2O_3	.05	-------	-------	-------
FeO	17.90	.05	.09	-------	NiO	.04	-------	-------	-------
MgO	5.71	.07	.07	-------	MnO	.15	-------	-------	72.37
CaO	.06	5.42	4.54	-------	BaO	-------	-------	-------	Present
Na_2O	.20	5.88	5.36	-------					
K_2O	None	3.57	4.84	-------	Available O	-------	-------	-------	15.67
H_2O-	.33	-------	.03	0.04					
H_2O+	.99	.78	1.19	2.56		100.46	100.33	100.38	90.64

ANALYSES OF SANDSTONES AND CHERTS

ARIZONA

Glauconitic sandstone, Grand Canyon. Partial analyses by Chase Palmer, record 2951.

	A	B
Fe_2O_3	8.68	13.12
FeO	1.00	1.41
K_2O	3.30	5.72
Na_2O	.18	.64

CALIFORNIA

"Oil sands." Analyses by George Steiger, record D–54–a.

A. Oil sand in Temblor formation, Milborn-Kennedy well 1, sec. 28, T. 21 S., R. 17 E. Portion passing 300-mesh sieve.

B. Same as A. Portion not passing 300-mesh sieve.

C. Bolsa Chica oil sand, Kettleman Hills, King County, sec. 24, T. 22 S., R. 17 E. Depth, 7,670 feet.

	A	B	C			
			Soluble in cold 1-10 HCl	Soluble in hot 1-10 HCl	Insoluble in 1-10 HCl	Determination made on original rock
SiO_2	59.16	72.48	0.08	1.24	44.91	----------
Al_2O_3	14.03	7.69	1.00	1.15	14.70	----------
Fe_2O_3	2.26	1.36	3.17	2.22	.97	----------
FeO	2.68	1.88	----------	----------	----------	----------
MgO	5.20	6.76	1.95	.80	.95	----------
CaO	2.68	1.46	4.71	.28	1.33	----------
Na_2O	2.36	1.76	----------	----------	----------	0.50
K_2O	2.14	1.72	----------	----------	----------	3.80
H_2O-	2.50	1.34	----------	----------	----------	5.78
H_2O+	3.28	2.44	----------	----------	----------	----------
TiO_2	.61	.23	None	None	.97	----------
CO_2	.33	.25	1.98	7.66	----------	----------
P_2O_5	.49	.22	----------	----------	----------	----------
SO_3	.80	.31	----------	----------	----------	----------
S[1]	1.25	.06	----------	----------	----------	----------
MnO	.03	.03	----------	----------	----------	----------
	99.80	99.99	12.89	13.35	63.83	10.08
			100.15			

[1] Pyrite is present in small quantity. Sulphur probably p resent as an organic compound. M. N. Short estimates pyrite as less than 0.1 percent.

NEVADA

A sample of chert collected by S. H. Cathcart from Triassic strata on Pilot Mountain, just east of Mina, representing several thousand feet. Secondary silica with accessory plagioclase, sericite, epidote, zircon, apatite, rutile, and calcite. Analysis by J. G. Fairchild, record C–521.

SiO_2	95.84	K_2O	0.36
Al_2O_3, ZrO_2, P_2O_5	1.97	Na_2O	.14
Fe_2O_3, FeO	.70	TiO_2	.13
CaO	.37		
MgO	.12		99.63

NEW MEXICO

Two samples studied by B. C. Renick with reference to ground waters. Determination of minor constituents by J. G. Fairchild, record C–668.

A. Poleo sandstone from ravine 1 mile west of Miller ranch, San Ysidro, Sandoval County.

B. Massive red sandstone below Poleo sandstone and above the scarlet red member. From mesa east of Jemez Creek and 2 miles south of junction of San Diego and Guadalupe Canyons, Sandoval County.

	Percent soluble in 1-1 HCl			Percent soluble in 1-1 HCl	
	A	B		A	B
$(Fe,Al)_2O_3$	0.19	0.78	SO_3	0.12	0.01
CaO	.13	.17	Soluble in boiling 5 percent solution of Na_2CO_3	.12	.50
MgO	.03	.05			
$(Na,K)_2O$	.07	.06			

OKLAHOMA

A–F. Oil sands submitted by A. F. Melcher. Analyses by E. P. Henderson, record C–394.

A. Waite Phillips well 1.
B. Sinclair well 2.
C. Carter well 4.
D. Waite Phillips well 5.
E. Phillips Skilly well 4.
F. Producers & Refiners well 6.

	A	B	C	D	E	F
Insoluble in HCl	83.52	83.90	85.82	86.65	72.95	82.95
R_2O_3[1]	9.45	7.12	4.67	7.77	3.20	7.58
CaO	.15	.45	.26	.10	10.70	.19
MgO	.88	.57	.53	.66	.75	.39
CO_2	----	----	----	----	8.38	----
	94.00	92.04	91.28	95.18	95.98	91.11

[1] Including FeO weighed as Fe_2O_3.

G–L. Whitehorse sandstone from Cement oil field. Collected by Frank Reeves and described in Bull. 726, pp. 51–56, 1922. Determinations by R. C. Wells, record C–213, to see if color could be related to the iron content.

G. Brick red.
H. Gray with purple cast.
I. Very light brick red.
J, K. Light straw.
L. White.

	G	H	I	J	K	L
Insoluble in hot 1–1 HCl	92.15	94.85	94.89	94.81	94.85	58.79
Soluble in hot 1–1 HCl:						
Fe_2O_3	1.76	.98	1.02	.97	1.08	.24
MnO	.02	.01	----	----	----	----
CaO	.26	.38	.30	.30	.22	12.21
MgO	1.68	.47	.62	.66	.58	8.52
Soluble in cold 1–1 HCl in 2 hours: Fe_2O_3	.24	.16	.34	.31	.29	.18
Percentage of total Fe_2O_3 dissolved by 2-hour treatment	.14	16.00	33.00	32.00	27.00	75.00
FeO (by usual hydrofluoric method)	.05	.02	----	----	Trace	.03

OREGON

Sixteen samples of diatomite submitted by R. W. Richards. Analyses by E. T. Erickson, record D–82.

A. Clover Creek, sec. 11, T. 18 S., R. 42 E., Baker County.
B. Klamath Falls, sec. 12, T. 39 S., R 8 E., Klamath County.
C. Sycan River, sec. 5, T. 36 S., R. 14 E., Klamath County.
D. Sprague River, sec. 12, T. 26 S., R. 10 E., Klamath County.
E. Poe Valley, sec. 25, T. 40 S., R. 11 E., Klamath County.
F. Drewsey, sec. 34, T. 19 S., R. 36 E., Harney County.
G, H. Drewsey, sec. 14, T. 20 S., R. 36 E., Harney County.
I. Harper, sec. 14, T. 19 S., R. 41 E., Malheur County.
J. Westfall, sec. 15, T. 18 S., R. 41 E., Malheur County.
K. Harper, sec. 34, T. 19 S., R. 42 E., Malheur County.
L. Harper, sec. 34, T. 18 S., R. 41 E., Malheur County.
M. Harper, sec. 2, T. 19 S., R. 41 E., Malheur County.
N. Harper, sec. 11, T. 19 S., R. 41 E., Malheur County.
O. Harper, sec. 22, T. 19 S., R. 42 E., Malheur County.
P. Terrebonne, sec. 16, T. 14 S., R. 12 E., Jefferson County.

	A	B	C	D	E	F	G	H
SiO_2	72.50	75.56	76.00	65.52	75.30	84.48	81.68	82.78
Al_2O_3	9.93	8.54	5.90	14.44	8.42	3.66	5.93	4.61
Fe_2O_3	4.58	2.66	2.03	3.34	2.89	1.46	1.20	1.77
CaO	.60	1.20	.38	1.56	1.90	.80	.54	.44
MgO	.54	.37	.23	.87	.63	.18	.30	.22
Na_2O	.33	1.08	.33	.91	.71	.22	.24	.62
K_2O	.16	.26	.15	.42	.32	.16	.10	.24
TiO_2	.45	.64	.13	.86	.45	.26	.31	.26
SO_3	.03	.06	.17	.03	.03	.06	.05	.15
Cl	.04	None	.06	.10	.34	.06	None	None
CO_2	.09	.11	.20	.04	.10	.05	.09	.06
Loss at 105° C. (24 hours)	4.78	3.76	5.20	5.20	3.80	4.90	4.62	4.74
Additional loss in Meeker burner flame (3 minutes)	5.83	5.40	9.18	7.40	5.67	4.24	5.10	4.78
	99.86	99.64	99.96	100.69	100.56	100.53	100.16	100.67

	I	J	K	L	M	N	O	P
SiO_2	77.96	83.82	74.78	82.64	85.52	78.12	82.84	83.18
Al_2O_3	3.93	3.74	6.69	3.20	2.60	6.29	3.18	2.66
Fe_2O_3	2.92	1.99	1.98	1.88	1.04	1.88	1.14	1.46
CaO	1.26	.58	.88	.64	.48	.96	.38	.80
MgO	.67	.30	.65	.38	.17	.41	.23	.35
Na_2O	.98	.34	1.44	.04	.28	.34	1.12	.48
K_2O	.16	.20	.32	.14	.04	.20	.14	.14
TiO_2	.27	.19	.27	.18	.14	.33	.18	.16
SO_3	.10	.12	.88	.06	.09	.04	.69	.10
Cl	.02	None	1.66	None	None	None	.18	.02
CO_2	.15	.09	.13	.09	.14	.13	.05	.08
Loss at 105° C. (24 hours)	6.22	3.72	6.48	4.92	4.72	4.72	5.68	6.28
Additional loss in Meeker burner flame (3 minutes)	6.16	5.06	6.56	5.40	4.44	6.80	5.52	4.50
	100.80	100.15	102.72	99.57	99.66	100.22	101.33	100.21

UTAH

A–R. Eighteen sandstones tested for uranium and vanadium. A to G, Crescent Creek, Henry Mountains; H and I, Park Creek, La Sal Mountains; J and K, Trachyte Creek, Henry Mountains; L to R, Browns Park, San Rafael Swell. Analyses A to F by R. C. Wells, record 2885; G to K by Chase Palmer, record 2887; L to R by George Steiger, record 2889. No selenium except 0.01 percent in E and M and 0.03 percent in Q.

	V_2O_5	UO_3			V_2O_5	UO_3	
		Gravimetric	Electroscopic			Gravimetric	Electroscopic
A	2.29	0.47	0.38	J	3.59	0.35	----
B	.09	None	.11	K	1.04	.43	----
C	.24	.11	.09	L	2.90	.06	----
D	4.65	.14	.09	M	6.69	3.19	----
E	.11	None	.03	N	None	None	----
F	.24	None	.03	O	4.02	None	----
G	.04	.04	----	P	.30	None	----
H	.07	.02	----	Q	11.13	.03	----
I	.05	.09	----	R	.20	None	----

S–V. Molybdenum-bearing sandstone from Ouray, described by F. L. Hess in Bull. 750, pp. 3–8, 1925. Analyses by W. T. Schaller, record C–246.

S. Sandstone richest in soluble salts.

T. Same after deducting insoluble.

U. Pale-blue fibers.

V. Same after deducting insoluble.

	S	T	U	V		S	T	U	V
Insoluble in water	81.79	-------	7.06	------	MgO	0.14	0.78	1.54	1.66
MoO_3[a]	.70	3.83	2.06	2.22	SO_3	5.29	29.04	25.09	27.00
Al_2O_3	1.13	6.18	3.07	3.30	H_2O[c]	9.31	51.13	50.23	54.04
FeO[b]	1.62	8.88	10.95	11.78		100.00	100.00	100.00	100.00
MnO	.01	.07	-------	------					
NiO	.01	.09	-------	------					

[a] Total molybdenum as MoO_3. [b] Total iron as FeO. [c] By difference.

VIRGINIA

Matrix of sandstone from Quantico, collected by G. F. Loughlin. Tests of "soluble silica" by J. G. Fairchild, record C–393.

A. Amorphous matrix, soluble in 10 percent NaOH, 22.8.

B. Partly crystalline matrix, soluble in 5 percent Na_2CO_3, 3.2.

WEST VIRGINIA

Big Injun oil sand from Clifton Oil & Gas Co., Mannington. Examined by P. G. Nutting. Portion soluble in acid analyzed by J. G. Fairchild, record C–965.

SiO_2	0.97	MgO	0.42
Al_2O_3	1.72	CaO	1.15
FeO	3.63		

ANALYSES OF CARBONATE ROCKS

ALABAMA

A–B. Two samples of marble near Sylacauga, collected by T. N. Dale. Analyses by Chase Palmer, record 3195.

A. Cream-colored. Very minute grains of pyrrhotite or pyrite.

B. Very little dolomite, quartz, pyrite, muscovite, and undetermined opaque specks.

C–D. Two samples of Bangor limestone from the DeBardeleben mine of the Alabama Fuel & Iron Co., Russellville district, Franklin County. Analyses by J. J. Fahey, record D–345. Sample D appears to be slightly weathered.

	A	B	C	D		A	B	C	D
SiO_2	0.67	-------	6.00	5.98	K_2O	0.27	-------	0.38	0.34
Al_2O_3	.16	-------	1.68	1.83	Na_2O			.02	.03
Fe_2O_3	-------	.52	.50	.41	CO_2	43.47	41.89	39.49	39.16
FeO	.04	.04	.35	.33	S	.02	-------	-------	-------
CaO	53.32	52.53	49.58	49.60	TiO_2	-------	-------	.10	.08
MgO	1.77	1.53	.95	.98	C	.01	-------	-------	------
H_2O	-------	-------	1.49	1.50	Insoluble	-------	2.66	-------	------
MnO	None	None	-------	------		99.73	99.17	100.54	100.24

ALASKA

A–L. Dolomitic rocks from the pre-Cambrian of central Alaska, collected by J. B. Mertie, Jr., and described in Bull. 836, pp. 369–392, 1933. Analyses by J. G. Fairchild, record D–31.

	A	B	C	D	E	F	G
SiO_2	4.74	27.77	30.39	37.31	31.06	26.42	29.30
CaO	48.70	20.33	19.78	8.36	19.17	21.94	25.88
MgO	2.93	12.80	13.03	6.97	12.88	14.03	7.49
Ignition	41.21	30.85	29.61	19.24	29.34	32.84	27.55
	97.58	91.75	92.81	71.88	92.15	95.23	90.22

	H	I	J	K	L
SiO_2	54.80	71.66	35.97	43.24	10.52
Fe_2O_3	26.68	3.84	5.07	5.34	----------
CaO	4.85	9.90	24.81	21.07	27.27
MgO	2.66	1.45	1.98	2.07	18.46
Ignition	6.32	9.66	23.41	17.47	21.62
	95.31	96.51	91.24	89.19	97.87

M–P. Four limestones from the Yukon-Tanana district, collected by Eliot Blackwelder. Partial analyses by A. A. Chambers, record 3092.

	M	N	O	P
$CaCO_3$	44.08	26.07	90.34	98.16
$MgCO_3$	19.50	20.02	.97	1.22

Q–GG. Seventeen samples of marble from southeastern Alaska, collected by E. F. Buchard and described in U. S. Geol. Survey Bull. 682, 1920. Analyses by R. K. Bailey, record 2952. The carbonates are calculated from CaO and MgO. respectively. In sample FF, however, the loss on ignition was only 36.82 and $SiO_2+R_2O_3$ was 9.71.

Q, R. Tokeen, Marble Island.
S, T. One and one-half miles south of Tokeen.
U, V. West side of Orr Island.
W. North side of Heceta Island.
X, Y. Dickman Bay, Prince of Wales Island.
Z. Waterfall Bay, Dall Island.
AA. Mill Creek Lake, east of Wrangell.
BB. Head of Red Bay, Prince of Wales Island.
CC. South of Sandy Cove, Glacier Bay.
DD–FF. Admiralty Island, near Marble Cove, Chatham Strait.
GG. Basket Bay, Chichagof Island.

Mark	Insoluble in HCl	$CaCO_3$	$MgCO_3$	Mark	Insoluble in HCl	$CaCO_3$	$MgCO_3$
Q	0.01	99.59	0.94	Z	0.32	99.59	1.03
R	.20	81.90	14.93	AA	19.06	53.69	26.10
S	20.77	78.65	1.87	BB	1.70	96.90	2.59
T	7.82	91.70	1.21	CC	2.56	96.19	.89
U	2.95	95.35	2.04	DD	.91	61.11	39.10
V	3.50	95.99	1.40	EE	3.61	95.44	1.45
W	13.18	84.46	2.85	FF	----------	59.97	39.90
X	22.84	74.61	3.25	GG	28.19	63.68	8.90
Y	37.32	58.40	6.61				

HH–KK. Four limestones collected by A. F. Buddington, described in Bull. 783, p. 61, 1926. Analyses by J. G. Fairchild, record C–630.

	HH	II	JJ	KK		HH	II	JJ	KK
CaO	49.07	54.22	55.41	55.52	Insoluble	10.91	2.79	0.12	0.37
MgO	.40	.30	.48	.30					
CO_2 (calculated)	38.96	42.93	44.11	43.93		99.75	100.24	100.12	100.12
$(Al,Fe)_2O_3$	.41	None	None	None					

ARIZONA

A–J. Ten samples of limestone from the Grand Canyon, collected by L. F. Noble and described in Prof. Paper 131, pp. 39–71, 1923. Analyses by A. A. Chambers, record 3123. F, Bright Angel quadrangle; all others Shinumo quadrangle.

	A	B	C	D	E	F	G	H	I	J
Insoluble	2.66	23.46	1.52	10.96	24.41	0.47	0.82	0.48	11.15	6.98
R_2O_3	5.44	2.54	.80	2.89	1.83	.41	.40	.10	.71	.56
CaO	29.54	48.25	30.10	27.43	22.95	31.79	32.54	55.50	48.68	29.98
MgO	18.26	Trace	20.78	17.88	15.01	19.65	19.52	.08	None	18.68

K–M. Samples of limestone analyzed on account of their relation to the development of ores.

K. Limestone, closely associated with asbestos, Ash Creek mine, 0.5 mile west of Chrysotile, collected by J. S. Diller. Analysis by J. G. Fairchild, record 3262.

L. Limestone from Bisbee, collected by D. F. Hewett. Analysis by J. G. Fairchild, record C–1038.

M. Altered limestone, same locality as L.

	K	L	M		K	L	M
Insoluble	1.00	1.35	5.24	MnO	-------	0.13	1.15
FeO	-------	None	None				
MgO	22.80	.52	14.27		99.50	99.74	100.58
CaO	36.30	54.37	35.62				
H_2O	9.40	-------	-------	MnO_2 in insoluble	-------	-------	1.10
CO_2	30.00	43.37	44.30				

ARKANSAS

BATESVILLE DISTRICT

A–E. Manganiferous limestone collected by H. D. Miser. Determinations by Chase Palmer, record C–110.

A. Fernvale limestone 3 miles north of Batesville. MnO, 2.16.

B. Same, 6 miles northeast of Batesville. MnO, 1.91.

C. Same, 5 miles northeast of Batesville. MnO, 7.52.

D. Lower part of St. Clair limestone, 3 miles northeast of Batesville. MnO, 1.97.

E. Red "buttons" in green Cason shale, 3 miles northeast of Batesville. BaO, 0.66.

F–I. Four rocks associated with manganese ore (see also hausmannite) collected by H. D. Miser and described in Bull. 734, 1923. Analyses by R. C. Wells, record 3231. Ba, SO_4, and CO_3 present but not determined.

F. Pebble-like *Girvanella* in St. Clair limestone.

G. Carbonate core in a manganese boulder, Fernvale limestone, Harvey mine.

H. "Button" from Cason shale, Cason mine.

I. Cason shale, Cason mine.

	F	G	H	I		F	G	H	I
SiO_2	0.29	1.51	2.75	32.75	MgO	0.87	0.96	1.45	3.38
Al_2O_3	4.06	2.06	5.68	8.22	CaO	42.80	10.60	29.85	14.22
Fe	1.56	6.54	3.08	4.98	Mn	5.94	35.50	5.85	5.87

J–P. Samples of rhodochrosite from the Batesville district collected by H. D Miser and D. F. Hewett. Analyses by R. C. Wells, record D–169.

J–N. From an enriched manganese-bearing lens in the Fernvale limestone.

O, P. From the limestone itself.

	J	K	L	M	N	O	P
Insoluble in 1-2 HNO_3	0.4	4.6	3.7	0.6	2.4	0.9	2.2
Soluble:							
CO_2	39.6	35.7	35.8	37.8	37.0	42.2	41.2
P_2O_5	.1	.5	.5	.5	.8	.6	.1
FeO	.1	.3	.3	.1	.2	1.3	1.0
MnO	45.2	49.2	49.1	52.8	45.5	5.9	1.8
CaO	13.8	7.9	8.2	7.9	11.6	47.3	51.2	
MgO	1.5	.6	.4	.3	1.7	1.0	1.0
SiO_2	.1	----	.2	.2	.3	.2	----
H_2O	----	.7	.6	----	----	.2	.1
O	----	----	.6	----	----	----	----
	100.8	99.5	99.4	100.2	99.5	99.6	98.6

AUSTRALIA

Samples from Torres Straits, Murray Island, Australia, submitted by T. W. Vaughan. Analyses by A. A. Chambers, record 3080.

A–E. Reef samples near the water line.

F. Reef material, 500–700 feet above sea level.

	A	B	C	D	E	F
Ignition	44.89	44.51	44.87	44.96	45.24	43.86
SiO_2	.23	.31	.09	.07	.22	.16
$(Al,Fe)_2O_3$	.35	.30	.21	.10	.26	.27
CaO	50.80	51.54	50.86	51.41	49.80	55.35
MgO	2.69	2.58	2.75	2.68	3.49	.28
SO_3	Trace	Trace	Trace	Trace	Trace	None
Na+K	Trace	Trace	Trace	Trace	Trace	(?)
	98.96	99.24	98.78	99.22	99.01	99.92

No P_2O_5 in any.

BAHAMAS

A. Composite bottom sample from Andros Island. Analysis by A. A. Chambers, record 3083.

B. Bottom mud submitted by T. W. Vaughan. Analysis by E. T. Erickson, record C–306.

C–F. Composite samples studied by M. I. Goldman. Partial analyses by J. G. Fairchild, record C–397.

	A	B	C	D	E	F
SiO_2	0.09	0.22	Trace	0.10	0.10	0.13
Soluble SiO_2	----	----	Trace	Trace	Trace	Trace
Al_2O_3	.08	.21	None	None	None	None
Fe_2O_3		.06				
MgO	2.43	.66	2.95	2.70	2.70	2.46
CaO	51.56	50.19	51.60	51.68	51.68	51.78
H_2O-	----	.79	----	----	----	----
Organic matter and H_2O+	----	5.86	----	----	----	----
TiO_2	----	None	----	----	----	----
CO_2	----	40.60	----	----	----	----
P_2O_5	None	Trace	None	None	None	None
SO_3	Trace	.51	Trace	Trace	Trace	Trace
MnO	----	Trace	----	----	----	----
SrO	----	.63	----	----	----	----
Ignition	44.84	----	----	----	----	----
	99.00	99.73	----	----	----	----

G. Calcareous mud collected by T. W. Vaughan. Determinations of organic matter other than carbonates by E. T. Erickson, record C–287.

Total organic carbon	0.65
Nitrogen	.07
Phosphorus	.01
Stabilized organic carbon insoluble in acids	.19
Stabilized organic hydrogen insoluble in acids	.03

CALIFORNIA

IVANPAH QUADRANGLE

Two samples of dolomite from thin beds in Lower Cambrian quartzite, collected by D. F. Hewett. They weather a chocolate brown. Analyses by J. G. Fairchild, record C–624.

	A	B		A	B		A	B
CaO	15.55	28.44	MnO	0.18	1.03	Insoluble	54.92	6.27
MgO	6.86	17.18	CO_2 (calculated)	20.25	43.74			
FeO	.72	3.25	Fe_2O_3	.64	.28		99.12	100.19

MISCELLANEOUS ROCKS

Magnesite rock collected by R. W. Stone. Analyses by Chase Palmer, record 3221.

A, B. Austin Creek, Sonoma County.
C. Pope Valley, Napa County.
D, E. Red Mountain, Santa Clara County.
F. Red Mountain, Stanislaus County.
G. Same, calcined.
H. Same as D, calcined.
I, J. Madrone station, Santa Clara County.
K. Sampson Peak, San Benito County.
L. Same, calcined.
M. Chiles Valley, Napa County.
N, O. Soda Valley, Napa County.
P, Q. Pope Valley, Napa County.
R. Cedar Mountain, Santa Clara County.
S. Morgan Hill, Santa Clara County.
T. Evergreen, Santa Clara County.
U. Red Mountain, Santa Clara County.
V. Gilliam Creek, Sonoma County.

	A	B	C	D	E	F	G	H	I	J	K
SiO_2	15.24	8.87	1.94	0.78	2.70	1.67	0.51	0.50	0.65	6.37	5.65
FeO	1.17	.88	1.49	.23	.23	.31	[1].39	[1].43	.33	.35	[1]1.82
CaO	1.15	.43	.67	2.06	.80	1.17	2.49	4.90	2.65	2.88	2.34
MgO	40.80	43.18	45.01	45.90	46.02	45.75	90.31	83.17	45.43	41.55	89.08
CO_2	41.02	46.31	50.65	51.68	50.32	50.95	5.22	11.34	51.42	49.18	1.65
	99.38	99.67	99.76	100.65	100.07	99.85	98.92	100.34	100.48	100.33	100.54

	L	M	N	O	P	Q	R	S	T	U	V
SiO_2	0.18	4.35	13.90	14.39	2.26	2.43	9.57	2.40	12.05	1.82	2.57
FeO	.93	1.71	.70	1.33	2.11	2.40	1.00	1.44	2.83	.50	.89
CaO	.90	2.11	.71	.76	1.52	1.57	2.83	3.68	1.98	1.85	.80
MgO	46.20	42.62	40.73	39.56	44.10	43.62	42.48	42.56	38.88	45.12	45.65
CO_2	51.86	49.05	44.63	43.65	50.18	50.11	44.70	49.94	44.94	50.73	50.33
	100.07	99.84	100.67	99.69	100.17	100.13	100.58	100.02	100.68	100.02	100.24

[1] Fe_2O_3.

W–DD. Magnesite rock. Analyses by Chase Palmer, record 3228.

W, X. Austin Creek, Sonoma County.
Y, Z. Soda Valley, Napa County.
AA. Calcined. Sampson Peak, San Benito County.
BB. Same, crude.
CC. Red Mountain, Stanislaus County.
DD. White Queen mine, Santa Clara County.

	W	X	Y	Z	AA	BB	CC	DD
SiO_2	14.72	8.73	12.65	13.88	5.21	1.10	0.51	0.50
FeO	1.35	.97	.80	1.49	1.70	.72	.57	.20
CaO	.64	.39	.95	.27	2.18	1.17	2.48	1.92
MgO	39.60	43.18	40.73	39.60	89.08	45.64	90.30	45.90
CO_2	43.73	46.31	44.64	44.62	1.65	51.20	5.22	51.68
	100.04	99.58	99.77	99.86	99.82	99.83	99.08	100.20

EE–KK. Samples of magnesitic dolomite from the Mojave River Canyon between Afton and Baxter, collected by W. W. Rubey. Partial analyses by J. G. Fairchild, record D–325.

	EE	FF	GG	HH	II	JJ	KK
Insoluble	12.21	7.29	14.40	17.46	26.40	16.65	5.13
CaO	24.39	7.83	11.07	6.57	14.52	4.68	28.32
MgO	20.55	35.59	29.51	30.92	19.98	33.53	20.30

COLORADO

A, B. Dolomite (blue limestone) from Leadville, unaltered, collected by G. F. Loughlin and described in Prof. Paper 148, 1927. Analysis by J. G. Fairchild, record C–461. A, Soluble in 1–3 HCl; B, insoluble.

	A	B		A	B		A	B
SiO_2	0.04	0.19	H_2O+	0.18		Organic matter	0.26	
Al_2O_3	.06	.15	P_2O_5	Trace		TiO_2		None
Fe_2O_3	None		SO_3	.03		Na_2O		0.11
FeO	.27		H_2S	None		K_2O		
MgO	21.23		MnO	Trace		FeS_2		(1)
CaO	30.64		ZnO	None				
CO_2	46.88		Cl	.08			99.67	.45
H_2O-	None		F	None				

[1] Not detected.

C. Limestone from Quarry Canyon near Manitou, collected by K. C. Heald in studies of oil-yielding limestones. Analysis by E. T. Erickson, record C–304.

D. Dolomite from Weber (?) formation of Mosquito Range, Lake County, collected by Charles H. Behre, Jr. Analysis by J. G. Fairchild, record D–163. The insoluble appears to be claylike material.

E. Timpas limestone, Granada. Analysis by W. C. Wheeler, record 2974.

F. Dolomitic limestone from Alma district, collected by Q. D. Singewald. Analysis by J. J. Fahey, record D–213.

G. Limestone from Aspen, collected by D. F. Hewett.

H. Same limestone altered. Analyses by J. G. Fairchild, record C–1038.

I. Marlstone from Green River formation in valley of Cathedral Creek, sec. 26, T. 3 S., R. 99 W., Rio Blanco County. Submitted by W. H. Bradley. Partial analysis by J. G. Fairchild, record C–1105.

	C	D	E	F	G	H	I
SiO_2	0.14	1.78	4.36	12.1	1.29	1.21	
Al_2O_3	.29		1.88				
Fe_2O_3							0.78
FeO	.04	1.84		1.8	None	1.46	1.75
MgO	5.71	19.85	.34	17.1	.05	18.42	14.38
CaO	48.72	29.83	51.71	26.7	54.45	32.08	26.05
H_2O-	.04	.09					
Organic matter	.36						
TiO_2	Trace						
CO_2	44.68	46.18	41.40	41.8	42.99	46.32	37.29
P_2O_5	.07	.06	Trace				
SO_3	.05						
Cl	.02	.09					
MnO	.01	.28		.4	.29	.21	
SrO	.22	None					
Na_2O		.08					
BaO		None					
	100.35	100.08	99.69	99.9	99.07	99.70	
Less O = Cl		.02					
		100.06					

CUBA

Matrix from coral reef, Guantanamo Harbor, collected by T. W. Vaughan. Partial analysis by George Steiger, record 3213.

$(Al,Fe)_2O_3$	0.16
CaO	47.12
MgO	1.11
CO_2 (calculated)	38.24
	96.63

DISTRICT OF COLUMBIA

White calcareous deposit near Tenleytown, collected by N. H. Darton. Analysis by George Steiger, record D–303. Insoluble in 1–4 HCl boiling 3 minutes, 12.14 percent.

		Soluble—Continued.		Soluble—Continued.	
Insoluble	12.14	CaO	36.75	CO_2	8.86
Soluble:		H_2O-	5.50	P_2O_5	.14
SiO_2	[1] 13.85	H_2O+	13.68		100.10
Al_2O_3	4.43	TiO_2	.19		
Fe_2O_3	2.39				
MgO	2.17				

[1] Of this soluble silica 12.35 percent went perfectly into solution with HCl; the remaining 1.50 percent was deposited as sandy silica and remained with the residue; it was dissolved by boiling for 15 minutes with a 5 percent solution of Na_2CO_3 and evidently belonged to a silicate mineral decomposed by boiling HCl.

GEORGIA

Two samples of marble from Tate, collected by T. N. Dale. Analyses by Chase Palmer, record 3195.

A. Coarse calcite marble with graphitic cloud. Microscope shows very little quartz, graphite, and pyrrhotite.

B. High power shows very minute pink dots. Contains also hornblende, quartz, and titanite.

	A	B		A	B		A	B
SiO_2	0.14	0.05	MgO	0.25	0.22	S	Trace	Trace
Al_2O_3	.31	.07	MnO		None	C		Trace
FeO	.05	.04	$(K,Na)_2O$	.15	.31			
CaO	55.29	55.71	CO_2	43.45	43.53		99.64	99.93

HAITI

Four samples of limestone collected by J. S. Brown. Analyses by J. G. Fairchild, record C–293.

A. Top of divide, road Port au Prince to Cape Haitien.

B. Beach near Mont-Rouis.

C. Miocene marl from valley 2 or 3 kilometers north of St. Marc.

D. Clay from Plaisance Valley.

	A	B	C	D		A	B	C	D
SiO_2	0.14	0.50	25.42	51.30	CO_2	43.45	43.18	23.75	5.09
Al_2O_3	.26	.20	8.32	16.88	H_2O			6.38	8.32
Fe_2O_3			1.93	4.77					
CaO	55.60	55.12	30.33	8.06		99.90	99.56	98.40	97.58
MgO	.45	.56	2.27	3.16					

IDAHO

Samples collected by C. P. Ross.

A–B. Travertine from Bayhorse quadrangle, southwest of Challis, Custer County. Analysis by J. G. Fairchild, record D–93.

C. Carbonate from open cut, Yellow Jacket mine, Casto quadrangle. Analysis by J. J. Fahey, record D–259. Description in United States Geological Survey Bulletin 854, 1935.

D. Average limestone, Casto quadrangle.

E. Contact-metamorphic limestone, Casto quadrangle. Analyses D–E by J. G. Fairchild, record C–927.

	A	B	C	D	E		A	B	C	D	E
CaO	52.90	51.78	53.40	33.44	15.32	Soluble SiO_2	0.05				
MgO	1.43	1.63	.79	10.59	8.54	Insoluble	2.18	2.47	0.99	13.84	46.70
CO_2	43.31	43.24	43.35	37.82	(1)	TiO_2				.10	
Al_2O_3	None	None		1.50	8.11		99.99	99.12	99.47	99.01	91.90
Fe_2O_3				1.72	12.97						
SO_3	.12										

[1] Undetermined.

INDIANA

Limestone, Bedford. Special analysis of part insoluble in cold 1–5 hydrochloric acid, by George Steiger, record C–1076.

SiO_2	83.89	Na_2O	0.41
Al_2O_3	5.84	K_2O	1.73
Fe_2O_3	6.83	TiO_2	.30
MgO	.64		100.70
CaO	1.06		

IOWA

Dolomitic limestone near Burlington, of Kinderhook (Mississippian) age, collected by J. S. Williams. Analysis by E. T. Erickson, record D–204.

Insoluble	3.16
R_2O_3	1.08
$CaCO_3$	67.71
$MgCO_3$	28.26
	100.21

KANSAS

Five samples of limestone, Syracuse quadrangle. Analyses by W. C. Wheeler, record 2878.

A. Eighteen miles southwest of Syracuse.
B. Northwest of Kendall.
C. Southeast of Syracuse.
D. Well southwest of Syracuse.
E. Quarry at Syracuse.

	A	B	C	D	E		A	B	C	D	E
Insoluble	1.79	3.61	18.56	2.72	3.18	Ignition	43.39	42.04	35.18	42.32	42.35
CaO	52.99	52.58	42.75	52.26	52.26		98.57	98.55	96.88	97.79	98.26
MgO	.40	.32	.39	.49	.47						

KENTUCKY

A. Limestone from locality about 50 miles south of Louisville, submitted by W. E. Boykin. Analysis by Charles Milton, record D–171.

B. Oil sand (composite sample), Irving oil field. Partial analysis by George Steiger, record 3135.

	A	B		A	B
CaO	55.60	22.3	Al_2O_3, Fe_2O_3	0.11	
MgO	.30	14.3	Insoluble	.80	24.7
CO_2	43.61	34.3		100.55	98.0
H_2O-	None				
H_2O+	.13				

MARYLAND

Dolomite from Beaver Dam quarries, Cockeysville, U. S. Nat. Museum 76037. Analysis by R. C. Wells, record 3029.

CaO	30.88	$(Al,Fe)_2O_3$	0.22
MgO	21.28	CO_2 (calculated)	47.59
FeO	.17		100.37
SiO_2	.23		

MASSACHUSETTS

Eleven samples of dolomite collected and described by T. N. Dale in Bull. 744, 1923. Analyses by J. G. Fairchild, record 3238.

A. Briggs quarry, Sheffield.
B. Charles Reed place, Great Barrington.
C. Miller quarry, West Stockbridge.
D. Two miles southwest of West Stockbridge.
E. Knoll 0.5 mile southeast of marble quarry, West Stockbridge.
F. Truesdell quarry, north end of West Stockbridge village.
G. Southwest foot of Rattlesnake Hill, Stockbridge.
H. Hutchinson quarry, Lenox.
I. East of New England Lime Co.'s Renfrew quarry, Adams.
J. Near Upton's, northwest of Adams.
K. Hilltop near Dean's mill, west of Adams.

	A	B	C	D	E	F	G	H	I	J	K
SiO_2	2.40	[1] 1.78	1.83	[1] 2.30	11.03	[1] 6.22	1.58	5.02	0.68	[1] 0.78	[1] 3.63
Al_2O_3	1.38	------	.60	------	2.23	.15	.48	1.49	.07	.06	.10
Fe_2O_3	------	.12	Trace	Trace	Trace	.06	Trace	.48	.05	Trace	Trace
FeO	.73	.16	.31	.24	.21	.41	.18	.80	.20	.25	.28
MgO	17.50	20.17	12.99	18.75	18.18	17.34	20.99	18.20	20.75	20.46	20.33
CaO	31.86	31.45	39.53	32.96	27.08	32.28	30.52	30.02	31.30	32.07	30.42
Na_2O	1.22	------	.08	------	------	------	------	------	.05	------	------
K_2O		------	.30	------	.64	------	.17	.69	------	------	------
CO_2	44.56	46.26	44.48	45.78	40.38	43.66	46.50	42.66	46.86	46.64	45.46
P_2O_5	------	------	------	------	------	------	.03	.06	------	------	------
TiO_2	------	------	------	------	------	------	------	.05	------	------	------
	99.65	99.94	100.12	100.03	99.75	100.12	100.45	99.47	99.96	100.26	100.22

[1] Insoluble in acid, other constituents soluble in acid.

MONTANA

A. Madison limestone (Mississippian) from north end of Big Horn Canyon, south of Hardin. Collected by K. C. Heald in studies of oil-bearing limestones. Analysis by E. T. Erickson, record C–304.

B. Limestone from Capitol Rock, T. 3 S., R. 62 E. Analysis by W. C. Wheeler, record 3006.

	A	B		A	B		A	B
SiO_2 and insoluble	0.43	28.90	H_2O-	0.02	------	SO_3	0.03	------
Al_2O_3	.42	4.00	Organic matter and H_2O+	.34	------	S	------	------
Fe_2O_3	------		TiO_2	.01	------	Cl	.06	------
FeO	.04	------	CO_2	46.91	------	MnO	Trace	------
MgO	19.93	1.26	Ignition	------	30.02	SrO	.09	------
CaO	31.72	35.79	P_2O_5	Trace	------		100.00	99.97

NEVADA

Limestone and dolomite collected by D. F. Hewett in the Goodsprings quadrangle and described in Prof. Paper 162, 1931. Analyses by J. G. Fairchild; Aa–U, record C–547; V, record C–473.

Aa–Fa. Anchor limestone member of Monte Cristo limestone.
Ab–Fb. Dolomitized limestone about 6 feet from contact of corresponding samples Aa–Fa.
Ga–La. Bird Spring formation.
Gb–Lb. Same bed dolomitized.
M. Dolomitized limestone of Monte Cristo limestone.
N–U. Limestone, dolomite, and altered products.
V. Dolomite partly altered by Tertiary intrusives into brucite.

	Aa	Ab	Ba	Bb	Ca	Cb	Da
CaO	55.32	31.40	55.18	31.98	55.28	31.52	54.98
MgO	.25	21.11	Trace	20.22	Trace	21.00	.25
CO_2	43.20	46.40	43.42	46.60	43.20	47.13	43.80
Fe_2O_3	None	None	None	None	None	None	None
Al_2O_3	None	None	None	None	None	None	None
	98.77	98.91	98.60	98.80	98.48	99.65	99.03

	Db	Ea	Eb	Fa	Fb	Ga	Gb
CaO	31.44	55.68	32.32	52.88	32.16	54.76	29.28
MgO	21.31	.10	20.58	2.84	20.66	Trace	19.77
CO_2	47.07	43.82	47.40	44.20	47.45	42.82	43.70
Fe_2O_3	None	None	None	Trace	Trace	.10	Trace
Al_2O_3	None	None	None				
Insoluble						2.05	6.00
	99.82	99.60	100.30	99.92	100.27	[1] 99.73	98.75

	Ha	Hb	Ia	Ib	Ja	Jb	Ka
CaO	55.24	28.76	55.66	32.56	52.92	29.90	48.14
MgO	.22	20.12	Trace	19.68	Trace	20.46	.30
CO_2	43.80	44.44	43.60	46.63	40.99	44.65	38.71
Fe_2O_3	None	None	None	None	None	None	None
Al_2O_3	None	None	None	None	None	None	None
Insoluble		7.32			5.91	5.42	12.14
	99.26	100.64	99.26	98.87	[1] 99.82	100.43	99.29

	Kb	La	Lb	M	N	Oa	Ob	P	Q	R	S	T
CaO	29.24	55.20	32.72	30.70	36.88	31.00	31.28	55.40	31.24	36.20	52.72	53.62
MgO	17.47	Trace	18.73	21.63	13.48	21.55	20.58	.25	18.49	22.28	.88	.20
CO_2	41.90	42.80	45.27	47.13	43.57	47.13	45.80	43.72	43.95	34.77	42.46	42.10
Fe_2O_3	.10	None	None	Trace	.20	Trace	.38	None	None	Trace	Trace	.48
Al_2O_3							Trace					
Insoluble	10.85				5.80	.20	1.40		6.03			[2]
Organic matter + water										6.59		
	99.56	98.00	96.72	99.46	99.93	99.88	99.44	99.37	99.71	99.84	96.06	[3] 97.59

	U	V		U	V
CaO	49.02	31.80	H_2O+		[5] 1.99
MgO	.15	22.22	Insoluble	3.08	[6] .10
CO_2	38.50	43.48	Organic matter + water	1.06	
Fe_2O_3	1.57			[4] 98.59	99.76
Al_2O_3	.21				
H_2O-		.17			

[1] Trace of sulphide present. 0.3 percent SO_3 in Ga. Samples contain a small quantity of organic matter.
[2] Not determined.
[3] Organic matter is not more than a trace.
[4] 1.19 MnO is insoluble in T, 1.35 MnO in U, available O not determined.
[5] Loss on ignition less CO_2 and H_2O-.
[6] Approximate.

W–Z. Four specimens of a magnesite series from southern Nevada overlying Overton conglomerate 4 miles west of Overton, Clark County. Analyses by J. G. Fairchild, record C-443.

W. Lower of series.
X. 20 feet higher.
Y. Lower bed of lower.
Z. Middle bed of lower.

	W	X	Y	Z		W	X	Y	Z
Soluble in 1–3 HCl:					Insoluble:				
SiO_2	0.99	0.92	0.63	0.32	SiO_2	15.78	24.82	11.63	7.66
Al_2O_3	Trace	Trace	[1]	[1]	Al_2O_3	2.07	4.43	[4] 1.31	[4] .83
Fe_2O_3	.41	.50	[2] 1.63	[2] .47	Fe_2O_3	.77	.53	[1]	[1]
FeO	1.03	.73	[1]	[1]	MgO	.30	.52	.09	.12
CaO	24.37	20.17	22.52	6.30	CaO	None	Trace	Trace	Trace
MgO	15.27	12.35	21.60	37.25	K_2O [5]	2.01	3.44	<.49	.36
CO_2	34.40	28.10	34.74	41.36	Na_2O	.22	.53		
P_2O_5	[3] .05	[3] .10	Trace	None	H_2O (ignition) [6]	1.96	2.38	5.10	4.38
						99.63	99.52	99.74	99.05

[1] Undetermined.
[2] Includes a little Al_2O_3 and total iron.
[3] Approximate.
[4] Includes a little Fe_2O_3.
[5] Includes any soluble alkali.
[6] The unusual quantity of water in Y and Z comes chiefly from the soluble portion and points to the presence of a hydrated compound of magnesium.

AA, BB. Rocks from Magnesite Wash, 5 miles southwest of Overton, collected by W. W. Rubey.

AA. Magnesitic rock. Analysis by J. G. Fairchild, record D–304.

BB. Associated claylike material. Analysis by E. T. Erickson, record D–307.

CC. Dolomite from Shafter, collected by D. F. Hewett. Analysis by J. G. Fairchild, record C–1038.

	AA	BB	CC		AA	BB	CC
Insoluble in HCl	8.22	42.26	6.58	Soluble—Continued.			
Soluble:				FeO			None
CaO	16.55	2.38	28.99	MnO			1.27
MgO	29.15	21.76	18.32				98.76
CO_2	42.35	3.61	43.60	MnO_2 in insoluble			.72
Loss on ignition	44.47	13.70					
H_2O-	1.01	13.24					

DD–GG. Samples collected by Eugene Callaghan. Analyses DD, EE, by Charles Milton, record D–292, FF, GG, by E. T. Erickson, record D–157.

DD. Magnesitic rock from Callville Wash.

EE. Magnesite from Horse Spring formation, Overton.

FF. Magnesite from hillside east of upper brucite deposit, Paradise Range, Mineral County.

GG. Dolomite 75 feet east of FF.

HH. Dolomitic magnesite from Currant district, southwest of Ely. Submitted by Eugene Callaghan and W. W. Rubey. Analysis by Charles Milton, record D–426.

	DD	EE	FF	GG	HH		DD	EE	FF	GG	HH
SiO_2	12.19	11.65	0.43	0.44	15.61	CO_2	32.47	40.09	51.03	47.05	[1] 36.54
Al_2O_3	.38	1.18	.13	.15	2.51	P_2O_5			.03	.01	
Fe_2O_3	.09	.25	.23	.14		SO_3	3.26	.12			
FeO			.22	.09		S			.03	.01	
MgO	20.30	37.66	45.35	21.56	29.53	MnO			.02	.02	
CaO	24.15	4.87	2.20	30.64	15.71	Li_2O	.17	.22			
Na_2O	.28	.31				B_2O_3	.18	None			
K_2O	.29	.32				C			Trace	Trace	
H_2O-	3.55	2.15	None	None							
H_2O+	2.24	1.82	.11	.12			99.56	100.65	99.78	100.23	100.10
TiO_2	.01	.01	Trace	Trace							

[1] Ignition.

II, JJ. Two limestones from the Yerington district, collected and described by Adolph Knopf in Prof. Paper 114, 1918. Analyses by W. C. Wheeler, record 3052.

II. One inch from pyroxene-andradite-chalcopyrite ore body of the Mason Valley mine.

JJ. South end of ore zone.

KK. Limestone from Ely, collected by D. F. Hewett.
LL. Altered limestone KK. Analyses KK, LL by J. G. Fairchild, record C–1038.

	II	JJ	KK	LL		II	JJ	KK	LL
SiO_2	1.80	3.04	9.24	8.96	CO_2 (calculated)	43.98	41.82	40.57	43.24
Al_2O_3	.14	1.39	-------	-------	MnO	-------	-------	.17	.63
Fe_2O_3 (total Fe)	.17	.64	-------	-------		100.89	99.85	99.85	99.83
FeO	-------	-------	None	None					
MgO	3.17	.84	4.30	19.18					
CaO	51.63	52.12	45.57	27.82	MnO_2 in insoluble	-------	-------	-------	2.26

NEW MEXICO

A–E. Limestones from the red beds. Analysis of portion soluble in hydrochloric acid by Chase Palmer, record 3170.
A. Chupadera formation, northwest of Queen.
B. Fusselman limestone, San Andres Canyon.
C. Tertiary, 1 mile east of Helen.
D. Chupadera formation, 10 miles north of Prairie Springs.
E. Between gypsum beds 10 miles southeast of Hope.

	A	B	C	D	E
$CaCO_3$	54.25	51.80	89.30	52.20	54.41
$MgCO_3$	38.70	38.00	Trace	38.22	36.12

F–J. Dolomite from Government test hole 18, Carlsbad formation, collected by W. B. Lang. Analyses by L. T. Richardson, record D–22.
F, Surface (?); G, 177 feet; H, 1,136 feet; I, 1,160 feet; J, 1,180 feet.
K. Dolomitic Permian limestone from 20 miles west of Carlsbad, collected by W. B. Lang. Partial analysis by L. T. Richardson, record D–42.

	F	G	H	I	J	K
CaO	30.87	27.32	30.24	27.33	28.34	30.05
MgO	20.18	20.30	19.19	20.03	20.52	20.47
Loss on ignition	46.65	43.03	45.57	42.75	44.07	-------
R_2O_3	.46	1.01	.29	1.14	.75	-------
Insoluble in 1–5 HCl	1.70	7.58	.58	7.94	5.26	-------
SO_3	.05	.21	3.20	.44	.23	2.35
NaCl	.08	.49	1.02	.41	.71	-------
	99.99	99.94	100.09	100.04	99.88	-------

L. Black caliche, common on the High Plains, from Roosevelt County, T. 6 S., R. 38 E., collected by W. B. Lang. Analysis by E. P. Henderson, record C–1028 Insoluble quartz grains and clay. Color caused by organic matter soluble in chloroform.

Insoluble	9.56
$CaCO_3$	88.63
$CaSO_4.2H_2O$	.88
R_2O_3	.70
	99.77

NEW YORK

A. Marl, Montezuma Marsh. Partial analysis by Chase Palmer, record 3235.
B. Dolomite from Oregon, Putnam County. Partial analysis by A. A. Chambers, record 3103.

	A	B		A	B
MgO	1.21	20.41	P_2O_5	None	-------
CaO	45.75	29.82			
CO_2	35.32	45.78		82.28	96.01

OHIO

Four samples of limestone from the Woodsfield and Summerfield quadrangles, collected by D. D. Condit. Analyses by A. A. Chambers, record 3075.

A. Calcareous clay, Alledonia station, Belmont County.
B. Lower Pittsburgh limestone, Bailey's Mills, Belmont County.
C. Same, Chaseville, Noble County.
D. Ames limestone, Senecaville, Guernsey County.

	A	B	C	D		A	B	C	D
SiO_2	25.70	2.83	1.48	12.72	CaO	17.81	52.78	53.38	44.32
$Al_2O_3+Fe_2O_3$	14.38	1.05	1.10	4.20	P_2O_5	------	------	------	.48
MgO	10.27	.42	.20	.10					

OKLAHOMA

A–E. Five limestones from Foraker quadrangle, studied by K. C. Heald. Analyses by Chase Palmer, record 3102. No MgO, S, or SO_3.

	A	B	C	D	E
Insoluble	1.92	4.62	3.51	8.83	10.28
CaO	54.04	52.88	54.08	48.94	45.81
CO_2	41.26	40.44	41.54	36.41	34.74
Fe_2O_3 (total Fe)	.46	.99	.33	2.31	5.72
	97.68	98.93	99.46	96.49	96.55

F, G. Two dolomites near Paden, collected by A. E. Fath. Analyses by W. C. Wheeler, record 3023. F, Gray; G, red.

H–K. Four samples of limestone collected by D. F. Hewett. Determinations of acid-soluble matter by J. G. Fairchild, record 3276.

H. From a deposit on Moseley Creek near Bromide, Johnson County, SW¼ sec. 28, T. 1 S., R. 8 E., in a vein with manganese minerals.
I. Hunton limestone 2 feet from vein.
J. Same 15 feet from vein.
K. Viola limestone several feet from a similar vein, SW¼ sec. 13, T. 2 S., R. 7 E

	F	G	H	I	J	K
Insoluble in HCl (sand)	12.22	12.17	----------	----------	----------	----------
Al_2O_3	.94	.07	----------	----------	----------	----------
Fe_2O_3	1.00	4.08	----------	----------	----------	----------
FeO	3.60	.75	4.02	3.45	0.28	4.02
MgO	14.98	17.76	14.35	12.15	.30	6.02
CaO	26.67	25.15	29.02	29.02	40.56	41.82
MnO	.57	.80	6.42	9.08	.39	.60
Ignition	40.18	40.06	44.89	43.79	32.30	42.25
	100.16	100.84	98.70	97.49	73.83	94.71

OREGON

A–J. Samples of limestone collected by R. W. Richards and B. N. Moore. Analyses by J. G. Fairchild, record D–63.

A. Sec. 3, T. 12 S., R. 44 E., Sisley Creek, Baker County.
B. Sec. 4, T. 12 S., R. 43 E., Nelson, Baker County.
C. Sec. 2, T. 2 S., R. 44 E., Black Line quarry, Wallowa County.
D. Sec. 15, T. 23 S., R. 48 E., Imnaha River, Wallowa County.
E. Sec. 10, T. 4 S., R. 44 E., Hurricane Creek, Wallowa County.
F. Sec. 5, T. 2 S., R. 43 E., Lostine Creek, Wallowa County.
G. Sec. 21, T. 7 S., R. 44 E., Martins Bridge, Baker County.
H. Sec. 28, T. 11 S., R. 45 E., Comas Creek, Baker County.
I. Sec. 7, T. 18 S., R. 25 E., Grindstone Creek, Crook County.
J. Sec. 18, T. 19 S., R. 42 E., Jackass Creek, Grant County.

	A	B	C	D	E	F	G	H	I	J
SiO_2	11.21	44.86	1.17	1.12	0.12	0.92	10.92	Trace	9.40	2.08
Al_2O_3	.15	.77	.17	.20	Trace	.34	3.21	None	.62	.40
Fe_2O_3	.17	.60	.12	.10	Trace	Trace	1.63	Trace	.48	.34
FeO	None	None	None	None	None	Undet.	.25	None	None	Trace
MgO	.52	.79	1.23	.36	.28	.52	.85	.52	.64	.16
CaO	49.82	29.72	53.15	54.44	55.62	54.50	45.36	55.65	49.12	54.05
Na_2O	.21	.10	.08	.19	.11	Trace	.22	Trace	.15	.17
K_2O	Trace	.25	.08	Trace	Trace	Trace	.45	Trace	Trace	Trace
H_2O	Trace	.10	.10	.20	.10	.10	.96	None	.60	.31
TiO_2	Trace	Trace	Trace	Trace	None	Trace	.20	None	Trace	Trace
CO_2	38.39	23.10	42.05	43.19	43.67	43.18	36.24	43.93	38.83	42.50
P_2O_5	.05	.10	Trace	.05	None	Trace	.07	None	Trace	Trace
SO_3	Trace	None	None	None	None	None	Trace	Undet.	None	None
MnO	.02	.10	Trace	Trace	Trace	Trace	.03	Trace	Trace	.10
SrO [1]	None?	None?	.40	None?	None?	None?	None?	None?	None?	None?
Li_2O	Trace	Trace	Trace	None	None	None	None	None	None	None
FeS_2	Trace	None	None	None	None	.24	.14	None	None	None
Organic matter	Trace	Trace	1.75	.07	None	Trace	.14	None	Trace	Trace
	100.45	100.39	100.30	99.92	99.90	99.80	100.67	100.10	99.84	100.11
Specific gravity	2.70	2.68	2.61	2.68	2.71	2.72	2.61	2.73	2.68	2.73

[1] Mere traces not determined.

K, L. Two samples of limestone, Sumpter quadrangle, collected by J. T. Pardee. Analyses by W. C. Wheeler, record 3055. K, Marble Creek; L, Marble Point.

M. Dolomite from Wallowa Mountains, T. 6 S., R. 46 E., collected by C. P. Ross. Analysis by J. G. Fairchild, record C-332.

	K	L	M		K	L	M
SiO_2	0.71	0.07	------	CaO	53.76	55.76	32.84
Al_2O_3	.05	.03	------	CO_2	43.87	43.99	46.60
Fe_2O_3 (total Fe)	.12	.08	------		100.06	100.15	99.96
MgO	1.55	.22	20.52				

PANAMA

Pleistocene deposit on Mount Hope, collected by T. W. Vaughan. Partial analysis by George Steiger, record 3213.

$(Al,Fe)_2O_3$	0.27
CaO	21.48
MgO	.35
CO_2 (calculated)	17.27
	39.37

PENNSYLVANIA

A–G. Limestone from Somerset quadrangle. Analyses by W. C. Wheeler, record 2888.

A. Laurel Hill, 6 miles northeast of Ligonier.
B. Laurel Hill.
C. Adams mine, 5 miles northeast of Somerset.
D. 3 miles southeast of Ligonier.
E. 1¾ miles southwest of Lavansville.
F. 4 miles north of Boswell.
G. 2½ miles north of Boswell.
H. Limestone near Greensburg. Analysis by R. C. Wells, record D-408.

	A	B	C	D	E	F	G	H
Insoluble	22.22	47.60	3.61	3.48	4.21	3.37	3.43	10.57
$(Al,Fe)_2O_3$	12.32	2.58	2.03	2.44	2.72	2.05	2.46	2.54
CaO	33.35	27.08	50.95	51.30	49.72	51.76	45.60	40.67
MgO	1.12	.42	.97	.69	1.23	.69	5.30	6.42
MnO	.33	------	------	------	------	------	------	------
Ignition	29.39	22.41	42.35	41.92	41.64	42.04	43.07	39.66
	98.73	100.09	99.91	99.83	99.52	99.91	99.86	99.86

SOUTH DAKOTA

Carbonates from the gold-bearing schists of the Homestake mine at Lead, collected by Sidney Paige and described in Bull. 765, 1924. Analyses by J. G. Fairchild, record C–211.

A. From De Smet open cut. Quartz, green mica, siderite.

B. From 300-foot level of Old Abe shaft. Chlorite, mica, amphibole, quartz, and carbonates.

C. From 400-foot level, Caledonia ore body. Chlorite in a groundmass of carbonates and quartz.

D. From 600-foot level near Deadwood Terra shaft.

E. From Incline ore body. Cummingtonite, quartz, and siderite.

F. From 500-foot level near Deadwood Terra shaft. Quartz, carbonate, and carbonaceous matter.

	A	B	C [1]	D [2]	E	F
Acid-soluble portion						
CaO	None	3.1	0.4	12.7	None	11.7
MgO	2.6	4.6	1.2	7.7	2.5	4.8
$FeO+Fe_2O_3$	23.9	31.5	11.0	6.4	20.2	12.4
CO_2	7.2	9.2	6.0	22.7	7.8	20.5
MnO				2.0		
Carbonates						
$CaCO_3$	None	5.5	.7	22.7	None	20.9
$MgCO_3$	5.4	9.6	2.5	16.1	5.2	10.0
$FeCO_3$	11.6	4.7	11.6	9.3	13.4	16.1
$MnCO_3$				2.1		
Fe_2O_3 as limonite	16.0	28.3	3.1	None	11.0	1.3

[1] Contains FeS_2.
[2] Contains $MnCO_3$, some FeS_2.

TENNESSEE

A–C. Samples of marble. A, McMullen quarry, Knoxville; B, Friendsville; C, Luttrell. Analyses by R. C. Wells, record 3013.

D, E. Marble from near Knoxville, fine and coarse material, divided by a suture, submitted by A. C. Lawson. Tests by R. C. Wells, record C–504, to detect any possible chemical differences for the textures. D, Fine-grained; E, coarse-grained. The fine-grained part also showed more organic matter.

	A	B	C	D	E		A	B	C	D	E
Ignition	43.80	43.66	43.38			SiO_2	0.05	0.16	0.47	0.40	0.07
CaO	55.70	55.37	55.37			S	.03	.01	.01		
MgO	.02	.13	.23	0.26	0.25		99.81	99.71	100.41		
MnO	.01	.02	.01								
Fe_2O_3	.17	.21	.46	.25	.23						
Al_2O_3	.03	.15	.48								

TEXAS

A. Limestone from a deep well near Mexia, collected by O. B. Hopkins. Analysis by R. M. Kamm, record 3151.

B. Limestone near Palestine, Anderson County, Austin chalk, collected by E. B. Eckel.

C. Georgetown limestone, same locality, collected by E. B. Eckel, Analyses B, C by J. G. Fairchild, record D–352.

	A	B	C		A	B	C
Insoluble	6.94			H_2O	0.60	1.26	0.30
SiO_2		5.55	1.16	TiO_2		.07	.02
Al_2O_3	1.92	1.18	.45	CO_2	37.98	39.52	42.60
Fe_2O_3		.89	.66	P_2O_5		.08	.01
FeO				S		None	None
MgO	.09	.02	.02	MnO		.02	.05
CaO	50.24	50.74	53.96	Carbonaceous residue	1.34		
Na_2O		.29	.27		99.11	99.62	99.50
K_2O							

UTAH

Six specimens from Ophir district showing the alteration of a limestone to a lead-zinc ore, collected by James Gilluly and described in Prof. Paper 173, 1932. Analyses by J. G. Fairchild, record C–1031.

A. Unaltered limestone.
B. Slightly altered limestone containing some quartz and muscovite.
C. Same with orthoclase and chlorite.
D. Same with additional epidote.
E. Ore in hornfels.
F. Dolomite replacing limestone, Ophir Hill Consolidated mine.

	A	B	C	D	E	F
SiO_2	1.05	22.67	32.73	37.08	19.22	3.97
Al_2O_3	1.20	4.96	11.65	11.14	7.60	1.56
Fe_2O_3	.38	.97	1.19	1.35	.96	None
FeO	1.96	2.73	2.73	1.42	1.80	2.12
MgO	4.31	2.17	4.16	1.92	2.26	16.28
CaO	48.18	35.55	24.57	21.80	2.47	30.16
Na_2O	Trace	Trace	Trace	.15	.59	.10
K_2O	.12	1.59	3.92	7.00	3.68	.33
H_2O-	.05	None	.14	.06	None	.02
H_2O+	.05	1.42	.70	.80	1.62	.16
TiO_2	None	.25	.50	.50	.20	None
CO_2	41.66	27.30	17.12	14.75	1.99	42.48
P_2O_5	.03	.26	.12	.25	.35	.03
Cl	.03	.02	.11	.03	Trace	Trace
F	None	None	None	None	.25	.75
S	.05	.56	.33	.17	.80	.03
MnO	.25	.10	.10	.20	.35	.95
FeS_2	.37	Trace?	None	1.50	26.39	1.57
PbS	None	None	None	None	14.37	None
ZnS	None	None	None	None	15.07	None
ZnO	None	None	None	None	----------	None
Cu	None	None	None	None	.40	None
Ag	None	None	None	None	Trace?	Trace?
	99.69	100.55	100.01	100.12	100.51	100.37
Less O=S or F_2	----------	.28	.17	.08	.32	.51
	----------	100.27	99.84	100.04	100.19	99.86
Specific gravity:						
Particles	2,760	2,782	2,762	2,724	3,841	2,854
Lump	2,760	2,758	2,758	2,716	3,591	2,710

VIRGINIA

Six samples of limestone collected by J. B. Eby. Analyses by J. G. Fairchild, record C–206.

A. Weathered fragments of Ordovician limestone near top of exposure on north side of Wallen Ridge, 2 miles west of Wise-Lee county line.
B. Fragments of Ordovician limestone in place, near middle of exposure on north side of Wallen Ridge, 2 miles west of Wise-Lee county line.
C, D. Fragments from Helderberg limestone in place from exposure on old road one-eighth mile east of Big Stone Gap high school.
E. Crushed limestone screenings from stone crusher, Simpson & Crawford quarry.
F. Fragments taken from quarry cars hauling stone to crusher, same quarry as E.

	A	B	C	D	E	F
Insoluble	6.94	5.02	2.80	2.02	6.04	9.04
$(Fe,Al)_2O_3$	.80	.46	.54	.08	.64	1.34
CaO	50.74	51.64	41.34	49.34	50.00	46.00
MgO	.49	1.24	10.79	4.61	2.19	3.39
CO_2	40.42	41.93	44.25	43.78	41.69	39.85
	99.39	100.29	99.72	99.81	100.56	99.62

G. Dolomitic limestone associated with gypsum at North Holston mine, Smyth County. Analysis by J. G. Fairchild, record C–929. $CaCO_3$, 55.7; $MgCO_3$, 44.3.

H. Black limestone from quarry of Rockingham Marble Corporation, Harrisonburg, submitted by G. F. Loughlin. Analysis by Charles Milton, record D–247.

Soluble in dilute HCl:		
CaO	43.20	
MgO	6.05	
$Fe_2O_3+Al_2O_3$	.34	
SiO_2	.09	
		49.68
Insoluble in dilute HCl:		
$FeS_2(=0.61Fe_2O_3)$	0.92	
SiO_2	6.78	
Al_2O_3, etc.	1.92	
		9.62
Ignition loss	(40.89)	
CO_2 (calculated)	40.50	
H_2O (calculated)	.08	
Pyrite correction (−)	.31	
		40.58
		99.88

WASHINGTON

Nine samples of magnesite collected by R. W. Stone. Analyses by Chase Palmer, A–G, record 3220; H, I, record 3228.

A. 12 miles west of Valley.
B, C. 18 miles west of Springdale.
D, E. Allen quarry, Valley.
F, G. Chewelah.
H. Valley.
I. Chewelah.

	A	B	C	D	E	F	G	H	I
SiO_2	4.27	4.83	5.60	0.46	1.20	0.64	5.56	5.33	1.85
FeO	.78	.85	.88	1.01	[1] 2.36	.85	[1] 1.74	1.15	1.00
CaO	1.07	7.39	6.88	.31	.92	.81	2.31	.35	1.74
MgO	45.02	38.41	40.90	46.23	90.59	47.27	74.39	43.52	45.20
CO_2	49.51	47.81	46.03	50.32	5.23	50.31	15.95	47.91	49.70
Insoluble								1.81	
	100.65	99.29	100.29	98.33	100.30	99.88	99.95	100.07	99.49

[1] Fe_2O_3.

WEST VIRGINIA

Travertine collected by Marshall Howe from Furnace Creek, 2 miles above Harpers Ferry. Partial analysis by E. T. Erickson, record D–49. Described in Prof. Paper 170, pp. 61–62, 1932. FeO, 0.17; MnO, 0.03; MgO, 0.64.

WYOMING

A. Minnekahta limestone (Permian?) from Nichols Canyon, half a mile north of Sundance, Crook County. Collected by K. C. Heald in studies of oil-bearing limestones. Analysis by E. T. Erickson, record C–304.

B. Dolomite at base of Spearfish formation, northern Black Hills, collected by W. W. Rubey. Analysis by J. G. Fairchild, record C–941.

	A	B		A	B		A	B
SiO_2	0.89		Organic matter and H_2O+	0.15		Cl	0.03	
Al_2O_3	.58		TiO_2	.01		MnO	Trace	
FeO	.02		CO_2	43.30	45.68	SrO	.07	
MgO	None	20.46	P_2O_5	Trace			100.18	98.13
CaO	55.01	31.28	SO_3	.08	.71			
H_2O-	.04							

ANALYSES OF SLATES AND SHALES

ALABAMA

A. Shale from Chilton County. Determination of carbonaceous matter by R. M. Kamm, record 3150, gave C, not graphite, 13.8 percent.

B. Shale near Erin, studied by David White. Analysis by George Steiger, record 2978, showed loss on ignition 6.52 percent; carbon, insoluble, and nonvolatile, 5.03 percent.

CALIFORNIA

A–C. Three samples of shale collected by H. W. Hoots from the Modelo formation of the Santa Monica Mountains. Analyses by J. G. Fairchild, record C–1007.

A. White diatomaceous shale from road near Hollywood Country Club.

B. Opal shale, 1 foot above volcanic ash bed on Mulholland Drive and about 50 feet above base of upper shale member of lower Modelo.

C. Hard platy shale 1 foot above volcanic ash bed on Mulholland Drive.

D, E. Two samples of Miocene shale from Kettleman Hills, collected by W. M. Bramlette. Analyses by R. C. Wells, record D–122.

D. Composite sample of ten siliceous shales.

E. Composite sample of ten diatomites or diatomaceous shales.

F. Altered shale from hanging wall of Argonaut mine, Mother Lode district, collected by Adolph Knopf and described in Prof. Paper 157, 1929. Analysis by J. G. Fairchild, record C–699. Ankerite, quartz, sericite, pyrite, and carbonaceous matter.

	A	B	C	D	E	F
SiO_2	73.71	73.04	55.80	82.69	65.20	57.21
Al_2O_3	7.25	3.58	4.13	1.76	4.56	[1] 11.76
Fe_2O_3	2.63	1.28	1.36	1.00	2.22	1.22
FeO	.44	.44	.44	.31?	.32?	4.30
MgO	1.47	.45	.50	1.08	1.54	3.58
CaO	1.72	8.63	18.14	2.93	6.47	3.43
Na_2O	1.19	.40	.40	.50	1.64	2.84
K_2O	1.00	.55	.75	2.61	3.22	2.47
H_2O-	2.88	2.82	2.58	4.75	9.31	.06
H_2O+	6.94	2.69	3.02			.83
TiO_2	.50	.30	.25			.70
CO_2	Trace?	5.96	12.81	2.28	4.05	8.37
P_2O_5	.24	.15	.24	.21	.15	
SO_3	.16	.05	Trace?			
Cl				.15	1.22	
F						
MnO				.012	.009	
FeS_2						2.14
Organic matter	None	.10	.16	Small	Small	1.50
	100.13	100.44	100.58	100.282	99.909	100.41
Soluble SiO_2 (5 percent Na_2CO_3)	4.46	17.22	18.52	8.58	5.53	

[1] Includes P_2O_5 if present.

COLORADO

A, B. Two specimens of oil shale collected by W. H. Bradley. Determinations of "soluble silica" only by E. T. Erickson, record C–960, gave 0.25 percent in A and 0.14 percent in B.

A. Monarch Shale Oil mine, sec. 32, T. 6 S., R. 97 W., Garfield County. Carbonates, analcite, and accessory pyrite, feldspars, quartz, zircon, and apatite.

B. East Middle Fork of Parachute Creek, sec. 10, T. 5 S., R. 95 W. Chiefly iron-bearing beidellite, with similar accessories.

C, D. Two shales from Grand Junction studied by M. I. Goldman with references to the origin of the niter. Analyses of water-soluble portion by W. B. Hicks, record 3081.

	C	D		C	D		C	D
K	2.92	0.83	CO_3	20.22	1.12	NO_2	0.01	0.005
Na	34.10	16.84	SiO_2	1.46	.53			
Ca	None	5.60	NH_4	.17	.08		100.00	100.005
Mg	None	5.54	NO_3	.22	.37			
SO_4	40.90	69.09				Total soluble salts	0.36	2.09

IDAHO

A, B. Two samples of calcareous shale, Hailey quadrangle. Analyses by W. C. Wheeler, record 2882.

	A	B
Insoluble	69.85	74.32
CaO	9.24	11.33
MgO	5.66	1.85
Ignition	14.78	11.68

OHIO

Shale collected by R. E. Lamborn. Analyses by J. G. Fairchild, record D–24.
A. From plant of Webster Brick Co., South Webster, Scioto County.
B. From plant of Marietta Shale Brick Co., Marietta.
C. From plant of Wadsworth Brick & Tile Co., 1½ miles southwest of Wadsworth, Medina County.

	A	B	C		A	B	C
Loss at 105° C	0.76	1.73	0.62	P_2O_5	0.31	0.19	0.15
Ignition loss	7.04	6.48	3.80	Na_2O	.78	.93	.51
SiO_2	56.64	55.80	75.24	K_2O	3.92	3.33	2.63
Al_2O_3	18.33	18.65	10.96	MnO	Trace	Trace	Trace
Fe_2O_3 [1]	8.70	8.16	4.01		100.53	100.75	99.83
CaO	.66	2.08	.40				
MgO	2.09	1.95	.61				
TiO_2	1.30	1.45	.90	Inorganic carbon	.31	.29	.06

[1] FeO disregarded.

SWEDEN

Kolm, a low-grade oil shale of Upper Cambrian age. Electroscopic determination by R. C. Wells, record C–930, gave 0.28 percent of UO_3.
A. Partial analysis by R. C. Wells, described in Washington Acad. Sci. Jour., vol. 21, p. 409, 1931. Calculated age, 450 million years. B. Analysis of ash by M. F. Connor, record C–1008.

A		B	
Pb	0.0264	SiO_2	48.68
U	.432	Al_2O_3	20.34
TiO_2	.10	Fe_2O_3	20.00
V_2O_5	.003	CaO	.90
Be, Zr, Th	None	MgO	1.40
ZnO	.004	SO_3	.62
Mo	.013	Na_2O	.60
Rare earths	Present	K_2O	5.84
Ash	31.25	TiO_2	.20
		P_2O_5	.15
		U_3O_8 and undetermined	1.27
			100.00
		S on kolm	4.74
		Fe of pyrite	3.85

WYOMING

Samples of shale and related products collected by W. W. Rubey.
A. Bentonite from mine near Pedro, lower part of the Pierre shale.
B. Carbonate concretions in the bentonite, upper part of Pierre shale.
C. Unaltered tuff from lower part of the shale at the mine.
D. Ironstone bedded in lower part of the shale, N½ sec. 17, T. 49 N., R. 66 W., Crook County.
E. Weathered Mowry shale near Thornton, described in Prof. Paper 154, pp. 153–170, 1929.
Analyses by J. G. Fairchild: A–C, record C–941; D and E, record C–870. D gives soluble in 1–1 hydrochloric acid.

	A	B	C	D	E
SiO_2	56.93		69.54		84.14
Al_2O_3	14.75		10.63		5.79
Fe_2O_3	2.08		.53	7.07	1.21
FeO				11.25	
MgO	1.86	1.47	.22		.41
CaO	6.35	22.06	3.27	26.64	.13
Na_2O	2.28		1.87		.99
K_2O	.93		.80		.50
H_2O	10.61		12.76		5.56
TiO_2					.22
CO_2	4.61	18.24	None	29.00	None
P_2O_5					
SO_3					
Organic matter					1.21
Insoluble in HCl		54.48			
	100.40	96.25	99.62		100.41

ANALYSES OF CLAYS, SOILS, ETC.

The analyses of individualized, selected, and purified clays, where the material represents a single, homogeneous substance, are listed under minerals—for example, allophane, anauxite, beidellite, halloysite, kaolinite, leverrierite, montmorillonite, nontronite, potash clay, and saponite.

ALABAMA

A. Clay, residual from the Bangor limestone, collected by E. F. Burchard at the DeBardeleben mine of the Alabama Fuel & Iron Co., Russellville district, Franklin County. Analysis by J. J. Fahey, record D–345.

B, C. Two samples of ferruginous sand from the Tuscaloosa formation, collected by E. F. Burchard in the Russellville district. B, Red Bay, C, Belgreen. Analyses by R. E. Stevens, record D–411.

D. Ferruginous surface soil, Langdon ore mines, Cherokee County, collected by E. F. Burchard. Analysis by R. E. Stevens, record D–458.

	A	B	C	D		A	B	C	D
SiO_2	46.96	82.64	83.46	51.85	Cr_2O_3				0.04
Al_2O_3	14.52	8.61	8.16	16.57	C_2O_5		0.02	0.02	.17
Fe_2O_3	6.92	3.83	3.97	18.47	CO_2	8.08			
FeO	.27			.43	SO_3		.14	.14	
MgO	2.56	.20	.19		S				.05
CaO	9.39	.14	.22		MnO		None	None	.17
Na_2O	.10	Trace	.14						
K_2O	2.43	.46	.18			100.02	100.31	100.27	97.41
H_2O-	8.23	3.72	3.53	2.04					
H_2O+				6.89	Loss on ignition				10.04
TiO_2		.55	.26	.73					

ARKANSAS

A. Nonplastic kaolinitic clay from Upper Cretaceous Tokio formation, sec. 24, T. 8 S., R. 25 W., 5 miles southeast of Murfreesboro, Pike County, submitted by C. S. Ross. Analysis by George Steiger, record C–600.

SiO_2	47.42	CaO	None	TiO_2	1.49
Al_2O_3	36.52	Na_2O	0.30	P_2O_5	.09
Fe_2O_3	.58	K_2O		CO_2	None
FeO	.10	H_2O-	.87		99.71
MgO	.11	H_2O+	12.23		

B–P. Samples, more or less bauxitic, collected by M. N. Bramlette in a survey for bauxite. They represent two well sections in Saline County. B–K, well C–1, sec. 18, T. 2 S., R. 13 W; L–P, well C–3, sec. 12, T. 2 S., R 14 W. Analyses by R. E. Stevens, record D–391.

	Feet		Feet		Feet		Feet
B	141–143	F	149–151	J	157–159	N	122–124
C	143–145	G	151–153	K	159–161	O	124–127
D	145–147	H	153–155	L	118–120	P	127–130
E	147–149	I	155–157	M	120–122		

	B	C	D	E	F	G	H	I
SiO_2	38.00	33.88	17.00	14.25	15.90	24.21	30.62	19.89
Al_2O_3	36.32	38.34	39.92	43.72	44.78	43.00	41.68	42.69
Fe_2O_3	2.35	6.82	14.53	12.30	10.80	7.88	5.86	10.76
H_2O below 160°	.75	.69	.89	.76	.68	.85	.73	.91
H_2O above 160°	15.90	18.22	24.54	25.01	25.52	20.92	18.61	22.76
TiO_2	1.98	1.50	1.69	2.04	1.98	1.89	1.73	2.16
	95.30	99.45	98.59	98.08	99.66	98.75	99.23	99.17

	J	K	L	M	N	O	P
SiO_2	31.21	38.60	14.35	7.15	9.78	28.38	33.72
Al_2O_3	39.11	37.75	42.40	52.77	41.30	36.81	33.15
Fe_2O_3	6.82	3.97	13.61	8.44	17.99	11.93	12.39
H_2O below 160°	.95	.74	1.24	.62	.82	.70	.82
H_2O above 160°	17.60	15.06	26.09	29.83	28.09	19.81	17.83
TiO_2	1.92	1.92	1.40	1.32	1.61	1.15	1.05
	97.61	98.04	99.09	100.13	99.59	98.76	98.96

Q–V. A second series of samples of bauxite ore taken later by M. N. Bramlette. Analyses by R. E. Stevens, record D–454.

Q. Drill hole B–5, depth 74–76 feet, northwest corner, sec. 2, T. 2 S., R. 14 W., Saline County.

R. Drill hole B–5, depth 76–78 feet, same locality.

S. Drill hole B–5, depth 78–80 feet, same locality.

T. Drill hole B–5, depth 80–83 feet, same locality.

U. Outcrop sample, old Calumet mine, sec. 26, T. 2 S., R. 14 W., Saline county.

V. Outcrop sample, sec. 12, T. 1 S., R. 13 W., Pulaski County.

	Q	R	S	T	U	V
SiO_2	15.72	4.73	5.74	9.43	10.35	22.48
Al_2O_3	51.00	58.03	58.60	52.00	56.58	47.68
Fe_2O_3	2.73	2.77	2.57	5.83	2.23	2.47
H_2O-	1.44	.63	.15	.42	.22	.52
H_2O+	26.35	31.31	30.70	26.71	29.03	22.27
TiO_2	2.25	2.46	2.06	4.08	1.79	2.55
	99.49	99.93	99.82	98.47	100.20	97.97

CALIFORNIA

Clays submitted by different persons.

A, B. Two bentonitic clays collected by H. W. Hoots. Analyses by J. G. Fairchild, record C–976.

A. Sample from 4- to 5-foot bed in Tejon formation, San Emigdio foothills, sec. 19, T. 10 N., R. 19 W.

B. Sample from Muddy Creek, San Emigdio grant, NW¼ sec. 18, T. 10 N., R. 22 W. Selenite present.

C. Bentonite from north flank of Santa Monica Mountains, Los Angeles County, collected by M. N. Bramlette. Analysis by Charles Milton, record D–181.

D. Claylike rock from drill hole on potash permit L. A. 047660, SW¼ sec. 27, T. 11 N., R. 2 W., S. B. M., collected by B. W. Dyer. Analysis by R. K. Bailey, record D–127.

E. Bentonitic clay from Death Valley, submitted by C. S. Ross. Analysis by R. E. Stevens, record D–364.

	A	B	C	D	E		A	B	C	D	E
SiO_2	65.44	63.76	50.03	64.80	33.02	H_2O+	3.58	4.38	7.52	------	5.44
Al_2O_3	14.16	12.28	16.75	[1] 16.50	19.50	TiO_2	.40	.36	.65	------	.13
Fe_2O_3	[2] 2.89	[2] 2.52	5.83	------	2.33	P_2O_5	------	------	------	0.24	------
FeO	------	------	.47	------	.13	SO_3	------	2.34	------	------	------
MgO	2.05	2.35	2.78	1.70	4.04	MnO	------	------	.01	------	------
CaO	1.42	2.16	1.20	1.10	.80	BaO	------	------	.16	------	------
Na_2O	2.30	1.33	.26	------	3.80	Ignition	------	------	------	2.80	------
K_2O	1.35	1.40	.60	11.60	.16						
H_2O-	5.68	7.16	13.53	------	11.69		99.27	100.04	100.03	98.50	100.04

[1] Contains a little Fe_2O_3.

[2] Total Fe.

COLORADO

A. Clay residue from limestone at Moffat tunnel, separated by T. S. Lovering. Analysis by J. G. Fairchild, record C–989.

B. Sample of clay, probably bentonitic, from Westcliff, submitted by C. S. Ross. Analysis by R. E. Stevens, record D–364. See Montmorillonite, Q, p. 107.

	A	B		A	B
SiO_2	58.27	54.77	K_2O	4.96	0.25
Al_2O_3	20.30	15.88	TiO_2	------	.17
Fe_2O_3	3.00	.58	H_2O-	3.85	9.26
FeO	.23	.62	H_2O+	5.04	10.25
MgO	1.79	4.99			
CaO	.82	2.08		100.17	99.91
Na_2O	1.91	1.06			

FLORIDA

Bentonitic clay collected by A. C. Munyan 1.4 miles west of Marianna. Analysis by J. G. Fairchild, record D–467.

SiO_2	55.40	Na_2O	0.02	P_2O_5	0.04
Al_2O_3	23.68	K_2O	1.73	MnO	.01
Fe_2O_3	3.76	H_2O-	5.50		100.06
MgO	1.09	H_2O+	8.00		
CaO	.05	TiO_2	.78		

IOWA

Clay residue from a limestone, prepared by C. S. Ross in a study of the disintegration of limestone. Analysis by J. G. Fairchild, record C–992.

SiO_2	61.70	CaO	Trace?	H_2O+	5.24
Al_2O_3	17.75	Na_2O	0.32	TiO_2	.75
Fe_2O_3	3.52	K_2O	6.66		99.83
MgO	2.71	H_2O-	1.18		

LOUISIANA

Two samples of so-called paraffin earth from Iberia Parish, collected by E. W. Shaw. Analyses by R. C. Wells, record 3161.

	A	B		A	B
H_2O at 130°	55.46	56.71	Na_2O	0.20	------
Ignition above 130°	13.38	12.73		99.63	99.07
SiO_2	21.33	21.20			
Fe_2O_3	1.73	1.67			
Al_2O_3	6.09	5.86	Combined C	3.13	------
CaO	.36	.43	SiO_2 soluble in 5 percent NaOH	.92	------
MgO	.31	.47	Organic matter soluble in gasoline	.01	------
K_2O	.77	------			

MAINE

Bottom samples from the Gulf of Maine, collected by the U. S. Bureau of Fisheries, and submitted by T. W. Vaughan. Five typical analyses by J. G. Fairchild, from record C–407.

	A	B	C	D	E
Soluble in HCl:					
SiO_2	0.7	0.8	0.4	0.5	1.2
$(Al,Fe)_2O_3$	2.9	3.5	1.4	2.5	6.8
CaO	.3	.4	1.0	.8	.5
MgO	.6	.7	.3	.4	1.3
Insoluble	90.0	84.5	83.7	91.8	79.5

MISSISSIPPI

A. Bauxitic clay from Tippah County, collected by E. F. Burchard on the land of W. T. Meadows, SW¼ sec. 36, T. 3 S., R. 2 W.

B. Ferruginous clay or laterite from Pontotoc County, collected by E. F. Burchard on the land of Joe Gregory, sec. 36, T. 9 S., R. 1 E. Analyses A and B by George Steiger, record D–351.

	A	B		A	B
SiO_2	29.08	6.38	H_2O+	13.14	20.63
Al_2O_3	20.93	32.03	TiO_2	1.04	2.32
Fe_2O_3	33.00	37.77			
H_2O-	2.30	1.34		99.49	100.47

C–K. Bauxitic clay from Mississippi, collected by E. F. Burchard and described in Bull. 750, pp. 101–145, 1925. Analyses by J. G. Fairchild, record C–482.

C. Kemper County.
D. Pontotoc County.
E. Tippah County.
F. Tippah County, 6 miles west of Ripley.
G. Tippah County, 1 mile northwest of Blue Mountain.
H. Siderite and pisolitic bauxite, Union County.
I. Pisolites of bauxite chipped from F.
J. Winston County near Betheden.
K. Winston County near Fern Spring. Samples J and K are mixed with clay.

	C	D	E	F	G	H	I	J	K
SiO_2	20.86	28.61	2.78	47.32	60.68	2.88	8.10	52.57	44.19
Al_2O_3	49.93	46.27	59.58	36.18	15.66	27.83	38.55	31.35	37.59
Fe_2O_3	1.37	1.46	1.72	1.08	6.40	1.78	3.35	2.27	.77
FeO [1]	None	None	None	None	None	27.58	15.29	None	None
MgO	.10	Trace	.07	.07	1.75	.77	.51	Trace	Trace
CaO	None	None	None	None	.29	1.10	.51	None	None
H_2O-	1.16	.62	.36	.49	5.56	(2)	.73	.48	.54
H_2O+	23.38	20.56	31.98	13.19	6.18	15.55	19.63	11.80	13.64
TiO_2	3.00	2.50	3.60	1.60	1.00	2.00	2.80	1.60	3.20
MnO	Trace	Trace	Trace	Trace	Trace	1.53	.75	Trace	Trace
CO_2	Trace	None	None	None	None	19.13	10.84	None	None
	99.80	100.02	100.09	99.93	[3] 97.52	100.15	101.06	100.07	99.93
Specific gravity of lump	2.316	1.585	2.050						

[1] FeO of $FeCO_3$.
[2] Undetermined.
[3] About 2 percent of alkalies probably present.

MISSOURI

A–E. Five diaspore clays collected by J. M. Hill in Franklin County. Diaspore identified as present by E. S. Larsen. Analyses by Chase Palmer, record 3224.

F. Diaspore product washed from D, apparently dehydrated before analysis.

	A	B	C	D	E	F
SiO_2	27.67	7.07	3.80	15.59	40.57	0.57
Al_2O_3	54.00	74.14	76.67	65.01	31.53	95.33
Fe_2O_3	.10	.27	.77	1.05	9.49	1.13
H_2O-	.99	.10	----	.49	.76	----
H_2O+	10.68	13.80	13.59	13.44	11.89	.43
TiO_2	3.09	4.35	4.84	3.39	5.61	2.53
	96.53	99.73	99.67	98.97	99.85	99.99

NEVADA

A, B. Composite sample of mud and clay from boring, Black Rock Desert. Analysis by R. K. Bailey, record 2916. A, Total analysis; B, soluble portion.

A				B	
SiO_2	43.58	P_2O_5	0.46	Cl	43.48
Al_2O_3	8.23	SO_3	1.25	SO_4	10.37
Fe_2O_3	3.57	Cl	3.55	CO_3, HCO_3	5.06
MgO	2.68	MnO	.18	B_4O_7	1.42
CaO	7.34	B_2O_3	.69	SiO_2	1.34
Na_2O	10.15		100.23	Na	37.35
K_2O	2.90	Less O	.80	K	.98
H_2O-	4.66		99.43		100.00
H_2O+	5.86				
CO_2	5.13				

C–I. Seven surface muds from Columbus Marsh. Composition of portion soluble in water. Analyses by W. B. Hicks, record 2934.

	C	D	E	F	G	H	I
Cl	40.30	53.30	48.15	49.20	34.15	53.20	45.40
SO_4	21.30	2.31	4.15	5.78	4.44	3.45	2.92
B_4O_7	1.14	2.21	1.45	6.21	25.88	3.30	3.01
CO_3	None	None	4.67	.75	.92	None	4.93
SiO_2	.23	3.20	2.60	.43	1.53	1.30	4.80
K	.58	.50	.47	.51	1.91	2.08	.67
Ca	5.89	None	None	.37	2.72	.29	None
Na	30.56	38.48	38.51	36.75	28.45	36.38	38.27
Mg	None	Trace	Trace	None	None	None	None
	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Soluble	18.26	11.27	20.00	11.75	6.53	7.24	10.96

PENNSYLVANIA

A. Clay shale from Antes Fort, sold as "rottenstone."
B. Similar material from Hull, England, analyzed for comparison.
C. Welsh "rottenstone." Analyses A–C by W. T. Schaller, record C–445.
D. Fire clay, submitted by C. S. Ross. Analysis by R. C. Wells, record C–942.

	A	B	C	D		A	B	C	D
SiO_2	52.5	67.6	70.4	33.99	TiO_2				None
Al_2O_3, Fe_2O_3	26.9	13.8	14.7	44.54	CO_2	None	None	None	
				.38	Rest, probably mostly alkalies	11.7	10.1	7.6	
CaO	.7	1.2	Trace	.21		100.0	100.0	100.0	99.81
MgO	2.5	Lost	.7	.12					
Ignition	5.7	7.3	6.6	20.57					

SOUTH DAKOTA

Bentonite from Ardmore used in making "refinite", submitted by J. Middleton. Analyses by W. T. Schaller, record C–207.
A. Natural clay, which swells only slightly in water.
B. "Refinite."

	A	B		A	B		A	B
SiO_2	51.64	46.80	CaO	2.18	3.36	TiO_2	(1)	(1)
Al_2O_3	18.25	18.44	Na_2O	2.09	3.69	CO_2	(1)	(1)
Fe_2O_3	1.24	2.10	K_2O	.12	.18		99.88	98.69
FeO	1.40	.34	H_2O-	13.22	12.12			
MgO	3.41	4.05	H_2O+	6.33	7.61			

[1] Present.

TENNESSEE

"Residual" clay from marble of Blount County. Partial analysis by Chase Palmer, record 2981.

SiO_2	21.32	CaO	26.81	CO_2	19.83
Al_2O_3	14.30	H_2O-	3.54		
Fe_2O_3	8.09	H_2O+			93.89
MgO	None	MnO	None		

TEXAS

A. Glauconitelike material from Mills service station, Loves Lookout, Cherokee County.

B. Glassy volcanic ash from Post City. Samples A–B submitted by C. S. Ross. Analyses by J. G. Fairchild, record D–289.

C. Bentonitic clay 0.8 mile east of South Bosque, McLennon County, collected by L. W. Stephenson. Analysis by J. G. Fairchild, record C–1077.

D. Surface crust of soil from Posey Saline, Anderson County, collected by Julia Gardner. Analysis by J. G. Fairchild, record C–639.

	A	B	C	D		A	B	C	D
SiO_2	26.40	72.74	51.87	80.21	H^2O-	3.70	------	0.81	10.27
Al_2O_3	16.80	11.84	26.80	5.16	H^2O+	11.65	4.62	12.61	
Fe_2O_3	18.40	.51	------	2.30	TiO_2	.23	.15	------	------
FeO	19.35	1.17	1.42	------	P_2O_5	.28	------	------	------
MgO	2.70	.40	4.42	Trace	SO_3	------	------	.73	------
CaO	None	.54	1.90	.46					
Na_2O	Trace	2.24	.03	1.00		100.03	100.26	100.68	99.34
K_2O	.52	6.05	.09						

UTAH

Five muds from Salduro Salt Marsh. Partial analysis of soluble matter by R. K. Bailey, record 2960.

	A	B	C	D	E
K	2.25	2.64	1.82	2.36	3.48
Cl	47.77	55.84	54.27	49.65	56.67
SO_4	13.86	3.65	5.41	13.14	3.55
Soluble salts	14.55	13.00	13.98	15.36	11.72
H_2O in mud	6.01	5.79	5.12	5.93	6.75

VIRGINIA

A. Under-water marine sediment from Chincoteague Bay, collected and analyzed by E. T. Erickson, record D–288.

SiO_2	76.32	MgO	0.77	SO_3	0.31
Fe_2O_3	1.08	Na_2O	1.65	Loss at 100°	1.55
Al_2O_3	10.69	K_2O	1.90	Further loss on ignition	3.34
TiO_2	.46	NaCl	.88		
P_2O_5	.07	MnO	.02		100.50
CaO	1.46				

B–D. Three clays of the beidellite type collected by C. S. Ross. Analyses by R. C. Wells; B, C, record D–268; D, record D–468.

B. Morefield pegmatite mine, Amelia.

C. Fracture filling in pegmatite, Roseland.

D. Claylike material containing cobalt from mine of Southern Mineral Products Co., Amherst County.

	B	C	D		B	C	D
SiO_2	37.93	44.23	29.41	TiO_2	2.70	1.01	0.76
Al_2O_3	28.10	31.30	28.97	CO_2	------	------	None
Fe_2O_3	13.60	5.77	12.20	NiO	------	------	.03
FeO	None	Trace	------	CoO	------	------	1.51
MgO	.72	.18	.18	MnO	------	------	6.75
CaO	.15	.45	.60	Li_2O	------	------	None
K_2O	.71	.95	.26	CuO	------	------	None
Na_2O	.06	.19	.18	O	------	------	1.53
H_2O-	4.52	3.97	4.65				
H_2O+	11.92	12.05	13.13		100.41	100.10	100.16

WASHINGTON

Five clays submitted by F. H. Knowlton. Approximate partial analyses by J. G. Fairchild, record C–408.

A. Corner 13th and Perry Streets, Spokane, represents bank 40 feet high.

B. Half a mile north of Mica, Spokane County. From well, beds probably 10 feet thick or more.

C. Schuele's ranch, south of Fivemile Prairie, Spokane County. Represents beds 20 feet thick or more.

D. Spokane, Portland & Seattle Railway cut west of Latah Creek, Spokane County. Represents beds 20 feet thick or more.

	A	B	C	D	E
SiO_2	64.00	57.00	70.00	56.00	45.00
Al_2O_3	20.00	15.00	19.00	23.00	30.00

WYOMING

A–C. Bentonitic clays collected by W. W. Rubey. Analyses by J. G. Fairchild, records C–870 and C–941.

A. From top of Mowry shale at Clay Spur.

B. From lower part of Belle Fourche shale, member of Graneros shale, at Osage, about 20 feet above Clay Spur bentonite.

C. From lower part of Pierre shale, mine near Pedro.

D. Bentonite from Big Horn Basin, collected by C. T. Lupton. Analysis by George Steiger, record 3085.

E. Bentonite from NW¼ sec. 30, T. 47 N., R. 63 W., Weston County, collected by D. F. Hewett. Analysis of fine portion only by George Steiger, record 3181.

F. Bentonite from Upton collected by C. S. Ross. Analysis by J. G. Fairchild, record C–993.

	A	B	C	D	E	F
SiO_2	70.98	53.50	56.93	56.96	54.31	55.44
Al_2O_3	[1] 11.47	[1] 21.57	[1] 14.75	19.46	20.22	20.14
Fe_2O_3	[2] 2.48	[2] 3.28	[2] 2.08	3.60	1.88	3.67
FeO				.16	.19	.30
MgO	1.38	1.89	1.86	1.77	.98	2.49
CaO	.26	1.25	6.35	2.06	.94	.50
Na_2O	1.69	1.94	2.28	.86	2.35	2.75
K_2O	.75	1.04	.93	.87	.21	.60
H_2O-	11.32	15.20	10.61	7.85	13.18	14.70
H_2O+				6.64	5.46	
TiO_2	.10	.11		.16	.07	.10
CO_2	None	None	4.61			
MnO				.10		
	100.43	99.78	100.40	100.49	99.79	100.69

[1] Includes any P_2O_5.

[2] FeO probably absent.

MISCELLANEOUS LOCALITIES

A, B. Marine sediments collected by the *Challenger* expedition. $CaCO_3$ determined by George Steiger, record C–326. Colloids by W. O. Robinson and noncolloids determined by W. H. Fry, of the Bureau of Soils. A, red clay; B, blue mud.

	A	B
Colloids	63.3	66.5
Noncolloids	16	22
$CaCO_3$	8.8	9.2

C–H. Samples of ocean-bottom mud submitted by T. W. Vaughan. Analyses by J. G. Fairchild, record C–303 and C–543. A few representative analyses have been selected for purposes of reference. See Carnegie Inst. Washington Papers from Dept. Marine Biology, vol. 23, 1926.

C. Atlantic, latitude 28°7′, longitude 74°14′.

D. Caribbean, latitude 16°48′, longitude 75°51′.

E. Pacific, latitude 7°24′, longitude 79°14′.

F. Pacific, latitude 5°48′, longitude 79°39′. C–F collected by Coast and Geodetic Survey steamer *Surveyor*.

G. Pago Pago Harbor, Samoa. Described by M. N. Bramlette in Carnegie Inst. Washington Papers from Dept. Marine Biology, vol. 23, p. 3, 1926.

H. Nuuli Lagoon, Samoa, near center.

	C	D	E	F	G	H
Soluble:						
SiO_2	1.07	0.87		0.93	0.97	0.57
Fe_2O_3	3.70	1.12	6.61	4.34	14.72	.97
Al_2O_3	2.93	.94	5.62	5.12		1.42
CaO	22.50	45.45	1.65	1.23	3.80	49.11
MgO	1.90	.74	2.30	2.28	2.03	2.92
P_2O_5	.12	.07		.12	.43	.13
K_2O	.63	.20				
Na_2O	1.39	3.39				
MnO			Trace			
CO_2					(2)	40.30
Insoluble:						
SiO_2	32.21	8.39	53.30	56.82	32.55	1.27
Fe_2O_3	10.01		3.13	3.42	[3] 26.42	1.34
Al_2O_3				12.89		
CaO	.43	4.83	15.82	.76	1.13	
MgO	.28			.83	.90	
K_2O	2.05			.89	1.58	
Na_2O	.35			.91		
Ignition					1.58	2.10

[1] Includes a little TiO_2.
[2] Contains much organic matter.
[3] Contains some TiO_2.

ANALYSES OF ORES AND GANGUE MATERIAL

Many partial analyses and routine determinations of metals, phosphates, ores, hydrocarbons, brines, potash salts, coals, minerals, mine waters, oils, nitrates, and miscellaneous substances have been made in the Survey laboratory, which do not need to be reported here, as they have little interest beyond answering some particular question. There are a few analyses, however, mostly of iron and manganese ores or gangue minerals, which show the usual composition of such materials, and these are given below. But if the material analyzed was chiefly of geochemical interest, on the one hand, or a mineralogical specimen, on the other hand, its analysis is given under one of the other headings.

ALABAMA

A–E. Iron ores collected by E. F. Burchard.

A, B, Clinton iron ores; analyses by R. C. Wells, record 3111. A, Crudup; B, Greasy Cove.

C–E from the Russellville district; analyses by J. G. Fairchild, record D–279. C, Small pebble of brown ore; D, selected pebble for composite analysis; E, porous brown iron ore.

F. Ore from Kent Mountain area. Analysis by Charles Milton, record D–284.

G. Low-grade brown iron ore, clay replacement type, from Penny Hollow, sec. 33, T. 6 S., R. 12 W., Franklin County. Analysis by George Steiger, record D–351.

	A	B	C	D	E	F	G
SiO_2	27.67	7.56	14.44	12.44	4.88	4.97	[1] 36.03
Al_2O_3	10.39	4.14	13.69	11.38	1.41	3.74	1.75
Fe_2O_3	42.15	54.10	57.90	62.02	80.72	81.78	52.10
FeO				.18	.18	.66	
MgO			None	None	None	.04	
CaO	5.93	12.52	.05	.05	None	.04	
K_2O	2.56	.17					
H_2O-			1.32	1.50	1.41	7.37	1.35
H_2O+			11.92	11.73	11.34		8.08
TiO_2	.62	.41	.76	.60	None	.32	.29
CO_2				.10	.10	.08	
P_2O_5	.84	.71	.10	.03	.34	.85	
S	.07			None	None		
MnO	.04	.07	.25	.09	.15	.14	
	90.27	79.68	100.43	100.12	100.53	99.99	99.60

[1] Insoluble.

H–L. Five samples of iron ore collected by E. F. Burchard. H–K are noteworthy on account of their high manganese content, a small quantity of cobalt, and traces of lead and copper not determined. Analyses H–K, by Charles Milton, record D–479; L by R. E. Stevens, record D–429.

H, I. Cherokee County, sec. 9, T. 12 S., R. 11 E., lands of W. C. Pope.

J. About 3 miles south of Spring Garden.

K. Cherokee County.

L. Russellville district, sec. 24, T. 6 S., R. 12 W.

	H	I	J	K	L		H	I	J	K	L
SiO_2	3.68	6.50	4.27	20.04	5.81	Ni	0.16				
Al_2O_3	12.67	19.37	13.11	15.42	3.00	P	.24	0.18	0.12	0.12	0.59
Mn	34.99	28.01	33.44	29.12	.12	S	None	None	Trace	None	.07
Fe	2.05	5.14	5.90	2.42	54.52	BaO	8.45	1.20	5.78	2.42	
Co	1.73	4.13	2.47	2.94		TiO_2					.06

M, N. Graphitic schists from Ashland, collected by E. S. Bastin. Determinations by A. A. Chambers, record 3120.

M. Composite of 30 samples from Southern Graphite Co. Graphite, 3.24 percent.

N. Composite of 35 samples from Standard Graphite Co. Graphite, 3.84 percent.

CALIFORNIA

Samples of natroalunite rock from Funeral Range, near Death Valley. Analyses by R. K. Bailey, record 3024. A, Hard rock near surface; B, soft rock 60 feet down.

	A	B		A	B
SiO	7.46	10.27	H_2O	14.87	17.60
Al_2O_3	39.02	38.46	SO_3	30.52	25.03
Na_2O	5.27	6.83		100.19	99.23
K_2O	3.05	1.04			

COLORADO

A. Breccia from Cresson mine, Cripple Creek, collected by G. F. Loughlin. Analysis by R. C. Wells, record C–871.

Soluble in acid		Insoluble in acid			
H_2O-	0.66	FeS_2	4.32	Se, Te	None
H_2O+	.55	SiO_2	46.78	ZrO_2	0.08
SO_3	.41	K_2O	6.92	As	.22
SiO_2	.70	Na_2O	3.70	F	None
CO_2	8.30	FeO	None	Cl	.02
FeO	1.94	Fe_2O_3	.49	S	.28
CaO	5.39	Al_2O_3	12.65	BaO	.07
MgO	2.57	TiO_2	.74	P_2O_5	None
Al_2O_3	1.77	CaO	.50		
MnO	.08	MgO	.65		99.79

B, C. Two samples from Alma district, Park County.

B. Carbonate gangue, ankerite, from Orphan Boy mine, submitted by B. S. Butler. Analysis by J. G. Fairchild, record C–1103.

C. Calcite from London mine, collected by G. F. Loughlin. Analysis by R. E. Stevens, record D–367.

	B	C		B	C
CaO	29.90	52.18	CO_2	45.34	43.02
MgO	19.10	.26	Insoluble	2.36	------
FeO	2.12	1.22		100.04	98.55
MnO	1.00	1.87			
H_2O	.22	------			

D. Sample of rock from dump, after gold extraction, Vindication Mining Co., Independence. Determination of potash by W. B. Hicks, record 3148. K_2O, 12.08 percent.

CUBA

Four samples collected in a study of manganese ores by E. F. Burchard. Analyses by George Steiger, record C–59.

A–B. Abundancia mine, Manganeso, Oriente Province.

C. Three miles west of Vinales, Pinar del Río Province.

D. Near Sabanilla, Oriente Province.

	A	B	C	D		A	B	C	D
Insoluble in HCl	58.39	29.25	25.09	53.16	Equivalent to—				
$(Al,Fe)_2O_3$	13.76	7.00	19.61	14.74	MnO_2	9.16	47.80	30.79	0.80
CaO	3.60	4.12	16.83	3.40	Mn	5.79	30.23	19.46	.50
MgO	2.60	1.96	3.29	4.00	Loss on ignition	------	------	------	24.76
MnO	7.48	39.01	25.13	.65					

FLORIDA

An examination of sand at Pablo Beach as a source of zirconium was made in 1918 by H. D. Smith, of the United States Bureau of Mines. Determinations of ZrO_2 by R. C. Wells, record C–97, were as follows: A, 0.4; B, 3.5; C, 2.3; D, 2.9.

HAITI

Manganese ore from Gros Marne, collected by W. S. Burbank. Partial analysis by J. G. Fairchild, record C–355: MnO, 33.3; Fe_2O_3, 1.52; P_2O_5, 0.13.

IDAHO

In the study of different ore deposits in Idaho "siderite" of somewhat variable composition has frequently been analyzed as a fairly abundant gangue mineral.

A–E. Five specimens collected by C. P. Ross in the Hailey and Casto quadrangles. Analyses by J. J. Fahey, record D–249.

A. Lydia tunnel, Mascot mine, Hailey quadrangle.

B. Tunnel 8, Lost Packer mine, Casto quadrangle.

C. Whale mine, Hailey quadrangle.

D. Sunset mine, Casto quadrangle.

E. Yellow Jacket mine, Casto quadrangle.

F–I. Four samples from Wood River district, collected and described by D. F. Hewett in Bulletin 814, 1930. Partial analyses by Chase Palmer, record 3018.

F. Near Narrow Gage shaft.

G. Jay Gould mine.

H. Wall rock, Minnie Moore mine.

I. Minnie Moore mine, associated with galena.

J. Armstead mine, Talache, submitted by Edward Sampson. Partial analysis by J. G. Fairchild, record C–348.

K. Ramshorn mine, Bayhorse quadrangle, collected by C. P. Ross. Analysis by J. J. Fahey, record D–236.

	A	B	C	D	E	F	G	H	I	J	K
Insoluble in HNO_3	0.95	1.72	1.24	0.33	1.57						
Insoluble in HCl						0.72	0.61	26.03	4.39		
FeO	51.25	46.03	47.00	1.30	1.30	48.62	43.74	21.17	42.19	47.90	53.67
MnO	1.97	8.75	7.70	.01	.04	9.10	14.37	6.05	13.50	11.40	5.45
MgO	5.65	4.47	2.64	1.06	.73					1.10	2.14
CaO			1.73	53.43	52.95	.80	.79	15.38	.92	Trace	None
CO_2 (calculated)	38.91	38.49	37.80	43.98	43.19	34.83	36.34	28.79	34.94	37.60	38.59
	98.73	99.46	98.11	100.02	99.78	94.07	95.85	97.42	95.94	98.00	99.85

MISSISSIPPI

A–C, samples of ore collected by E. F. Burchard. Analyses A–B by E. T. Erickson, record D–191; C by George Steiger, record D–351. D collected by O. B. Hopkins; analysis by R. C. Wells, record 3113.

A. Siderite, Blue Mountain.

B. Siderite, altering to limonite, associated with bauxite, Tippah County.

C. Ferruginous bauxite on the land of W. T. Meadows, sec. 36, T. 3 S., R. 2 W., Tippah County.

D. Ferruginous sandstone near Reform.

	A	B	C	D		A	B	C	D
Insoluble	1.27	11.37		41.3	H_2O+			17.23	
Soluble SiO_2	.77	1.18			TiO_2	None	0.12	1.24	
SiO_2			9.95		CO_2	36.83	29.56		
Al_2O_3	.12	.43	33.80		P_2O_5	.20	.03		
Fe_2O_3	.47	7.58	36.30	47.2	MnO	4.31	.62		
FeO	54.70	45.20			Loss at 200°	.41	1.14		
MgO	.26	.53							
CaO	.36	.57				99.70	98.33	100.43	
H_2O-			1.91						

NEVADA

A–C. Three gangue carbonates from Pioche district, submitted by J. L. Gillson. Analyses by J. G. Fairchild, record C–638.

D. Manganese ore from 10-inch streak in Surprise claim, Golconda, collected by J. T. Pardee, described in Bull. 710, pp. 236–237, 1920. Analysis by Chase Palmer, record C–140.

E–G. Manganese ore from Three Kids deposit, Las Vegas. Collected by D. F. Hewett. Partial analyses by J. G. Fairchild, record C–1122.

	A	B	C	D	E	F	G
SiO_2	0.21	0.05	0.16	4.70			
Fe_2O_3				12.00			
FeO	None	None	None				
MgO	.20	.70	.27				
CaO	55.77	55.33	54.66	1.99			
CO_2 (calculated)	44.09	44.23	43.92				
MnO	.07	Trace	1.11	48.96	1.27	6.01	3.87
MnO_2					46.31	42.93	44.26
O				6.95			
BaO				4.73			
PbO					1.31	.44	5.65
WO_3				1.54			
	100.34	100.31	100.12	80.87			

H. Graphitic schist near Carson. Determination of graphite by A. A. Chambers, record 3086, gave 48.97 percent.

I. Sericite from talc gouge, Divide silver district, collected by Adolph Knopf and described in Bull. 715, p. 159, 1921. Analysis by J. G. Fairchild, record 3259.

SiO_2	48.16	H_2O	5.84
Al_2O_3	34.00	TiO_2	.20
FeO	2.07		99.89
K_2O	9.62		

J–L. Samples of alunite from different localities.

J. Black Eagle mine, Rawhide district. Analysis by W. B. Hicks, record 2967.

K. Railroad Pass; collected by Eugene Callaghan. Analysis by R. C. Wells, record D–341. On extracting the ignited rock with water on the steam bath the soluble alkalies amounted to: Na_2O, 0.46; K_2O, 3.01 percent.

L. Vein material near Sulphur, collected by E. S. Larsen. Slightly mixed with some other very finely crystallized material. Partial analysis by George Steiger, record 3217.

	J	K	L		J	K	L
SiO_2	1.24	26.05	1.56	TiO_2	-------	0.33	-------
Al_2O_3	36.90	27.77	37.00	H_2O-	0.20	.38	-------
Fe_2O_3	-------	1.39	-------	H_2O+	14.17	9.52	-------
MgO	Trace	-------	.19	SO_3	36.50	25.17	37.06
CaO	Trace	-------	1.44		99.69	97.95	88.77
Na_2O	2.32	.76	1.98				
K_2O	8.36	6.58	9.54				

NEW MEXICO

A. Kaolinite replacing quartz and sericite in a vein at Tyrone. Collected by Sidney Paige and described in Prof. Paper 122, 1922. Some pyrite is also present. Analysis by George Steiger, record 3211.

B. Limonite gossan from Magdalena district, collected by A. H. Koschmann. Analysis by R. E. Stevens, record D–451.

	A	B		A	B		A	B
SiO_2	68.11	56.25	K_2O	4.08	-------	SO_3	-------	2.30
Al_2O_3	16.84	7.36	H_2O-	(1)	2.15	Cr_2O_3	-------	.06
Fe_2O_3	.80	15.32	H_2O+	(1)	4.55	MnO	-------	1.92
FeO	3.53	None	F	.09	-------	BaO	-------	3.29
MgO	.50	.82	S	3.15	-------		97.98	96.83
CaO	.44	1.70	TiO_2	-------	.41			
Na_2O	.44	-------	P_2O_5	-------	.70	Insoluble in HCl	-------	70.38

[1] Undetermined.

NEW YORK

Graphitic schists collected by E. S. Bastin near Saratoga Springs. A determination by A. A. Chambers, record 3120, on a composite sample from 35 places on the property of the Graphite Products Corporation, gave graphite, 7.30 percent.

NORTH CAROLINA AND SOUTH CAROLINA

Six samples of altered rocks associated with gold-bearing lodes, collected by J. T. Pardee. Partial analyses by J. G. Fairchild, record D–453.

A. Blackmon mine, S. C. Green schist ore body.

B. Haile mine, S. C. Bumalo pit, gray banded schist.

C. Highway west of Yadkin River, Stanly County, N. C. Banded gray slate.

D. Brewer mine, S. C. Outcrop south of big pit.

E. Brewer mine, S. C. Outcrop in placer pit southwest of mill.

F. Highway 1 mile north of Waxhaw, N. C. Slate saprolite.

	A	B	C	D	E	F
SiO_2	57.78	41.46	62.08	82.26	75.84	63.46
Al_2O_3 (P_2O_5)	29.46	32.74	17.50	10.60	12.70	19.56
Fe_2O_3 (total Fe)	.50	7.18	8.28	2.83	6.25	7.40
MgO	Trace	Trace	2.61	Trace	Trace	.72
CaO	Trace	Trace	1.48	Trace	Trace	Trace
TiO_2	1.12	.74	.82	.30	.72	.56
K_2O	7.26	9.18	3.06	2.88	3.21	3.04
	96.12	91.30	95.83	98.87	98.72	94.74

SOUTH DAKOTA

Manganese nodules from the Chamberlain district, collected by D. F. Hewett. Partial analyses by J. G. Fairchild, record C–1123. A, B, outer layers; Aa, Bb, inner layers.

	A	Aa	B	Bb
Mn	22.95	17.95	22.68	18.25
Fe	8.06	3.15	8.61	3.14

TENNESSEE

Low-grade brown iron ore, of clay replacement type, collected by E. F. Burchard at Wright mine, Lawrence County. Analysis by George Steiger, record D–351.

Insoluble	49.90	H_2O+	7.86
Al_2O_3	1.60	TiO_2	.25
Fe_2O_3	38.54		
H_2O-	1.53		99.68

TEXAS

A–Q. Iron ore, mainly limonite, from Cass County, collected by E. B. Eckel. Analyses by J. J. Fahey, record D–375. CaO, MgO, and alkalies not determined.

A. Concord school district, 8 miles west of Linden, Cass County, in southwest corner of Linden quadrangle. Average of 10 pit samples. Limonite.

B. Same. Brown flinty laminated ore.

C. Surratt district, 4.5 miles north of Linden, Cass County. Low quality limonite.

D. Same. Typical good ore.

E. Northern part of Jernigan Hill, 5 miles S. 20° E. of Linden, Cass County. Picked quality concentrating ore.

F. Southern part of Jernigan Hill. Spongy cellular limonite.

G. Harris tract, 9 miles S. 30° E. of Linden, Cass County. Typical limonite ore, Trench F.

H. Same. Trench P.

I. Prewitt district, 6 miles S. 60° E. of Linden, Cass County. Good quality limonite.

J. Hickory Hill, 7.5 miles N. 25° W. of Atlanta, Cass County. "Buff crumbly" ore.

K. Waters tract, 6 miles N. 45° W. of Atlanta, Cass County. Typical ore.

L. Atlanta district, 1.5 miles N. 40° W. of Atlanta, Cass County. Limonite.

M. Bivins district, 1.5 miles west of Bivins, Cass County. Limonite.

N. Bowie Hill, east end, 7.5 north of Atlanta, Cass County. Typical ore.

O. Same, extreme western part.

P. Same, central part.

Q. Bivins district, 1.5 miles west of Bivins, Cass County. Limonite.

	A	B	C	D	E	F	G	H	I
SiO_2	11.10	15.72	22.83	13.31	2.24	20.28	23.07	23.03	18.20
Al_2O_3	4.88	8.73	4.62	6.45	1.04	6.42	3.41	5.16	4.33
Fe_2O_3	70.28	61.44	61.15	66.47	85.62	61.52	60.87	58.33	64.52
H_2O	12.80	13.39	10.83	13.11	10.72	12.01	11.33	11.67	10.88
TiO_2	.17	.19	.16	.21	.07	.12	.16	.21	.18
CO_2	None	.02	.02	.02	.50	.02	.02	.02	.02
P_2O_5	.24	.76	.22	.29	.15	.08	.18	.21	.25
S	.09	.03	.06	.06	.05	.05	.05	.03	.03
	99.56	100.28	99.89	99.92	100.39	100.50	99.09	98.66	98.41

	J	K	L	M	N	O	P	Q
SiO_2	11.91	9.74	10.04	12.40	20.14	7.77	8.03	8.24
Al_2O_3	2.31	5.46	4.85	4.58	5.23	4.61	4.88	4.21
Fe_2O_3	70.41	71.22	70.91	70.71	61.28	74.67	74.16	74.57
H_2O	12.81	11.90	12.82	12.46	12.11	12.46	12.90	13.10
TiO_2	.15	.15	.15	.14	.15	.15	.15	.15
CO_2	.02	.02	.50	.02	.02	.02	.02	.02
P_2O_5	.31	.22	.22	.17	.23	.21	.25	.17
S	.03	.03	.03	.05	.03	.03	.06	.05
	97.95	98.74	99.52	100.53	99.19	99.92	100.45	100.51

R–X. Iron ore from Cass, Marion, and Upshur Counties, collected by E. B. Eckel. Analyses by George Steiger, record D–375. CO_2 was estimated at 0.1 to 0.3 percent in each sample. CaO and MgO also small if any.

R. Gilbert tract, Marion County, 6½ miles northeast of Ore City, Upshur County. Limonite ore, unwashed.

S. Southeastern part of Gilbert tract, Marion County. Light-brown flinty ore.

T. Small deposit 2.2 miles east of Hughes Springs, Cass County. Limonite.

U. Southeastern part of Morris County, 5 miles S. 30° W. of Hughes Springs. Limonite.

V. Southwestern part of Cass County, Cain farm, 5 miles S. 10° W. of Hughes Springs. Limonite.

W. Spring Hill area, 5 miles S. 20° E. of Hughes Springs, Cass County. Limonite.

X. Hill 1 mile N. 55° E. of Avinger, Cass County. Limonite.

	R	S	T	U	V	W	X
SiO_2	9.72	21.33	12.64	10.96	19.60	3.08	19.53
Al_2O_3	5.63	4.86	3.64	3.74	4.04	2.41	3.93
Fe_2O_3	70.29	59.06	70.07	72.45	63.64	82.93	65.44
FeO	.51	.34	.14	.27	.40	.27	.40
H_2O-	1.30	1.98	1.12	1.07	1.12	.72	.82
H_2O+	12.38	11.52	11.55	10.90	10.53	10.60	9.76
TiO_2	.19	.30	.22	.14	.11	.11	.09
P_2O_5	.18	.14	.20	.19	.26	.11	.18
S	.13	.19	.06	.09	.07	.12	.10
MnO	.03	None	.10	.06	.07	.06	.02
	100.36	99.72	99.74	99.87	99.84	100.41	100.27

Y–II. Limonite from Cass, Marion, and Upshur Counties. Collected by E. B. Eckel. Analyses by E. T. Erickson, record D–375. The Al_2O_3 may be a little high as only one reprecipitation of Al_2O_3 was made.

Y. Daingerfield Hill, 1 mile west of Daingerfield, Morris County. Limonite.

Z. Hill 2¾ miles N. 45° E. of Hughes Springs, Cass County. Limonite.

AA. Hill 2 miles N. 30° W. of Hughes Springs, Cass County. Limonite.

BB. Hill 2 miles N. 70° E. of Hughes Springs, Cass County. Limonite.

CC. Norwood Hill, north end, 4 miles N. 65° E. of Hughes Springs, Cass County. Limonite.

DD. Hooten Hill, 0.5 mile northeast of Hughes Springs, Cass County. Limonite.

EE. Veal's Switch, Morris County, 2½ miles northwest of Hughes Springs. Limonite.

FF. Prewitt tract, 4½ miles S. 45° E. of Linden, Cass County. Limonite.

GG. Road outcrop 0.9 mile west of Lanier, Cass County. Limonite with much sand.

HH. John Davis tract, 2 miles S. 70° W. of Linden, Cass County. Limonite.

II. Hagerty Hill on Cass ond Marion County line, 8 miles north of Jefferson, Marion County. Limonite.

	Y	Z	AA	BB	CC	DD	EE	FF	GG	HH	II
SiO_2	16.16	19.76	9.98	14.92	13.10	13.70	9.24	13.54	19.72	15.88	15.96
Al_2O_3	3.48	4.42	6.38	4.94	7.65	6.13	5.88	5.26	3.99	3.91	4.51
Fe_2O_3	67.88	62.30	72.20	68.82	66.23	66.73	69.40	70.16	64.01	68.69	67.45
MgO	.11	.16	.12	.21	.08	.14	.16	.11	.06	.04	.13
CaO	.02	.02	.10	None	.04	.08	.08	.06	.08	.06	.14
H_2O-	1.07	1.04	1.27	1.19	1.23	1.75	1.58	1.19	1.09	1.00	1.51
H_2O+	11.28	12.15	10.33	10.23	11.56	11.59	13.33	9.67	11.08	10.42	10.44
TiO_2	.10	.30	.14	.14	.20	.16	.10	.10	.08	.08	.08
P_2O_5	.56	.35	.14	.21	.46	.40	.28	.20	.13	.14	.26
S	.03	.03	.09	.10	.03	.04	.03	.04	.10	.04	.04
MnO	.01	.08	.03	.11	.05	.03	.02	.06	.06	.08	.09
	100.70	100.61	100.78	100.87	100.63	100.75	100.10	100.39	100.40	100.34	100.61

JJ–OO. Iron ore of mixed character from Morris and Cass Counties, collected by E. B. Eckel. Analyses JJ–LL by J. G. Fairchild; MM–OO by Charles Milton, both record D–375.

JJ. Outcrop in stream, 0.75 mile S. 60° W. of Lanier, Cass County. Greensand.

KK. Same, greensand indurated with carbonate.

LL. Well on Daingerfield Hill, 0.6 mile N. 45° W. of Daingerfield, Morris County. Fresh oolitic glauconite(?).

MM. Southeastern part of Morris County, 5 miles S. 30° W. of Hughes Springs, Cass County. Partly oxidized carbonate ore.

NN. Same as MM.

OO. Knight area, 1.5 miles west of Lanier, Cass County. Cleaned carbonate.

	JJ	KK	LL	MM	NN	OO
SiO_2	39.39	24.48	13.47	15.60	11.69	4.07
Al_2O_3	16.83	5.59	8.20	3.09	1.22	.30
Fe_2O_3	8.09	7.74	13.20	13.38	47.65	5.23
FeO	15.38	35.70	37.26	37.95	19.06	55.30
MnO	----------	----------	----------	.23	.23	.16
MgO	1.51	----------	(1)	.37	.02	.03
CaO	----------	----------	----------	.90	None	None
Na_2O	.02	.02	None	----------	----------	----------
K_2O	.45	.34	None	----------	----------	----------
H_2O	11.41	5.00	9.42	4.16	8.06	.89
TiO_2	.27	.40	.04	----------	----------	----------
S	----------	----------	----------	.01	.01	.02
CO_2	5.66	20.12	15.16	22.79	11.04	33.30
P_2O_5	.23	.25	.64	.94	.50	.20
	99.24	99.64	97.39	99.42	99.48	99.50

[1] Present.

PP–TT. Iron carbonate from Cass County, collected by E. B. Eckel. Analyses by J. J. Fahey, record D–375. CaO, MgO, and alkalies not determined.

PP. Surratt district, 4.5 miles north of Linden, Cass County. Average carbonate ore.

QQ. Same, picked carbonate ore.

RR. Surratt district, especially pure carbonate ore.

SS. Prewitt district, 6 miles S. 60° E. of Linden, Cass County. Cleaned carbonate ore.

TT. 1.7 miles S. 27° E. of Lanier, Cass County. Carbonate ore.

	PP	QQ	RR	SS	TT		PP	QQ	RR	SS	TT
SiO_2	4.39	9.59	3.23	1.64	1.98	CO_2	31.01	28.85	32.24	34.95	34.40
Al_2O_3	3.15	4.03	3.66	1.98	1.40	P_2O_5	.19	.35	.32	None	.16
Fe_2O_3	4.96	3.67	2.05	3.02	4.49	C	.38	.51	.36	.23	.25
FeO	51.63	48.63	52.94	56.96	54.03		----------	----------	----------	----------	----------
H_2O	1.86	2.50	1.90	1.30	1.38		97.69	98.25	98.74	100.10	98.13
TiO_2	.12	.12	.04	.02	.04						

UU, VV. Graphitic schists collected by E. S. Bastin. Determinations by A. A. Chambers, record 3120.

UU. Composite of 80 samples on property of Texas Graphite Co., Burnet. Graphite, 10.64 percent.

VV. Richest rock, same locality. Graphite, 11.74 percent.

WW–YY. Greensands, thought to be an intermediate stage in the origin of iron ore, collected by E. B. Eckel in Cass County. Analyses by J. J. Fahey, record D–375.

WW. Fresh greensand, Surratt tract, 4½ miles north of Linden, on east bank of Bowman Creek.

XX. Oxidized greensand, same locality.

YY. Fresh greensand, west bank of Bowman Creek.

ZZ. Alunite rock or alum from Toyah, Reeves County. Analysis by W. B. Hicks, record 3168.

	WW	XX	YY	ZZ		WW	XX	YY	ZZ
SiO_2	28.67	39.10	27.21	5.79	TiO_2	0.30	0.41	0.42	------
Al_2O_3	16.80	23.69	18.87	23.90	CO_2	10.03	.02	9.85	------
Fe_2O_3	8.41	20.06	9.32	------	P_2O_5	.25	.26	.31	------
FeO	20.74	.58	18.55	------	MnO	.11	.11	.12	------
MgO	1.55	.02	1.49	------	SO_3	------	------	------	23.70
CaO	.45	None	.38	------	C	(1)	(1)	(1)	------
Na_2O	.03	.10	.11	2.01		99.80	99.79	100.18	88.77
K_2O	.70	.79	.43	4.54					
H_2O	11.76	14.65	13.12	40.06					

[1] Present.

AAA, BBB. Two rocks from Terlingua, associated with mercury ore, collected by C. P. Ross. Analyses by J. J. Fahey, record D–437.

AAA. Fresh argillaceous limestone east of Olivas winze, 50-foot level, Mariposa mine.

BBB. Alteration product of AAA, called "jaboncillo", from portal of tunnel 5, Mariposa mine.

	AAA	BBB		AAA	BBB		AAA	BBB
SiO_2	39.76	63.10	CaO	17.49	0.02	CO_2	15.85	None
Al_2O_3	14.29	20.84	MgO	1.30	.02	Hg	None	0.08
Fe_2O_3	1.79	6.30	Na_2O	.42	.36	Cl	.05	.17
FeO	1.73	.14	K_2O	1.32	1.00		100.06	100.53
TiO_2	.60	.63	H_2O	5.46	7.87			

UTAH

A–D. Oxidized silver, lead, and bismuth ores from the Tintic district, collected and described by Lindgren and Loughlin in Prof. Paper 107, 1919. Analyses by R. C. Wells, record 2990.

A. Gemini mine, level 19. Siliceous material covered by fine soft yellow powder.

B. Victoria mine. Contains bismutite.

C, D. Eagle and Blue Ball mine, 1,200-foot level.

	A	B	C	D	E
Ignition	4.94	3.57	5.03	2.62	3.55
Insoluble in HNO_3	82.96	66.10	81.83	59.87	82.15
Soluble:					
CO_2	.22	2.48	.71	2.15	.27
Cl	None	None	Trace	None	None
As_2O_5	Trace	.05	1.68	2.16	Trace
P_2O_5	.41	None	None	None	None
Cu	Trace	None	None	Trace	None
Ag	.29	4.15	None	1.44	None
PbO	.58	.31	3.26	12.25	4.04
Fe_2O_3	8.24	.92	2.72	1.72	.40
CaO	.20	.76	.44	1.26	.22
MgO	None	None	None	None	None
Bi_2O_3	Trace	18.07	2.50	9.07	None?
SO_3	.58	.58	.95?	.41	None
	98.42	96.99	99.12	92.95	90.63

E, F. Uraniferous asphaltite, collected by F. L. Hess from Temple Mountain, San Rafael Swell. Analyses by W. T. Schaller, record C–325.

E. Lower part of †La Plata sandstone, southwest side of "Temple", Temple Rock, 45 miles southwest of Green River.

F. Lower Cowboy claim, Chemical Products Co., south Temple Wash, 42 miles southwest of Green River.

	E	F		E	F
Volatile matter [1]	67.11	49.57	S [3]	1.37	4.98
Insoluble residue [2]	26.54	46.32	As	Trace?	Trace?
U	2.88	1.13	Se	None?	None?
V	1.17	.23			

[1] Loss on ignition; includes organic matter, water, and all volatile substances. Not corrected for any change in oxidation of residue.
[2] Residue insoluble in hot HCl. Probably largely sand grains.
[3] Determined by Eschka's method.

G–I. Three samples of alunite from the Marysvale district submitted by G. F. Loughlin. Partial analyses by E. P. Henderson, record C–590.

J–N. Five samples from Homer McCarty's prospect, Marysvale, collected by B. W. Dyer. Analyses by J. G. Fairchild, record C–1044.

O, P. Samples of alunite collected by G. F. Loughlin at Antelope Canyon, NW¼ sec. 21, T. 26 S., R. 4 W. Analyses by E. P. Henderson, record C–607.

M, N, and O are natroalunite.

	G	H	I	J	K	L	M	N	O	P
SiO_2	38.33	62.20	47.20				5.13	7.86	2.36	4.08
Al_2O_3	27.96	15.50	26.65				38.17	33.01	27.48	36.57
Fe_2O_3							1.68	10.37		
Na_2O				0.51	1.37	0.41	4.72	3.40	7.43	3.66
K_2O	1.82	.66	.76	2.96	3.71	2.25	2.04	3.29	2.34	5.44
H_2O							14.80	12.21		
SO_3	19.45	12.48	14.32				32.37	24.71	38.18	35.41
TiO_2							.35	3.80		
	87.56	90.84	89.93				99.26	98.65	85.79	85.16

VIRGINIA

Iron ores collected by J. B. Eby. Analyses by J. G. Fairchild, record C–264.

A. Boons Path Iron Co., Boons Path, 700 feet from foot of slope into mine 8.

B. Boons Path Iron Co., Boons Path, composite sample from three locations in mine 10.

C. Intermont Coal & Iron Co., Irondale, from Old Mule drift, vein 3, 500 feet in.

D. Intermont Coal & Iron Co., Irondale, from South drift, 500 feet in.

E, F. Intermont Coal & Iron Co., Harvey, car sample of ore from operation in vein 3.

	A	B	C	D	E	F
SiO_2	11.30	14.47	18.54	38.01	29.98	31.40
Al_2O_3	.19	3.18	4.60	4.92	4.80	3.98
Fe_2O_3	62.79	55.55	60.48	54.06	61.14	60.97
FeO	4.23	4.36	5.59	.50	Trace	.42
MgO	2.27	2.54	1.03	.13	.21	.20
CaO	7.12	8.62	3.48	Trace	.64	.38
SO_3	.08	.08	.09	.02	.06	.03
P_2O_5	.66	.50	.46	.30	.63	.37

WASHINGTON

Rock partly replaced by manganese ore, Lake Crescent, Olympic district, collected by J. T. Pardee and described in Bull. 795, pp. 6–7, 13, 1928. Partial analyses by J. G. Fairchild, record C–777. A, rock; B, manganese ore.

	A	B		A	B		A	B
MnO	8.52	73.88	SiO_2	11.53	7.65	P_2O_5	0.40	
MgO	3.03	1.10	Al_2O_3	6.18	None			
CaO	31.70	5.49	Fe_2O_3	7.95	.94		94.33	93.41
CO_2	24.42	4.35	TiO_2	.60	None	Mn	6.60	57.22

WYOMING

Iron ores from the Seminoe Mountains, Carbon County, described by T. S. Lovering in Bull. 811, pp. 230–235, 1930. Analyses by E. P. Henderson, record C–932.

A. Hard hematite from test pit 0.3 mile west of Iron Hill, sec. 12, T. 25 N., R. 86 W.

B. Hematite jasper.

C, D. Magnetite jasper.

E. Lean magnetite-hematite jasper.

F, G. Hematite jasper. All samples from the same general formation.

	A	B	C	D	E	F	G
SiO_2	[1] 3.32	[1] 50.06	50.42	47.70	59.90	54.28	51.98
Fe_2O_3	98.25	50.57	26.29	51.25	34.23	46.68	48.32
FeO			18.05		5.18		
P_2O_5	.034		.014				
CaO			2.24				

[1] SiO_2 reported in samples A and B is the insoluble material after treatment with hydrochloric acid plus the silica that was recovered from the soluble portion.

ANALYSES OF MINERALS

In the following pages are given the analyses of over 185 minerals, of which the following species were first analyzed or described by chemists connected with the Survey: Ammonioborite, argentojarosite, arseniobismite, bisbeeite, brannerite, bravoite, corvusite, crandallite, creedite, fernandinite, gillespite, griffithite, johannsenite, kernite, lorettoite, lucinite, minasragrite, pascoite, plumbojarosite, rauvite, searlesite, shattuckite, sincosite, tungstenite, uvanite, and vanoxite.

Other minerals that were imperfectly described have been more sharply characterized and their true composition made known. Further, many of the analyses represent new occurrences of the minerals, some of them having been previously found only in other countries.

NATIVE ELEMENTS

ARSENIC

Native arsenic from the Pend Oreille district, Idaho, collected by Edward Sampson. Analysis by R. C. Wells, record C–599.

S	0.6	As (by difference)	95.7
Sb	1.5		
Fe	.6		100.0
Pb	.1	Specific gravity at 25° C	5.640
SiO_2	1.5		

GOLD

A. From Boss mine, Yellow Pine district, Nev. Described by Adolph Knopf in Bull. 620, p. 8, 1916. Analysis by R. C. Wells.

B. Native gold from Grass Valley, Calif., collected by W. D. Johnston, Jr. Analysis by E. T. Erickson, record D–206.

C–D. From Battle Branch mine, Dahlonega, Ga., collected by Charles Park, Jr. Determination of fineness by E. T. Erickson, record D–417. C, lower level; D, upper level.

	A	B	C	D		A	B	C	D
Au	97.8	84.37	74.28	90.89	Undetermined		4.07		
Ag	2.2	11.56							
Pt	Trace					100.00	100.00		

LEAD

Sample from Happy Creek, Iditarod district, Alaska, collected by J. B. Mertie, Jr. Analysis by E. T. Erickson, record D–295.

Main constituent, Pb.
Also present, Sb.
Traces, As and Cu.
Absent, Se, Ge, Ag, Ga, Au, Ni, Co, Zn, Cd, Te, Bi, Sn, and Tl.

PLATINUM

A, B. Specimens of platinum from Oregon, collected by J. T. Pardee. Qualitative spectrographic analysis by George Steiger, record D–134. A, from Esterly mine, Waldo district; B, from Pioneer mine, Coos County.

	A	B
Pt	Very large	Very large.
Ir	Small	Fairly large.
Os	None	None.
Pd	Fairly large	None.
Rh	None	Possible trace.
Ru	Possible trace	Fairly large.

C–F. Samples collected in Alaska by J. B. Mertie, Jr. Analyses by R. C. Wells. C, D, record 3214; E, F, record 3165.

C. Concentrate from Kodiak Island.
D. Peters Creek, Susitna Valley.
E. Boob Creek, Mount Hurst district.
F. Dime Creek, Koyuk district.

	C	D	E	F		C	D	E	F
SiO_2, etc	1.2	1.0	0.6	3.4	Rh	0.7	0.5	------	------
IrOs	26.9	32.0			Ru	------	------	0.3	0.9
Ir, part from IrOs	6.1	9.1	------	------	Pd	.1	Trace	.3	.9
Rh, part from IrOs	.1	.9			Cu	.6	.1	------	Trace
Pt	55.3	47.3	83.4	71.5	Ni	.08	.03	------	Trace
Ir	2.4	2.2	.4	3.8	Zn+Ag	Trace	Trace	------	.6
Fe	6.4	5.2	9.8	6.1					
Pb	------	------	------	1.4		100.18	99.83	94.8	98.1
Au	.3	1.5	------	9.5	Specific gravity	17.2	18.1	------	------

SULPHUR

A–G collected from three volcanoes on the Alaska Peninsula by A. G. Maddren and described in Bull. 692, pp. 283–398, 1919. Analyses by R. C. Wells, record 3216.

A–C. High-grade sulphur, Makushin Volcano.
D–E. Earthy portion, same locality.
F. Akun Island.
G. Morainic material from Stepovak Bay.
H–J. From Jemez Canyon, N. Mex., submitted by G. R. Mansfield. Analyses by B. Salkover, record 3219.

	A	B	C	D	E	F	G	H	I	J
S	99.0	88.3	86.3	29.8	13.8	55.5	37.6	38.55	21.17	32.40

SULPHIDES, ARSENIDES, AND ANTIMONIDES (INCLUDING SULPHO-SALTS)

ALASKAITE

A, B. Specimen from Colorado, submitted by M. N. Short. Analyses by J. G. Fairchild, record C–1125. A, as analyzed; B, after deducting insoluble and FeS_2.

	A	B		A	B
Pb	12.4	15.4	S	19.2	16.0
Bi	45.0	55.3	Insoluble	7.3	-------
Ag	9.5	11.7		100.1	100.0
Cu	1.3	1.6			
Fe	5.4	None			

ARSENOPYRITE

Specimen from Jachymov, Bohemia (Czechoslovakia). Analysis by Chase Palmer, record 2911.

Fe	34.30
As	45.51
S	19.75
	99.56

BORNITE

From Virgilina, Va. Analysis by Chase Palmer, record 3002.

Cu	62.50
Fe	11.64
S	25.15
	99.29

BRAVOITE

From Spirit Mountain, Alaska, collected by R. M. Overbeck, as an unknown nickel mineral; described in Bull. 712, pp. 94–98, 1920. Analysis by W. T. Schaller, record 3241.

Insoluble in aqua regia	1.2	Insoluble in HCl:	
Soluble in HCl:		Cu	0.5
Cu	.2	Fe	18.6
Fe	9.8	Ni	16.4
Ni	3.2	S (by difference)	50.1

Mn, Zn, Co, As absent.

CHALMERSITE

From Threemen Mining Co., Landlocked Bay, Prince William Sound, Alaska. Impure; mixed with pyrrhotite and other sulphides. Collected by B. L. Johnson and later described, with a new analysis by E. T. Allen, in Econ. Geology, vol. 12, p. 519, 1917. Preliminary analysis by R. C. Wells, record 2898.

S	35.67
Fe	46.48
Cu	16.57
Pb	1.30
Zn	.38
	100.40

ENARGITE

Specimen from Yankee Girl mine, Ouray, Colo. Analysis by Chase Palmer, record 2911.

Cu	45.37
Fe	1.55
As	17.00
S	31.14
	95.06

GALENA

Silver- and bismuth-bearing variety from Leadville, Colo., submitted by E. P. Chapman and described in Econ. Geology, vol. 28, p. 678, 1933. Analysis by R. E. Stevens, record D–159.

Pb	63.90	Fe	1.21
Ag	5.76	Zn	.58
Bi	11.80	S	14.44
Sb	1.50		
Cu	.23		99.42

GERSDORFFITE

From Chatham, Middlesex County, Conn., submitted by M. N. Short. Analysis by J. G. Fairchild, record C–1125.

As	34.9	Cu	None
Ni	31.6	S	17.1
Co	.7	Insoluble	None
Fe	3.9		
Sb	9.1		97.7
Bi ?	.4		

GLAUCODOT

From Cobalt, Ontario. Submitted by F. F. Osborne and described in Econ. Geology, vol. 24, p. 728, 1929. Analysis by J. G. Fairchild, record C–1060.

Co	20.08	MgO	2.35
Ni	6.35	CO_2 (calculated)	6.23
Fe	5.82	Insoluble	3.84
As	36.20		
S	15.47		100.99
CaO	4.65		

MAUCHERITE

Three analyses by Chase Palmer, record 2910.

A. Typical maucherite, Thuringia.
B. "Temiskamite", Elk Lake, Cobalt district, Ontario, from T. L. Walker.
C. Supposed chloanthite, Annivierthal, Switzerland.

	A	B	C		A	B	C
Ni	48.80	47.69	47.55	As	48.50	46.59	47.05
Co	1.32	2.03	1.24	Gangue	.81	.64	.93
Fe	.04	None	.15		99.79	99.81	99.89
Bi	.27	1.99	2.55				
S	.05	.87	.42				

PYRITE

A, B. Two specimens from North Carolina, collected by C. S. Ross. Analysis by George Steiger, record 3206. A, Oliver pyrite mine, 4½ miles south of Crown; B, 1½ miles east of Otto.

	A	B		A	B
Insoluble	6.59	4.38	As	Trace	Trace
S	46.49	33.29	Zn	2.30	1.14
Fe	39.92	45.67	Pb	.30	.26
Cu	1.38	.21			

C–I. "Octahedral pyrite" from French Creek iron mines, Pa., collected by Florence Bascom. Thought to be related to an intrusive of Triassic age. Analyses by R. C. Wells, records C–427 and C–431. Other samples showed only traces of cobalt and small percentages of copper. Nickel appeared clearly to be present in D–F, with a little in G, and doubtful traces in C and H.

	C	D	E	F	G	H	I
Co	Trace	Trace	(1)	(2)	Trace	0.03	0.19
Cu	0.03	0.10	0.80	1.0	0.10	1.2	15.30
As							.04

[1] Very doubtful trace.
[2] Slightly more than a trace.

J. Pyrite, Saul's shaft, 4 miles west of Estabrook, Converse County, Wyo. Analysis by R. C. Wells, record 2958, gave Cu, 0.012 percent.

PYRRHOTITE

A. From Spirit Mountain, Alaska, collected by R. M. Overbeck and described in Bull. 712, p. 97, 1920. Analysis by W. T. Schaller, record 3241.

B. From Three Cripples mine, near Estabrook, Wyo. Analysis by R. C. Wells, record 2058.

	A	B		A	B
Insoluble in aqua regia	0.9	28.38	Insoluble in HCl:		
Soluble in HCl:			Cu	0.3	-------
Cu	.3	.23	Fe	.9	-------
Fe	53.2	41.80	Ni	None	None
Ni	2.2	None	S (by difference)	42.2	-------
Co	None	Trace	Mn, Zn, As	None	-------

SIEGENITE

From La Motte mine of American Lead Co., Madison County, Mo. Analysis by J. G. Fairchild, record C–1070. The sample was considered a mixture of siegenite, chalcopyrite, galena, and insoluble in the proportions of 40, 38, 10, and 12, respectively. Discussed by M. N. Short and E. V. Shannon, Am. Mineralogist, vol. 15, pp. 1–22, 1930.

Pb	9.40	S	30.57
Cu	13.10	Insoluble	11.88
Fe	15.17		100.11
Co	8.72		
Ni	11.27		

SKUTTERUDITE

From Schneeberg, Germany, submitted by M. N. Short. Analysis by J. G. Fairchild, record C–1125.

As	75.4	Cu	0.7
Ni	15.2	S	None
Co	4.5	Insoluble	None
Fe	3.5		99.3
Sb	None		
Bi ?	None		

SMALTITE

A. From Horace Porter mine, Gunnison County, Colo., submitted by M. N. Short. Analysis by J. G. Fairchild, record C–1077.

B. From Schneeberg, Saxony, submitted by M. N. Short. Analysis by J. J. Fahey, record C–1121.

	A	B		A	B
As	75.30	63.42	Bi	-------	0.86
Co	10.98	15.83	Insoluble	1.44	.32
Ni	5.14	15.07		98.68	99.19
Fe	5.82	3.69			

SPHALERITE

Sample collected by C. S. Ross near Spruce Pine, N. C. Analysis by J. G. Fairchild, record D–390.

Insoluble	0.27	Soluble—Continued.	
Soluble:		Pb	None
Zn	59.34	S	34.11
Fe	6.16		100.16
Cd	.23		
Mn	.05		
Cu	None	Specific gravity	4,070

TENNANTITE

From Bonanza mine, Colorado, purified by M. N. Short. Analysis by E. P. Henderson, record C–1014, on 0.31 gram.

Sb	12.85	Zn	5.29
As	18.62	Pb	Trace
Cu	35.49	Ag, not determined, but qualitatively found present.	
Fe	5.93		

TETRAHEDRITE

A. From Tintic Standard mine, Utah, submitted by G. F. Loughlin. Analysis by R. C. Wells, record C–595.

B. From Park City district, Utah.

C. From Little Cottonwood district, Utah. B, C, partial analyses by R. C. Wells, record 2901.

	A	B	C		A	B	C
Gangue	3.02			Zn	3.86		
S	24.19			Pb	11.41	None	6.24
As	4.50	[1]	[1]	Ag	.92	Trace	Trace
Sb	14.30				98.86		
Cu	32.04						
Fe	4.62						

[1] Present.

TUNGSTENITE

Collected by J. J. Beeson from Emma mine, Little Cottonwood district, Salt Lake County, Utah. Described by Wells and Butler, Washington Acad. Sci. Jour., vol. 7, p. 596, 1917. WS_2. Analysis of impure sample by R. C. Wells, record 3188.

W	44.7	Pb	4.1	H_2O	0.7
S	29.1	As	1.0	SO_3	.1
Fe	8.9	Sb	.8	Undetermined	7.3
Zn	.4	Cu	1.3		100.0
Mn	.6	Ag	.4		
Ni	.3	SiO_2	.3		

TELLURIDES

TETRADYMITE

A, B. From Hachita, N. Mex. Analysis by E. P. Henderson on 0.6 gram of selected material, record C–791. A, sample; B, recalculated for mineral.

C. From Whitehorn, Colo. Purified and submitted by M. N. Short. Analysis by E. P. Henderson, record C–922.

	A	B	C		A	B	C
Insoluble in HNO_3	3.66			Fe	0.50	0.52	Trace
Te	43.66	45.33	46.87	Mg	Trace	Trace	
S	.69	.71	.29		99.45	99.46	99.93
Se	None		Trace				
Bi	50.94	52.90	52.77				

CHLORIDES AND FLUORIDES

CARNALLITE

A. From a depth of 3,150 feet in an oil well 7 miles west of Thompson, Utah. Analysis by R. K. Bailey, record C–549. Identified optically by M. N. Short.

B. From Government well 1, NW¼ sec. 13, T. 17 S., R. 31 E., Eddy County, N. Mex., depth 933 feet. Analysis by J. J. Fahey, record C–998.

	A	B		A	B
Insoluble		0.04	H_2O	39.6	38.38
Mg	8.8	8.80	Cl	37.7	38.32
Na		Trace		100.0	99.61
K	13.9	14.07			

CREEDITE

From Wagon Wheel Gap, Colo. Collected by E. S. Larsen and described by Larsen and Wells, Nat. Acad. Sci. Proc., vol. 2, p. 360, 1916. Analysis by R. C. Wells, record 3069. R. E. Stevens found 30.96 percent of fluorine nephelometrically.

H_2O-	0.72	O (calculated)	3.97
H_2O+	11.08	F (calculated)	30.35
Al	11.58		100.00
Ca	23.98		
SO_4	18.32	Specific gravity	2.730

GEARKSUTITE

A. From Wagon Wheel Gap, Colo., described by Larsen and Wells, Nat. Acad. Sci. Proc., vol 2, p. 360, 1916. Analysis by R. C. Wells, record 3064. R. E. Stevens found 42.30 percent of fluorine nephelometrically.

B. Between Hot Springs and Warm Springs, Va., about 1 mile north of Hot Springs. Collected and analyzed by E. P. Henderson, record C–1035.

	A	B		A	B
H_2O-	0.44	15.52	Na	0.04	0.20
H_2O+	15.20		K	.07	.05
Al	15.11	15.06	O	5.09	-------
Ca	22.41	22.15	F	41.00	-------
Mg	Trace	-------		99.36	-------
Fe	Trace	-------			

HALITE

A–B. From Cardona, Spain, collected by H. S. Gale. Analysis by E. T. Erickson, record 3250. A, Salmon-colored; B, banded.

C. Impure sample collected by O. B. Hopkins, Sinclair Oil & Gas Co.'s Schallert No. 1 well, Duval County, Tex. A composite of 15 samples. Partial analysis by B. Salkover, record 3183.

	A	B	C		A	B	C
Insoluble	-------	-------	0.63	Fe	-------	-------	0.48
K	0.12	0.10	Trace	Cl	60.27	58.61	-------
Na	39.00	37.98	30.89	SO_4	.27	1.42	13.77
Ca	.08	.54	5.76		99.77	98.67	-------
Mg	.03	.02	-------				

H_2O undetermined.

KAINITE

From McNutt well no. 1, sec. 4, T. 21 S., R. 30 E., Eddy County, N. Mex. Analysis by J. J. Fahey, record C–1039.

K	13.30	H_2O	20.95
Na	1.03	Material insoluble in H_2O	1.74
MgO	16.72	Fe, Al, and Ca	None
Cl	13.51		
SO_3	32.50		99.75

LORETTOITE

From Loretto, Tenn., described by Wells and Larsen, Washington Acad. Sci. Jour., vol. 6, p. 669, 1916. Analysis by R. C. Wells, record 2984.

PbO	93.98	CO_2	0.20
Cl	3.98	Insoluble in HNO_3	.58
H_2O	.03		
P_2O_5	.11		100.31
CaO	.48	Less O	.90
MgO	.56		
Al_2O_3	.08		99.41
ZnO	.31		

"SYLVINITE"

From Amelie mine, near Mulhouse, Alsace. Mixture of halite and sylvite. Average samples as mined and shipped, collected by H. S. Gale. Analyses by E. T. Erickson, record 3249.

	A	B		A	B
Cl	50.34	50.13	Mg	0.03	0.02
SO_4	2.41	2.10			
K	12.56	17.47		91.24	92.49
Na	24.71	21.78	Insoluble in H_2O	8.00	7.02
Ca	1.19	.99	Moisture at 180°	.33	.30
				99.57	99.81

SYLVITE

Crude sylvite from Markham salt dome, Texas, submitted by D. C. Barton, December 1924. Sylvite confirmed by M. N. Short, as first proved occurrence in the United States. Analysis by R. K. Bailey, record C–566.

Percent soluble in water	97.70
K_2O in sample	15.00
Sulphate	Trace

OXIDES AND HYDROXIDES

BRAUNITE

Sample collected by D. F. Hewett at Spiller manganese mine, 12 miles northeast of Mason, Mason County, Tex. Analysis by W. T. Schaller, record D–372.

SiO_2	9.90	MgO	0.19
MnO	66.89	H_2O	.73
Fe_2O_3	15.39	Insoluble	.67
O	6.27		
CaO	.06		100.10

CASSITERITE

Wood tin collected by Adolph Knopf in northern Lander County, Nev. Described in U. S. Geol. Survey Bull. 640, pp. 131–135, 1917. Analysis by A. A. Chambers, record 3108.

SnO_2	85.14	H_2O-	0.20
Fe_2O_3	13.42	H_2O+	.05
SiO_2	1.03		
MnO	.02		99.86

CHROMITE

A–F. Six samples from Cuba, collected by Albert Busch. Analyses by R. C. Wells, record 3229.

A. 7 miles west of Mocha, Matanzas.
B. 8 miles southeast of Punta Gorda, Oriente.
C. 0.75 mile south of Navas Bay, Oriente.
D. 9 miles northeast of Camaguey, Camaguey.
E. 3 miles northwest of Alta Gracia, Camaguey.
F. 2 miles northeast of Alta Gracia, Camaguey.
G. From Deep Creek, 22 miles south of Bend Rock, Wyo. Analysis by George Steiger, record 3222.

	A	B	C	D	E	F	G
Cr_2O_3	43.0	38.1	27.6	35.7	35.2	34.2	38.82
SiO_2	5.4	.9	8.9	3.9	3.9	1.5	6.45
Fe	13.0	11.7	12.9	12.2	12.8	11.1	16.62
Al_2O_3	15.0	27.0	25.3	29.8	27.4	28.3	12.50
S	Trace	----	----	----	----	None	----
P	None	----	----	----	----	Trace	----
Ni	(1)	----	----	----	----	.05	----
MgO	----	----	----	----	----	----	15.42
CaO	----	----	----	----	----	----	None
MnO	----	----	----	----	----	----	.44

[1] Present.

H–M. Six specimens from Kenai Peninsula, Alaska, collected by A. C. Gill and described in Bull. 712, pp. 102–123, 1920. Analyses by Chase Palmer, record C–107.

H. North shore of Claim Point.
I, J. Rolf mine, Claim Point.
K. Ridge northwest of Red Mountain.
L. Pass between two branches of Fish Creek, Red Mountain.
M. Ridge between Windy River and north branch of Fish Creek.

	H	I	J	K	L	M
Cr_2O_3	46.84	34.67	28.62	32.10	48.69	41.93

N–S. Samples from different localities.

N. Deer Creek, Converse County, Wyo. Analysis by Chase Palmer, record 3172.

O. Grant County, Oreg., south side of John Day River, opposite mouth of Cummings Creek. Collected by A. J. Collier. Analysis by R. C. Wells, record 3176.

P. Sent to J. S. Diller by E. T. Wear, of Jolon, Calif. Analysis by R. C. Wells, record 3212.

Q. Deer Creek Canyon, Wyo. Determinations by George Steiger, record 3014.

R. Scotts Bar, Siskiyou County, Calif. Collected by W. D. Johnston, Jr. As analyzed.

S. Same after deducting 2.2 percent $(Ca,Mg)SiO_3$ assumed to be present. Analysis by Charles Milton, record D–340.

	N	O	P	Q	R	S
SiO_2	7.21				1.29	
Al_2O_3	33.14				5.84	5.97
Fe_2O_3					6.40	6.54
FeO					14.83	15.16
MgO					13.12	12.73
CaO					.26	
Cr_2O_3	44.24	49.6	54.7	35.20	57.92	59.19
V_2O_3				.56?		
MnO					.25	.25
NiO					.06	.06
					99.97	99.90

CORVUSITE

From Ponto No. 3 claim, Gypsum Valley, San Miguel County, Colo. Collected by F. L. Hess and described in Am. Mineralogist, vol. 18, p. 195, 1933. Analyses by W. T. Schaller, record C–734. A, purple black; B, brownish black.

	A	B		A	B
Insoluble SiO_2	0.16	0.17	Fe_2O_3	1.69	0.99
Soluble SiO_2	.63	2.19	V_2O_4	10.26	10.13
MoO_3	.16	.18	V_2O_5	69.00	65.24
CaO	1.85	1.70	H_2O (ignition corrected)	13.52	14.09
UO_3	1.16	3.12			
Carbonaceous matter	.52	1.98		98.95	99.79

DELAFOSSITE

From Pope-Shenon mine, Salmon, Idaho, collected by C. P. Ross and described in Bull. 774, 1925. Analysis by W. T. Schaller, record C–469.

A. Analysis.

B. Impurities deducted.

C. Theory for $Cu_2O.Fe_2O_3$.

	A	B	C		A	B	C
Cu_2O	27.94	45.80	47.29	Ignition loss	6.62		
Fe_2O_3	33.06	54.20	52.71				
Insoluble	30.94				99.26	100.00	100.00
Soluble SiO_2	.70						

GAHNITE

These specimens submitted by C. S. Ross.

A. From McGruger mine, Ga. Analysis by J. J. Fahey, record D–16.

B. From Ore Knob, N. C. Analysis by E. P. Henderson, record C–508.

C. From Ore Knob, N. C. Analysis by J. J. Fahey, record D–25.

	A	B	C		A	B	C
SiO_2	0.50	1.60	0.14	TiO_2	None	0.61	
ZnO	35.55	38.40	34.47	MnO	None		None
Al_2O_3	54.06	46.55	55.15	MgO	3.06	5.84	2.78
FeO [1]	7.41	6.69	7.33		100.58	99.69	99.87
CaO	None		None				
Cr_2O_3	None		None				

[1] Total iron as FeO.

HAUSMANNITE

A–B. From W. T. Gray mine, Batesville district, Ark., collected by H. D. Miser. Analyses by J. G. Fairchild, records 3251 and 3253.

C–E. From Olympic Peninsula, Wash., collected by J. T. Pardee. Analyses by E. P. Henderson, record C–752, 765, and 771. C, magnetic; D and E, nonmagnetic.

	A	B	C	D	E
SiO_2		0.10			3.04
MnO	91.38	90.40	48.90	84.2	86.40
Excess O	7.78	8.87	3.6	8.44	6.47
H_2O	.62	1.03			1.16
$(Al,Fe)_2O_3$		.48	11.05	1.08	.76
BaO	.26	None			
CaO	Trace	Trace			1.28
MgO	Trace	Trace			
	100.04	100.88			99.11
Specific gravity at 15.5°		4.778			

HEMATITE

From Tullock Creek coal field, Mont. Collected by G. S. Rogers and described in Prof. Paper 108, pp. 1–10, 1918. Analysis by Chase Palmer, record 3093.

Fe_2O_3	83.57
S	Trace
Cl	Trace

HERCYNITE

Separated from rock from Pittsylvania County, Va., submitted by T. L. Watson and analyzed by George Steiger, record D–262. Association described in Washington Acad. Sci. Jour., vol. 8, pp. 665–670, 1918.

SiO_2	0.84	MgO	9.88
Al_2O_3	53.56	TiO_2	.68
Fe_2O_3	10.26		100.00
FeO	24.78		

HETAEROLITE

From Leadville, Colo. Analysis by Chase Palmer, record 2973.

ZnO	37.66
Mn_2O_3	54.63
Fe_2O_3	.67
SiO_2	2.91
H_2O	3.78
	99.65

LEUCOXENE

A hydrous titanium mineral collected in Saline County, Ark., by M. N. Bramlette is provisionally classed as leucoxene. Analysis by Charles Milton, record D–439. Some gibbsite and a little magnetite which could not be removed with the electromagnet were identified under the microscope.

TiO_2	77.24	H_2O+	7.57
Al_2O_3	6.73	CaO	None
Fe_2O_3	4.83	MgO	Trace
P_2O_5	.93		100.21
SiO_2	.84		
H_2O-	2.07		

LIMONITE

A–B. From North Carolina, collected by W. S. Bayley. Analyses by J. G. Fairchild, record C–376. A, from near Coalville; B, from Linville Mountain, near Avery.

C. From Dragon iron mine, Tintic, Utah, described in Prof. Paper 107, 1919. Analysis by George Steiger, record D–261.

	A	B	C		A	B	C
SiO_2	------	1.40	3.25	TiO_2	------	0.05	None
Al_2O	------	.61	.76	P_2O_5	Trace	1.95	0.78
Fe_2O_3	83.35	83.40	80.02	SO_3	------	------	.47
FeO	------	None	.24	MnO	------	.12	Trace
MgO	------	None	.30	S	------	------	.10
CaO	None	None	.42	BaO	------	Trace	None
H_2O-	.82	.92	1.71				
H_2O+	11.32	11.22	12.30		------	99.67	100.35

MAGNETITE

A–D. Four samples from North Carolina, collected by W. S. Bayley. Analyses by J. G. Fairchild, record 3258.

A. Cranberry mine, Cranberry.

B. Peg Leg mine on Doe River, 1 mile south of Roan Mountain station.

C. Lansing mine, Ashe County.

D. Lansing mine, Helton Creek.

E. Magnetic iron ore from Conejos quadrangle, Colo., collected by E. S. Larsen. Analysis by J. G. Fairchild, record C–241.

	A	B	C	D	E		A	B	C	D	E
SiO_2	14.28	4.67	5.73	2.33	3.54	H_2O+	0.17	0.38	2.81	0.83	0.33
Al_2O_3	1.08	.58	1.70	2.38	1.45	TiO_2	.12	.80	12.96	Trace	.50
Fe_2O_3	50.35	62.90	45.51	60.42	65.15	CO_2	None	None	None	1.97	None
FeO	28.30	28.90	26.20	24.80	27.61	P_2O_5	None	Trace	Trace	Trace	Trace
MgO	.62	.33	3.99	3.37	.24	SO_3	Trace	.23	Trace	.11	.20
CaO	5.18	1.04	Trace	1.14	.22	MnO	.18	.16	.34	3.01	.37
Na_2O	.37	.22	Trace	.26	Trace	Cr_2O_3	None	None	.39	None	------
K_2O	Trace	Trace	Trace	Trace	Trace						
H_2O-	.04	.06	.06	.04	.13		100.69	100.27	99.69	100.66	99.74

PSILOMELANE

From Tucson, Ariz., collected by D. F. Hewett. Analysis by Charles Milton, record D–208.

Insoluble	8.35	K_2O	0.11	CuO	0.25
SiO_2 (soluble)	.90	H_2O-	.49	PbO	.32
Al_2O_3	.55	H_2O+	3.78	MnO_2	59.65
Fe_2O_3	3.27	TiO_2	Trace		
MgO	Trace	P_2O_5	.05		99.29
CaO	.05	MnO	6.70		
Na_2O	.42	BaO	14.40	Specific gravity	4.21

PYROLUSITE

A. Sample containing cobalt and nickel collected from a prospect near Coble, Hickman County, Tenn. Analysis by E. P. Henderson, record C–631.

B. Composite of 50 samples from Caddo Gap and DeQueen quadrangles, Ark., described by Miser and Purdue in Bull. 808, 1929. Analysis by George Steiger, record 3141.

C. From Puerto Rico. Analysis by George Steiger, record 3143.

	A	B	C		A	B	C
Insoluble	6.05	5.17	0.66	Cu	Trace	------	------
MnO_2	52.93	64.60	73.9	Li	Trace	------	------
Al_2O_3	21.15	4.80	------	F	None	------	------
Fe_2O_3	.88	9.62	.77	CaO	None	1.42	0.17
CoO	.81	------	------	SO_3	None	.05	.08
NiO	1.48	------	------	CO_2	None	------	------
BaO	.11	------	------				
H_2O	14.40	------	------		98.01	------	------
P_2O_5	.20	.81	.11				

SPINEL

Associated with serendibite, Warren County, N. Y., collected by E. S. Larsen. Partial analysis by W. T. Schaller, record C–733.

Insoluble	0.86	CaO	0.29
SiO_2	4.23	MgO	24.24
Al_2O_3	60.63		
FeO	4.57		94.82

TENORITE

Impure material from Tintic district, Utah. Analysis by W. T. Schaller, record 3074.

CuO	80.12
H_2O	4.02
P_2O_5	1.44
Insoluble	2.94
X(?)	11.48
	100.00

VANOXITE

From Jo Dandy claim, Paradox Valley, 58 miles west of Placerville, Colo. Submitted by A. O. Egbert. Described by F. L. Hess in Bull. 750, pp. 63–67, 1925. Analyses by W. T. Schaller, record C–314–a.

A. As received.

B. With impurities, quartz, gypsum, carnotite, ferganite, uvanite, pyrite, roscoelite, deducted.

C. Different sample as received.

D. With impurities deducted.

	A	B	C	D		A	B	C	D
V_2O_4	11.93	51.60	22.56	49.66	MoO_3	0.11	-------	-------	-------
V_2O_5	6.25	27.03	13.59	29.91	SO_3	6.26	-------	0.24	-------
UO_3	1.55	-------	-------	-------	Insoluble	61.51	-------	51.35	-------
P_2O_5	.11	-------	[2.58]	-------	Soluble silica	.19	-------	-------	-------
Fe_2O_3	.94	-------	-------	-------	Se	Trace	-------	Trace	-------
H_2O-	[7.37]	21.37	3.13	6.89		100.00	100.00	100.00	100.00
H_2O+			6.15	13.54					
CaO	3.78	-------	.40	-------					

WAD

From Suiter, Va., collected by H. D. Miser. Analysis by J. G. Fairchild, record C–240.

MnO	67.10
Available O	13.41
H_2O-	1.04
H_2O+	7.60
BaO	(1)
	89.15

[1] Present.

CARBONATES

ANKERITE

A. From North Star mine, Grass Valley, Calif., collected by W. D. Johnston, Jr. Analysis by J. G. Fairchild, record D–115.

B. From Latouche Island, Alaska. Partial analysis by Chase Palmer, with carbon dioxide calculated, record 3174.

C. From Fontana copper deposit, N. C., collected by C. S. Ross. Analysis by E. P. Henderson, record C–701.

	A	B	C		A	B	C
Insoluble	1.46	-------	1.10	CO_2	43.30	43.02	44.19
CaO	30.64	30.52	27.26	H_2O	.40	-------	-------
MgO	11.38	10.93	12.99	Fe_2O_3	.32	-------	-------
FeO	12.52	10.22	12.78		100.33	96.01	99.60
MnO	.31	1.32	1.28				

CALCITE

[A few analyses of calcite are also given under "Ores and gangue materials".]

A–G. Seven samples collected by C. S. Ross. Analyses A–E by E. P. Henderson, record C–701; F–G by J. G. Fairchild, record C–731.

A. From Ducktown, Tenn., 1,200 level, Burra Burra mine, coarse rhombs associated with ore.

B. Burra Burra dump.

C. From vein cutting hornblende-epidote rock, Cranberry, N. C.

D. Associated with ore, Cullowhee, N. C.

E. From quartz vein at 1,400-foot level, Burra Burra mine.

F. Associated with ore and barite, Peach Bottom mine, N. C.

G. Associated with gold-bearing quartz veins, Columbia gold mine, near Thompson, Ga.

	A	B	C	D	E	F	G
Insoluble in HCl	0.20	0.80	0.10	0.20	None	8.98	5.62
FeO	1.76	1.14	.88	.77	[1] 1.73	[1] .36	None
MnO	Trace	.19	.37	Trace	1.38	.55	.17
CaO	53.40	54.14	55.46	55.78	53.20	49.22	52.80
MgO	Trace	.15	.20	.46	.45	.42	Trace?
BaO					[2]	.24	[2]

[1] From total Fe.
[2] Undetermined.

H–K. Manganiferous calcite. H, I, collected by C. S. Ross; analyses by J. J. Fahey, record C–1054. J, K, collected by D. F. Hewett; determinations by J. G. Fairchild, record C–1021.

H. Near Sparta, N. C.

I. Kings Mountain, N. C.

J. Water Canyon, Socorro County, N. Mex. Vein calcite.

K. Aguila, Maricopa County, Ariz. Vein calcite.

	H	I	J	K		H	I	J	K
Insoluble	0.25	2.48			BaO			3.46	0.13
FeO	.05	.04			CuO			.13	None
MgO	.82	.64			ZnO			.02	None
CaO	31.54	53.38			PbO			None	None
CO_2 (calculated)	41.92	43.11							
MnO	26.02	.67	91.89	1.14		100.60	100.32		

L. "Biaxial calcite" from Ore Knob, N. C., associated with pyrrhotite and copper minerals. Collected by C. S. Ross. Analysis by J. H. Fairchild, record C–494.

CaO	48.68	Fe_2O_3 [1]	3.42
MgO	1.23	CO_2 (calculated)	42.31
MnO	4.32	Insoluble	.85
SrO	.17		99.98
BaO	None		
PbO	None		

[1] Calculated from total Fe. May include traces of Al_2O_3.

M. Pisolite deposited from hot springs at the terraces, San Antonio, Tex. Specimen submitted by Alexander Deussen. Analysis by W. C. Wheeler, record 3049.

SiO_2	1.88	CaO	52.89
Al_2O_3	.36	Ignition	43.73
Fe_2O_3	.27		99.89
MgO	.76		

CERUSITE

From the Colorado mine, Tintic, Utah. Collected by Waldemar Lindgren. Analysis by R. C. Wells, record 2988.

Insoluble in HNO_3	8.39	SO_3	1.19
Cl	.02	Ca, Mg	None
CO_2	14.43		97.46
PbO	72.85		
Fe_2O_3	.58		

HYDROMAGNESITE

From Paradise Range, Nye County, Nev., collected by Eugene Callaghan and described in Nevada Univ. Bull., vol. 27, no. 1, pp. 7–34, 1933. Analysis by Charles Milton, record D–267.

MgO	42.82	Fe_2O_3	0.09
CO_2	37.36	Insoluble	.07
CaO	.04		99.70
H_2O-	.06		
H_2O+	19.26		

HYDROZINCITE

From Goodsprings, Nev., collected by D. F. Hewett and described in Prof. Paper 162, 1931. Analysis by W. T. Schaller, record C–1056.

ZnO	72.81	Soluble SiO_2	0.10
CO_2	17.10	Insoluble	.18
H_2O-	.15		99.60
H_2O+	8.86		
CaO	.40		

MAGNESITE

[See also under "Carbonate rocks".]

A. From Magnesite Wash, Nev., collected by W. W. Rubey. Analysis by R. C. Wells, record D–312.

B. Submitted by R. S. Talbot, of Spokane, Wash. Analysis by W. B. Hicks, record 3118.

C. From Red Mountain, Livermore, Calif. Analysis by R. C. Wells, record 2963.

D–E. Two samples representing face cuttings near Kaolin, Clark County, Nev., collected by H. S. Gale. Partial analyses by W. B. Hicks, record 3063.

F. From Porterville, Calif. U. S. National Museum No. 77516. Analysis by Charles Milton, record D–256.

	A	B	C	D	E	F
SiO_2	11.27	2.66	0.03	11.12	11.82	0.09
Al_2O_3	1.62	.86	.07	.98	.94	
Fe_2O_3						
FeO	.31					
CaO	6.59	.34	.85	5.36	5.90	.03
MgO	35.98	45.80	46.70	36.72	36.40	47.63
MnO	Trace					
K_2O	.63					
Na_2O	.72					
TiO_2	.06					
CO_2	38.80	50.04	51.94	44.15	43.45	52.17
H_2O-	1.90					
H_2O+	2.17		.29			
B_2O_3						.07
SO_3	.21					
	100.26	99.70	99.88	98.33	98.51	99.99

RHODOCHROSITE

Two samples collected by Arthur Keith from Sevier, Tenn. Partial analyses by George Steiger, record 3227.

	A	B		A	B
SiO_2	15.54	9.53	MgO	3.00	11.63
Al_2O_3	2.42	4.02	CaO	11.58	22.10
Fe_2O_3	1.50	2.28	MnO	33.98	11.98

SIDERITE

[See also analyses under "Ores and gangue materials".]

A. From locality 5 miles south of Linden, Tex., collected by E. F. Burchard. Analysis by R. C. Wells, record 2997.

B. From Bigorre, France, with a little quartz. U. S. National Museum No. 16874. Analysis by R. C. Wells, record D–104. Some magnetite was identified in the sample, and the calculated CO_2 takes account of this, requiring 0.76 percent FeO.

C. From Isère, France. Analysis by J. G. Fairchild, record D–94.

	A	B	C		A	B	C
Insoluble		3.90	None	H_2O+	1.05		
SiO_2	1.10			TiO_2	.04		
Al_2O_3	1.02			CO_2	36.54	[1] 36.80	[1] 41.00
Fe_2O_3	.40	1.70	0.60	P_2O_5	.11		
FeO	59.42	53.60	47.86	S	.05		
MgO		3.70	10.40	MnO	.13		.10
CaO	.16	.50	.40				
H_2O-	.15				100.17	100.20	100.36

[1] Calculated.

STRONTIANITE

Collected by Adolph Knopf from Barstow, Calif., and described in Bull. 660, pp. 257–264, 1918. Analyses by R. C. Wells, records 3177 and 3179.

	A	B		A	B
SiO_2		5.59	CO_2		28.18
Al_2O_3		1.17	SO_3	0.03	.28
Fe_2O_3		1.73	TiO_2		.05
CaO	6.40	5.19			
SrO	60.99	55.20			96.39
BaO	None	None			

[1] Total Fe.

SILICATES

ALBITE

Two partial analyses of specimens from Batchellerville, N. Y., by George Steiger, record 3167.

	A	B
Na_2O	9.73	9.27
K_2O	.90	1.19

ALLANITE

From locality 14 miles northwest of Wheatland, Wyo. Described in Am. Mineralogist, vol. 19, pp. 81–82, 1934. Analysis by R. C. Wells, record C–1080. Calculated age, 1,500 million years.

SiO_2	33.64	MnO	0.25	PbO	0.11
ThO_2	1.28	CaO	9.75	BeO	[1] None
Al_2O_3	12.16	MgO	1.83		
Fe_2O_3	7.67	H_2O	2.84		100.22
Ce_2O_3	14.63	TiO_2	.24		
$(La,Di)_2O_3$	7.34	U_3O_8	.02	Specific gravity	3.72
FeO	8.46				

[1] Test by J. J. Fahey.

ALLOPHANE

Six samples submitted by C. S. Ross. For optical and dehydration data on allophane see Prof. Paper 185–G, pp. 144–148, 1934, by Ross and Kerr.

A. From Laurium, Greece.
B. From Monte Vecchio, Sardinia.
C. From Dutchess County, N. Y.
D. From Morehead, Ky. Analyses A–D by J. J. Fahey, record D–200.
E. From Huron, Lawrence County, Ind. Analysis by J. G. Fairchild, record D–155.
F. From Liege, Belgium. Analysis by L. T. Richardson, record D–67.

	A	B	C	D	E	F
SiO_2	28.60	32.30	25.19	27.61	21.26	33.96
Al_2O_3	31.66	30.41	36.53	32.29	34.95	31.12
Fe_2O_3	.16	.23	.78	.23	.10	None
P_2O_5	None	.02	.02	1.31	7.15	----
H_2O-	19.26	16.38	21.20	19.36	14.85	12.84
H_2O+	14.64	14.43	15.76	18.05	21.38	20.28
CuO	.96	1.60	----	----	----	----
ZnO	2.62	4.06	----	----	----	----
MgO	.12	.29	.02	.10	.05	----
CaO	.20	.02	.04	.02	None	2.26
CO_2	1.20	.55	1.04	.72	----	----
SO_3	.04	.21	None	.12	----	----
TiO_2	None	None	None	None	----	----
Organic matter	----	----	----	----	Trace	----
Na_2O, K_2O	.28	.10	.10	.10	----	----
	99.74	100.60	100.68	99.91	99.74	100.46

ANALCITE

A–B. Collected by W. H. Bradley from a bed 750 feet above the base of the Green River formation in sec. 27, T. 9 S., R. 25 E., Uintah County, Utah, and described in Prof. Paper 158, pp. 1–7, 1930.

A. Determinations on material of specific gravity below 2.47 separated by heavy solution by E. P. Henderson, record C–920.

B. Except for pyrite, bituminous material, and calcite, almost pure analcite. Analysis by J. G. Fairchild, record C–986. H_2O+ was determined on material extracted with C_6H_6.

C. From Aquarius Cliffs, Yavapai County, Ariz. Submitted by C. S. Ross. Analysis by J. G. Fairchild, record C–979.

D. Crystals coating a brecciated porphyritic rock at Terlingua, Tex., collected by C. P. Ross. Analysis by Charles Milton, record D–399.

	A	B	C	D		A	B	C	D
SiO_2	55.07	52.54	60.61	57.86	CO_2	----	0.29	----	----
Al_2O_3	25.07	15.78	18.03	21.03	FeS_2	----	2.74	----	----
Fe_2O_3	----	4.54	1.01	----	Bituminous material	----	3.93	----	----
MgO	----	.63	.05	Trace					
CaO	----	.36	.04	----		----	99.61	100.44	99.68
Na_2O	----	8.63	10.98	12.51					
K_2O	----	1.16	1.02	None					
H_2O-	----	.05	.34	8.28					
H_2O+	----	8.96	8.36						

ANAUXITE

Two samples submitted by C. S. Ross and described in Prof. Paper 165, pp. 161–169, 1931. Analyses by J. G. Fairchild, record C–993.

A. Anauxite 1 mile west of Lancha Plana, Calif., near the Mokelumne River.

B. From Newman pit near Ione, Calif., Mokelumne River.

	A	B		A	B		A	B
SiO_2	52.46	48.80	CaO	0.03	0.22	H_2O+	12.07	12.81
Al_2O_3	32.20	35.18	Na_2O	.25	.25	TiO_2	.55	.61
Fe_2O_3	1.69	1.24	K_2O	.31	.40		100.94	100.67
MgO	None	None	H_2O-	1.38	1.16			

ANTIGORITE

From Verdiolite quarry, near Easton, Pa., collected by W. S. Bayley. Analysis by J. G. Fairchild, record C–527.

SiO_2	46.20	Na_2O	0.25	F	0.60
Al_2O_3, Fe_2O_3	5.59	K_2O	4.54	CO_2	Present
FeO	1.06	H_2O-	.24		----
MgO	33.95	H_2O+	5.72		98.15
CaO	None				

BAVENITE

From Himalaya mine, Mesa Grande, San Diego County, Calif. Analysis by J. G. Fairchild, record D–66. This specimen was received by W. T. Schaller from E. Schernikow.

SiO_2	58.40	BeO	2.67
Al_2O_3	12.16	H_2O	2.90
Fe_2O_3	.10		
CaO	23.67		99.96

BEIDELLITE

A–B. Two samples from Tremont, Miss., submitted by C. S. Ross. Analysis by J. J. Fahey, record C–1118. A, powder; B, lump.

C, D. Beidellite from Princesa mine, Maniquipi, Chihuahua, Mexico, submitted by C. S. Ross. Analysis by E. T. Erickson, record D–432.

	A	B	C	D		A	B	C	D
SiO_2	57.96	54.70	43.76	49.34	Na_2O	None	None	0.30	------
Al_2O_3	27.61	28.53	27.88	22.88	H_2O-	1.41	3.16	10.59	14.77
Fe_2O_3	------	------	6.42	2.36	H_2O+	9.31	8.94	7.67	6.57
FeO	1.40	1.63	Trace	Trace	TiO_2	------	------	.30	None
MgO	1.25	.98	1.23	1.67	C	1.18	2.41	------	------
CaO	None	None	.90	2.66		100.82	100.93	100.23	100.25
K_2O	.70	.58	1.18	------					

E–H. Samples submitted by C. S. Ross. Analyses E, F, by J. G. Fairchild, record C–993; G, H by L. T. Richardson, record D–67; E, Ancon, Panama; F, Fairview, Utah; G, H, Cornwall, England.

I. From a tunnel near Twin Falls, Idaho. Analysis by J. J. Fahey, record D–124.

J. Beidellite gouge from Flathead mine, Montana, collected by P. J. Shenon. Analysis by J. G. Fairchild, record D–92.

	E	F	G	H	I	J
SiO_2	44.02	46.04	46.66	45.13	49.55	43.83
Al_2O_3	28.90	22.60	37.81	35.25	17.78	26.82
Fe_2O_3	5.15	5.48	.60	2.19	6.61	7.56
FeO	.33?	.25	------	------	------	Trace
MgO	.50	1.85	.26	.46	3.24	.61
CaO	.68	1.26	------	.42	None	.10
Na_2O	.17	Trace	.19	.52	------	.33
K_2O	.50	2.25			------	
H_2O-	------	10.00	.70	3.86	15.45	8.64
H_2O+	18.64	9.86	13.92	12.24	6.88	11.08
TiO_2	.53	.40	------	------	.58	.42
BaO	------	------	------	------	------	.29
	99.42	99.99	100.14	100.07	100.09	99.68

BEMENTITE

Samples collected from Black and White mine, Olympic Mountains, Wash., by J. T. Pardee. Analyses by George Steiger, records 3225 and 3261.

A. Bementite rock, described by Pardee in Bull. 725, pp. 234–236, 1922.

B. Bementite separated from same, described by Pardee, Larsen, and Steiger in Washington Acad. Sci. Jour., vol. 11, p. 25, 1921.

	A	B		A	B
SiO_2	26.38	39.92	FeO	------	4.15
Al_2O_3	3.48	1.32	H_2O-	18.32	.49
Fe_2O_3	3.52	------	H_2O+		7.90
CaO	1.56	.40			
MgO	1.31	4.46		98.44	100.22
MnO	46.57	41.58			

BERYL

Slightly altered material from Custer County, S. Dak., received through F. W. Horton, of the U. S. Bureau of Mines. Analysis by R. E. Stevens, record D–334. Probably from the Old Mike mine.

SiO_2	63.32	Li_2O	0.95	MgO	0.13
Fe_2O_3	.04	K_2O	.23	P_2O_5	.04
BeO	9.75	Rb_2O	.09	H_2O	2.36
Al_2O_3	20.00	Cs_2O	1.38		
Na_2O	1.70	CaO	None		99.99

BIOTITE

From locality 8 miles northwest of Custer, S. Dak., on property of Maywood Chemical Co., submitted by F. L. Hess. Analysis by J. J. Fahey, R. C. Wells, and R. E. Stevens, record D–40. Described in Am. Mineralogist, vol. 17, p. 173, 1932, but analysis revised in 1934.

SiO_2	36.97	H_2O+	2.48	F	3.17
Fe_2O_3	2.26	MnO	.22		101.03
Al_2O_3	17.51	Cr_2O_3	None	Less $O=F_2$	1.34
TiO_2	2.64	Na_2O	.45		99.69
FeO	14.81	Li_2O	.65		
CaO	None	K_2O	8.50		
MgO	8.45	Rb_2O	1.46		
H_2O-	.32	Cs_2O	1.14	Specific gravity	3.10

BISBEEITE

A. From Shattuck mine, Bisbee, Ariz., U. S. National Museum Canfield collection no. 6593.

B. Another specimen, U. S. National Museum no. R. 4874.

C. Recalculated from B, deducting 9.25 percent of malachite. Analysis A–C, by W. T. Schaller, record D–21.

D. An earlier analysis of bisbeeite by W. T. Schaller, record 2926.

	A	B	C	D		A	B	C	D
SiO_2	36.71	33.33	36.93	36.0	H_2O+	[2] 8.32	7.48	7.46	5.4
Fe_2O_3	1.31	.51	------	------	CO_2	------	[3] 1.84	------	------
FeO	------	------	------	.9					
CaO	.48	.35	.39	------		100.64	100.02	100.00	99.3
CuO	49.45	48.78	46.66	52.1					
H_2O-	[1] 4.37	7.73	8.56	4.9	Specific gravity	3.05	2.98	2.88	------

[1] Average of 4.34 and 4.40.
[2] Average of 8.26 and 8.38.
[3] Determined by J. G. Fairchild.

CERITE

From locality 2 miles N. 45° E. of Jamestown, Boulder County, Colo., Fidelity Lode claim, east central part of sec. 17, T. 2 N., R. 71 W., submitted by E. N. Goddard and T. S. Lovering. Analysis by J. G. Fairchild, record D–405. Part of fluorite removed by grinding and sieving. Specific gravity, 4.653. Pb/U+0.38 Th=0.130. Age calculated, 920 million years.

SiO_2	18.78	MnO	0.17	F	5.94
Al_2O_3, TiO_2	.24	ZnO	None	Cl	None
FeO	1.17	CaO	12.55	B_2O_3, BeO	None
U_3O_8 (U=0.435)	.513	MgO	.16		100.827
Ce_2O_3	28.85	PbO (Pb=0.069)	.074	Less $O=F_2$	2.52
$(La,Tb)_2O_3$, etc	27.20	H_2O	.96		
Y_2O_3, etc	2.94	CO_2	1.00		98.307
ThO_2 (Th=0.25)	.28	P_2O_5	None		

CHRYSOCOLLA

A. From Live Oak mine, Miami district, Ariz., collected by F. L. Ransome.

B. From Keystone Copper mine, 5 miles west of Globe, Ariz., collected by D. B. Sterrett. Analyses A, B by W. T. Schaller, record C–317.

C. From Emerald Isle mine, Kingman, Ariz., submitted by W. T. Schaller. Analysis by L. T. Richardson, record D–76.

	A	B	C		A	B	C
SiO_2	44.12	41.44	40.30	MgO	0.40	0.31	0.40
CuO	31.70	34.25	28.90	H_2O-	------	------	16.92
FeO	.68	.30	------	H_2O+	------	------	8.38
CaO	1.02	.79	1.05		97.92	97.09	99.38

CLINOHYPERSTHENE

From Roseland, Va., collected by C. S. Ross. Analysis by J. G. Fairchild, record D–196.

SiO_2	52.02	CaO	1.90	MnO	0.16
Al_2O_3	2.64	H_2O-	.06		
Fe_2O_3	.55	H_2O+	.34		101.17
FeO	21.46	TiO_2	.44		
MgO	21.60			Specific gravity	3.496

CLINOPTILOLITE

From Dome, Ariz. Separated from bentonite by washing and removal of feldspar and quartz by M. N. Bramlette, and described by Bramlette and Posnjak in Am. Mineralogist, vol. 18, p. 167, 1933. Analysis by J. G. Fairchild, record D–198.

SiO_2	64.30	K_2O	1.36
Al_2O_3	12.78	H_2O-	4.78
Fe_2O_3	.82	H_2O+	9.50
MgO	.62		
CaO	2.42		100.54
Na_2O	3.96		

CLINOZOISITE

From Roseland, Va., collected by C. S. Ross. Analysis by J. G. Fairchild, record D–196.

SiO_2	39.96	CaO	23.58	MnO	Trace
Al_2O_3	30.59	$(K,Na)_2O$	.13		100.19
Fe_2O_3	3.23	H_2O-	None		
FeO	.60	H_2O+	2.00		
MgO	.05	TiO_2	.05		

DICKITE

A. Sample from Cusihuiriachic, Chihuahua, Mexico, described by C. S. Ross in Prof. Paper 165, pp. 158–161, 1931. Analysis by J. G. Fairchild, record C–993.

B. Dickite from vertical seams on Back Bone Mountain, about 2 miles north of Williams, Le Flore County, Okla. Analysis by R. K. Bailey, record 3042. Described as "intumescent kaolinite" by Schaller and Bailey, Washington Acad. Sci. Jour., vol. 6, pp. 67–68, 1916.

	A	B		A	B
SiO_2	45.04	46.55	H_2O-	None	14.04
Al_2O_3	40.70	38.90	H_2O+	14.08	
Fe_2O_3	Trace		TiO_2	Trace	
MgO	Trace				
CaO	.22			100.04	99.49
Na_2O	Trace				

FELDSPAR

Primary feldspar (microcline-andesine antiperthite) from Roseland, Va., collected by C. S. Ross. Analysis by J. G. Fairchild, record D–189.

SiO_2	61.44	H_2O-	0.30
Al_2O_3	23.47	H_2O+	.20
Fe_2O_3, FeO	.20	BaO	.19
MgO	.05	TiO_2	.10
CaO	5.00		
Na_2O	5.23		100.26
K_2O	4.25		

GARNET

A–E. Collected by C. S. Ross, and described in Prof. Paper 179, p. 63, 1935. Analyses A–D by J. G. Fairchild, record C–890; E, by W. T. Schaller, record C–945. A, Ore Knob, N. C.; B, Ducktown, Tenn.; C, Monarat, Va.; D–E, Cullowhee, N. C.

F. Almandite collected by C. F. Park, Jr., from Battle Branch mine, Auraria, Ga. Analysis by R. C. Wells, record D–399.

G. Another garnet collected by C. F. Park, Jr., at Battle Branch mine. Analysis by R. E. Stevens, record D–448.

	A	B	C	D	E	F	G
SiO_2	38.30	37.64	36.59	35.62	35.61	36.18	39.79
Al_2O_3	20.51	20.59	19.63	None	.28	20.10	19.59
Fe_2O_3	.40	.86	.60	29.58	29.32	1.27	2.38
FeO	24.92	18.44	11.77	3.43	3.86	33.06	28.38
MnO	7.73	16.98	19.18	Trace	.55	.39	1.02
MgO	.40	1.75	1.20	Trace	None	2.09	2.36
CaO	8.30	4.12	8.82	31.50	30.12	5.52	5.72
TiO_2						1.26	.88
	100.56	100.38	97.79	100.13	99.74	99.87	100.12

G–S. Garnet, mainly spessartite, collected by D. F. Hewett from the Piedmont crystalline belt; G–I from pegmatites, J–O from veins, P–S disseminated. Analyses G–L by Charles Milton, M–Q by R. S. Stevens, R–S by J. J. Fahey, record D–398.

G. Flat Rock mine, 4 miles northwest of Spruce Pine, N. C.
H. 2.5 miles west of Spruce Pine, N. C.
I. Wheatley mine, 3 miles east of Moneta, Va.
J. Hart mine, Union Point, Ga.
K. Iron mine, West Hawley, Mass. (garnet and quartz).
L. Iron mine, West Hawley, Mass. (calculated as garnet).
M. Betts mine, West Cunningham, Mass.
N. Rankin prospect, Kings Mountain, N. C.
O. Bald Knob, N. C.
P. Gossan Lead, Va.
Q. Higdon Mountain, Macon County, N. C.
R. Beam farm, Kings Mountain district, S. C.
S. Shooting Creek, N. C.

	G	H	I	J	K	L	M
SiO_2	37.56	37.28	36.71	37.95	46.94	37.50	36.49
Al_2O_3	20.90	20.31	19.59	19.89	16.61	19.60	19.41
Fe_2O_3	.03	.17	None	.84	.25	.29	2.15
FeO	15.47	13.52	13.55	13.43	11.00	12.98	24.19
MgO	1.48	.69	.18	2.16	1.03	1.22	1.92
CaO	1.05	1.22	.39	3.48	3.27	3.86	5.29
TiO_2	.20	.26	.28	.21	.11	.13	.69
MnO	23.96	26.62	28.72	21.96	20.81	24.56	9.69
ZnO	None						
	100.65	100.07	99.42	99.92	100.02	100.14	99.83

	N	O	P	Q	R	S
SiO_2	35.68	36.03	36.40	37.32	44.23	36.71
Al_2O_3	19.07	19.25	19.56	19.24	11.52	16.86
Fe_2O_3	3.60	1.81	3.33	3.12	5.62	3.24
FeO	7.10	17.85	16.68	7.90	12.06	31.98
MgO	.91	1.25	2.50	1.56	2.90	1.51
CaO	3.30	6.54	5.59	8.44	3.04	3.90
TiO_2	.25	.52	.37	.05	.80	.20
MnO	30.53	16.49	15.65	23.13	19.96	5.88
ZnO						
	100.44	99.74	100.08	100.76	100.13	100.28

T. Spessartite from Katerina mine, Hiriart Hill, Pala, Calif. Analysis by W. T. Schaller, record 2869.

U. Uvarovite, submitted by W. E. Smith, Daggett, Calif. Analysis by E. P. Henderson, record C–982.

	T	U		T	U
SiO_2	37.06	35.83	CaO	0.08	34.56
Al_2O_3	21.96	9.13	Cr_2O_3		17.26
Fe_2O_3	None	2.61	MnO	20.41	
FeO	20.05				
MgO	Trace	.22		99.56	99.61

GILLESPITE

From Dry Delta, Alaska Range, near Fairbanks, Alaska, collected by P. S. Smith. Analysis by W. T. Schaller, record C–396.

SiO_2	50.08	Mn_2O_3	0.14
FeO	14.60	Insoluble in HCl	2.20
BaO	31.02	H_2O	.82
Al_2O_3	.34		
Fe_2O_3	.56		99.76

GLAUCONITE

A–F. Glauconitic greensand collected by G. R. Mansfield in New Jersey and described in Bull. 727, 1922. Analyses by R. K. Bailey, record 3263. A, Sewell; B, Elmwood; C, Woodstown; D, Birmingham; E, magnetically separated glauconite from composite sample representing 12 feet of greensands from Sewell; F, magnetically separated glauconite from composite sample representing 12 feet of greensand from Elmwood.

	A	B	C	D	E	F
SiO_2	50.38	49.50	50.32	68.90	50.58	49.47
Fe_2O_3	18.69	18.27	18.38	8.91	19.50	19.46
FeO	2.84	3.03	3.02	1.52	2.98	3.36
Al_2O_3	7.83	6.52	7.53	3.52	6.72	5.59
CaO	.37	1.77	.65	2.10	.34	.60
MgO	3.54	3.78	3.82	1.90	4.10	3.96
K_2O	7.85	7.37	7.88	3.56	8.26	8.04
Na_2O	.30	.26	.22	.82	.04	.15
CO_2	.10	.30	.15	1.00	.30	.56
P_2O_5	.28	1.09	.34	1.05	.27	1.06
H_2O	8.70	8.98	8.58	7.68	7.76	8.54
	100.88	100.87	100.89	100.96	100.83	100.79

G–L. Carbonaceous matter other than carbonate in glauconite submitted by G. R. Mansfield, determined by E. T. Erickson, record C–302. For details of locations see Bull. 727, 1922.

G. Hole, 6 Woodstown. C, 0.07.

H. Locality 35, hole 10, depth 15 feet. C, 0.24.

I. Marlton district, hole 15, depth 28 feet. C, 0.10.

J. Locality 96, hole 17, depth 15 feet. C, 0.21.

K. Sewell. Grains separated magnetically from washed greensand. C, 0.10.

L. Elmwood Road. Grains separated magnetically. C, 0.09.

M. Glauconite from a lead mine in Missouri, submitted by C. S. Ross and described in U. S. Nat. Mus. Proc., vol. 69, art. 2, pp. 1–15, 1926. Analysis by G. V. Brown, record 3271. No TiO_2 or Na_2O.

N. From Huntington, Oreg., collected by T. E. Stephenson. Analysis by E. P. Henderson, record C–528.

O. Glauconite from vesicular basalt, 23 miles east of Reno, Nev., collected by C. S. Ross. Small sample.

P. Similar material from basalt, Sandoval County, N. Mex. 0.5-gram sample. Analyses O, P by R. C. Wells, record D–468.

	M	N	O	P		M	N	O	P
SiO_2	48.66	49.05	55.61	50.6	H_2O+	4.62	[1]11.79	4.40	6.9
Al_2O_3	8.46	7.96	.79	4.2	P_2O_5	.12	-------	None	Trace
Fe_2O_3	18.80	19.66	17.19	14.1	MnO	.01	-------	.09	-------
FeO	3.98	2.34	4.02	3.3	SO_3	-------	-------	None	-------
MgO	3.56	1.17	7.26	6.4	Li_2O	-------	-------	None	-------
CaO	.62	.75	.21	3.1	TiO_2	-------	-------	None	Trace
Na_2O	None	.78	.19	.4	CO_2	-------	-------	None	-------
K_2O	8.31	6.18	10.03	8.7					
H_2O-	1.94	-------	.48	1.4		99.08	99.68	100.27	99.1

[1] Total H_2O.

GRIFFITHITE

From Cahuenga Pass, Calif. Described by E. S. Larsen and George Steiger in Am. Jour. Sci., 5th ser., vol. 15, p. 1, 1928. Analysis by Steiger, record 3112.

SiO_2	39.64	CaO	2.93	H_2O+	4.90
Al_2O_3	9.05	Na_2O	.71		100.49
Fe_2O_3	7.32	K_2O	None		
FeO	7.83	TiO_2, SrO	None		
MgO	15.80	H_2O-	12.31	Specific gravity	2.309

GRUNERITE

A. From Mount Humboldt, Mich., collected by Stephen Richarz. Analysis by J. J. Fahey, record D–263.

B. From an ilmenite vein near Bedford, Va., collected by C. S. Ross. Analysis by J. G. Fairchild, record D–286.

	A	B		A	B		A	B
SiO_2	50.54	51.50	MnO	2.02	0.53	H_2O-	None	------
Al_2O_3	2.14	1.76	CaO	None	None	H_2O+	0.73	01.65
Fe_2O_3	None	.12	MgO	4.64	10.38		99.89	99.90
FeO	39.37	33.42	Na_2O, K_2O	.35	.30			
TiO_2	.10	.24						

HALLOYSITE

Samples submitted by C. S. Ross. The properties of halloysite are fully described by Ross and Kerr in Prof. Paper 185–G, 1935.

A. From Peppers, N. C. Analysis by E. T. Erickson, record D–137.

B. From Hickory, N. C. Analysis by J. G. Fairchild, record C–993.

C. From Huron, Lawrence County, Ind. Analysis by J. G. Fairchild, record D–155.

D. Same locality. Analysis by L. T. Richardson, record D–67.

E. From Liége, Belgium. Analysis by L. T. Richardson, record D–67.

F. From Iyo, Japan. Analysis by J. J. Fahey, record D–200.

	A	B	C	D	E	F
SiO_2	44.68	44.08	43.67	40.26	44.75	41.63
Al_2O_3	38.59	39.20	37.91	37.95	36.94	20.53
Fe_2O_3	.39	.10	.26	.30	.31	.23
FeO	------	None		(1)	(1)	
MgO	.08	.05	Trace	(1)	(1)	.15
CaO	.18	None	None	.22	.11	None
Na_2O	.11	.20	------	.74	.60	.10
K_2O	.05	------	------		------	
H_2O-	1.55	1.44	3.79	4.45	2.53	9.35
H_2O+	14.90	14.74	14.50	15.94	14.89	12.12
TiO_2	Trace	Trace	------	------	------	None
P_2O_5	------	------	.12	------	------	.22
CuO	------	------	------	------	------	14.77
CO_2	------	------	------	------	------	.31
SO_3	------	------	------	------	------	.28
	100.53	90.81	100.25	99.86	100.13	99.69

[1] Doubtful trace.

G. From Edwards Plateau region, Texas. Analysis by R. K. Bailey, record D–125. Described by Ross and Kerr in Prof. Paper 185–G, 1935.

H. From Gardner mine, 4 miles northeast of Huron, Ind., collected by H. Ries and described as "indianaite" in Bull. 708, 1922.

I. From Mississippi, collected by M. A. Pentz. Analysis by Charles Milton, record D–144.

J. White rock, possibly halloysite, from Tintic, Utah, collected by Waldemar Lindgren. Analysis by R. C. Wells, record 2937.

K. From Cerro Gordo, Inyo County, Calif. Analysis by Chase Palmer, record 2996.

	G	H	I	J	K		G	H	I	J	K
SiO_2	44.50	43.47	44.34	41.20	43.11	K_2O	0.14	------	0.04	------	------
Al_2O_3	38.68	38.03	37.39	36.90	38.60	H_2O-	1.17	3.83	2.00	22.60	
Fe_2O_3	.24	.25	.42	------	------	H_2O+	14.38	14.73	15.09		------
FeO	------			------	------	TiO_2	------	None	Trace	------	------
MgO	.05	------	.04	------	------	Ignition	------	------	------	------	17.52
CaO	None	------	.17	------	------		100.35	100.31	99.66	100.70	99.23
Na_2O	1.19	------	.17	------	------						

HEDENBERGITE

A. From Hanover, N. Mex., collected by A. C. Spencer. Analysis by W. T. Schaller, record D–237.

B. From Yakuki mine, northeastern Japan.

C. From Sasagatani mine, Japan. Analyses B, C by J. G. Fairchild, record D–245; both specimens studied optically by W. T. Schaller.

D. From Cranberry, N. C., collected by C. S. Ross. Analysis by E. P. Henderson, record C–892.

E. From Cranberry, N. C., collected by C. S. Ross. Analysis by J. G. Fairchild, record D–269.

F. From Ducktown, Tenn., collected by F. B. Laney and separated by C. S. Ross. Analysis by J. G. Fairchild, record D–194.

G. From Independence, Va., collected by C. S. Ross. Analysis by J. G. Fairchild, record D–396.

	A	B	C	D	E	F	G
SiO_2	48.64	48.18	48.69	48.97	48.08	51.46	49.26
Al_2O_3	.88	.05	.05	.98	2.16	.98	.74
Fe_2O_3	1.16	1.47	1.35	2.59	2.66	None?	2.17
FeO	15.45	24.90	21.85	23.10	21.30	16.93	19.65
MgO	.03	.39	2.01	3.28	3.00	7.54	2.11
MnO	10.77	3.25	3.76	.73	.46	.10	3.56
ZnO	.24	None	None	----------	None	----------	None
CaO	21.99	22.24	22.42	20.63	22.00	23.08	21.88
H_2O-	.06	----------	----------	----------	----------	----------	.66
H_2O+	.99	----------	----------	----------	----------	----------	
CO_2	.14	----------	----------	----------	----------	----------	----------
	100.35	100.48	100.13	100.28	99.99	100.09	100.03
Specific gravity	3.494	----------	----------	----------	----------	----------	----------

HISINGERITE

Specimen from Bellevue King mine, Bellevue, Idaho. Analysis by W. T. Schaller, record 2868.

SiO_2	38.13	H_2O-	13.20
Fe_2O_3	36.66	H_2O+	8.53
FeO	.84		99.81
MgO	2.45		
MnO	Trace		

HORNBLENDE

Specimen from vicinity of Bedford, Va., collected by C. S. Ross. Analysis by J. G. Fairchild, record D–286.

SiO_2	46.20	CaO	10.02	TiO_2	0.33
Al_2O_3	6.94	Na_2O	.84	MnO	.24
Fe_2O_3	4.50	K_2O	.48		100.03
FeO	21.00	H_2O+	2.00		
MgO	7.48				

ILVAITE

From T. 36 N., R. 9 E., Thunder Creek region, Wash., collected by J. S. Diller. Analysis by R. C. Wells, record 3204.

SiO_2	30.8	MnO	0.8
TiO_2	Trace	Al_2O_3, etc.	.6
Fe_2O_3	25.1	FeS_2	(1)
FeO	24.2		98.7
CaO	16.6		
MgO	.6		

[1] Present.

INESITE

Specimen from Quinault, Wash., submitted by J. J. Glass. Analysis by J. G. Fairchild, record D–173.

SiO_2	45.67	H_2O-	2.13
MnO	35.10	H_2O+	6.53
FeO	.92		100.54
CaO	9.33		
MgO	.86		

JEFFERSONITE

From Ogdensburg, N. J., U. S. National Museum no. 49651. Analysis by J. G. Fairchild, record D–269.

SiO_2	47.22	ZnO	8.76	H_2O	0.28
Al_2O_3	1.76	MgO	2.82	TiO_2	None
Fe_2O_3	3.20	CaO	20.04		
FeO	6.93	Na_2O	.32		99.08
MnO	8.65				

JOHANNSENITE

A–C. Theoretically $MnCa(SiO_3)_2$, named by W. T. Schaller. Analysis A by L. T. Richardson; Aa, B, and C by W. T. Schaller, with MnO by J. G. Fairchild, records D–86 and D–193.

A, Aa. Specimen collected by J. T. Pardee from California vein, Musick mine, Bohemia district, Lane County, Oreg.

B. From Schio, Vicenza, Italy, collected by D. F. Hewett.

C. From Italy, Roebling collection.

D. From Hanover, N. Mex., collected by A. C. Spencer. Analysis by W. T. Schaller, record D–237.

E. From Tetela de Ocampo, Pueblo, Mexico. Furnished by Manuel Santillán. Analysis by W. T. Schaller, record D–388. The sample is estimated to be 79 percent johannsenite, 3 percent hedenbergite, 1 percent diopside, 17 percent rhodonite, and 2 percent quartz.

F. From Franklin, N. J., separated by J. J. Glass from pink bustamite. Studied by W. T. Schaller. Analysis by J. G. Fairchild, record D–245.

	A	Aa	B	C	D	E	F
SiO_2	42.80	42.88	47.62	48.16	48.15	50.24	50.30
Al_2O_3	Trace?	----	.81	None	.31	.32	----
FeO	2.93	3.46	4.31	.50	4.28	.88	2.59
Fe_2O_3	Trace?	.59	.62	None	1.58	.25	----
MgO	1.34	2.06	2.74	.23	.48	.26	6.19
ZnO	.64	----	.21	.28	.14	----	3.27
MnO	23.56	23.65	21.15	27.82	21.37	29.24	14.85
CaO	21.10	20.88	20.15	20.56	20.88	18.16	22.97
CO_2	3.86	----	2.07	1.02	1.39	----	----
SO_3	1.62	None	----	----	----	----	----
H_2O-	.62	.53	.19	.55	.24	.15	----
H_2O+	1.50	1.63	.25	.58	.96	.49	----
MnO_2	----	----	----	.11	----	----	----
	99.97	95.68	100.12	99.81	99.78	100.69	100.17
Specific gravity	3.23	----	----	----	3.282	----	----

KAOLINITE

A. Washed sample from Woodrow, N. C., collected by W. S. Bayley. Analysis by George Steiger, record 3245.

B. Material embedding creedite, Wagon Wheel Gap, Colo., collected by E. S. Larsen. Analysis by R. C. Wells, record 3069. Described in Nat. Acad. Sci. Proc., vol. 2, pp. 360–365, 1916.

C. From Owensville, Mo., submitted by John Skornia through Jefferson Middleton. Analysis by R. C. Wells, record 3182.

	A	B	C		A	B	C
SiO_2	46.41	44.2	44.45	TiO_2	None	----	1.21
Al_2O_3	37.76	40.2	38.37	Na_2O	.17	----	----
Fe_2O_3	.70	----	.78	K_2O	.55	----	----
FeO			.14	P_2O_5	.04	----	----
MgO	.09	Trace	.26				
CaO	None	.3	.27		100.28	97.9	99.28
H_2O-	1.10	13.2	.98				
H_2O+	13.46		12.82	Specific gravity	----	2.548	----

LEPIDOLITE

From Katerina mine, Pala, Calif., collected by W. T. Schaller. Determination of alkalies only by R. E. Stevens, record D–377.

Li_2O	3.51	Rb_2O	1.11
Na_2O	1.27	Cs_2O	.13
K_2O	10.32		

LEUCHTENBERGITE

From tungsten vein near brucite deposit, NW¼ sec. 36, T. 12 S., R. 36 E., Paradise Range, Nye County, Nev., collected by Eugene Callaghan. Analysis by Charles Milton, record D–170.

SiO_2	31.02	CaO	0.02	H_2O+	12.77
Al_2O_3	20.79	TiO_2	Trace	Na_2O	.51
Fe_2O_3	.04	MnO	Trace	K_2O	.07
FeO	1.20	P_2O_5	.01		
MgO	34.25	H_2O-	.03		100.71

LEVERRIERITE

A. From Manhattan, Nev., carrying gold; collected by H. G. Ferguson and described in Bull. 723, 1924. Stated to be pure by E. S. Larsen. Determinations by R. K. Bailey, record C–124.

B. From National City, a few miles south of San Diego, Calif., submitted for identification. Analysis by W. T. Schaller, record C–316. Probably bentonite.

C. From Elko, Nev., submitted by Jefferson Middleton. Analysis by E. P. Henderson, record C–370.

	A	B	C		A	B	C
SiO_2		54.36	49.30	H_2O-	4.56	11.09	22.40
Al_2O_3		21.14	21.88	H_2O+	16.15	8.16	
MgO			3.06	MgO, alkalies		4.46	
CaO		.79	1.20				
K_2O	0.31					100.00	97.84

MICROCLINE

A–I. Samples from Connecticut pegmatites collected by F. J. Katz and described in Mineral Resources for 1915, pt. 2, pp. 43–49, 1917. Partial analyses by George Steiger, record 3167. A–B, Chatham; C–D, Portland; E–I, Glastonbury.

	A	B	C	D	E	F	G	H	I
Na_2O	2.96	2.37	2.76	2.95	2.52	2.42	2.52	2.32	2.28
K_2O	12.51	12.63	12.65	12.32	12.87	13.12	12.89	12.78	13.06

J, K. A sample of green microcline, collected by J. J. Glass at Amelia, Va., was analyzed for alkalies only by R. E. Stevens, record D–331 (J). White microcline in sharp contact with the green gave the results under K.

L–O. Samples collected by F. J. Katz. Analyses by George Steiger, record 3167. L–N, from Batchellerville, N. Y.; O, from Bedford, N. Y.

	J	K	L	M	N	O
Na_2O	01.54	0.084	5.38	2.32	2.96	2.54
Li_2O		.08				
K_2O	14.38	15.44	11.92	13.15	12.63	12.65
Rb_2O	1.02	.42				
Cs_2O	Trace	.10				

MONTICELLITE

From Ivanpah quadrangle, Calif.-Nev., collected by D. F. Hewett. Analysis by W. T. Schaller, record D–192.

Insoluble diopside	2.55	CaO	33.08
SiO_2	37.36	H_2O-	.04
FeO	1.40	H_2O+	1.24
MnO	.04		
MgO	24.90		100.61

MONTMORILLONITE

[For other analyses of montmorillonite see "Bentonitic clays."]

A–F. Six samples of montmorillonite submitted by C. S. Ross.
A. From Atzcapozalco, Mexico. Analysis by E. T. Erickson, record D–432.
B. Near Laurel, Miss. Analysis by J. J. Fahey, record D–203.
C. Near Jackson, Miss. Analysis by R. C. Wells, record D–268.
D. Husband farm, Smith County, Miss. Porous variety.
E. Same, dense variety. Analyses D, E by R. E. Stevens, record D–355.
F. Montmorillonite low in iron, exact locality unknown. Analysis by J. G. Fairchild, record C–993.

	A	B	C	D	E	F
SiO_2	50.44	49.48	50.20	50.37	50.39	51.50
Al_2O_3	16.26	17.75	16.19	17.11	17.37	19.44
Fe_2O_3	5.38	3.33	4.13	2.68	2.84	.10
FeO	Trace	.15	None	.20	Trace	----------
MgO	3.92	4.42	4.12	4.59	4.56	5.07
CaO	.72	.16	2.18	1.23	1.29	.48
Na_2O	----------	.12	.17	.56	.46	.20
K_2O	----------		.16	.09	.04	
H_2O-	16.00	18.26	15.58	12.29	13.31	14.50
H_2O+	6.30	5.86	7.57	10.93	10.11	8.04
TiO_2	.42	.29	.20	----------	----------	None
	99.44	99.82	100.50	100.05	100.37	99.33

G–M. Seven samples submitted by C. S. Ross. Analyses G–K by J. G. Fairchild, record C–993 and D–289; L by J. J. Fahey, record D–174; M by R. E. Stevens, record D–364.
G. Montmorillonite from San Diego County, Calif.
H. From Amargosa Valley, Calif., washed.
I. Pink montmorillonite from pegmatite, San Diego County.
J. Montmorillonite (galapectite) from Anglar, France.
K. Alteration product of pollucite from Greenwood, Maine.
L. Montmorillonite from locality near Dixon, N. Mex.
M. From Santa Rita, N. Mex.

	G	H	I	J	K	L	M
SiO_2	53.96	54.58	50.06	50.86	54.28	51.37	54.15
Al_2O_3	15.44	16.44	21.32	18.76	22.94	15.41	15.99
Fe_2O_3	1.12	2.59	.22	2.07	.24	.78	.59
FeO	Trace	.11	Trace	----------	----------	.14	.06
MgO	6.99	4.90	4.42	3.48	2.92	6.22	4.48
CaO	.80	.72	1.26	1.76	3.18	Trace	1.90
Na_2O	.94	3.02	.33	.37	.08	.79	.42
K_2O	.54	.81	.19	----------		.46	.19
Li_2O	----------	----------	----------	----------	.02	----------	----------
H_2O-	14.22	11.10	14.06	22.34	7.82	15.76	13.29
H_2O+	6.34	5.49	7.56		8.70	8.20	8.99
TiO_2	.19	.18	Trace	Trace	.06	.29	.11
MnO	----------	----------	.13	----------	----------	----------	----------
Cs_2O	----------	----------	----------	----------	None	----------	----------
Cl	.29	----------	----------	----------	----------	Trace	----------
SO_3	----------	----------	----------	----------	----------	.23	----------
	100.83	99.94	99.55	99.64	100.24	99.65	100.17

N, O. Two samples of montmorillonite submitted by C. S. Ross.
N. From locality west of Leakey, Real County, Tex. Analysis by J. J. Fahey, record D–124.
O. From Rideout, Utah. Analysis by J. G. Fairchild, record C–993.
P–R. Three samples studied by P. G. Nutting. Analyses by J. G. Fairchild, record D–467.
P. Sanders, Apache County, Ariz. Sample from Filtrol Co. White.
Q. Westcliff, Colo. Pink, conchoidal. Compare analysis under clays, p 67.
R. New Mexico, sec. 6, T. 20 N., R. 9 E.

	N	O	P	Q	R
SiO_2	51.74	56.86	51.20	55.29	52.30
Al_2O_3	22.81	16.00	15.12	14.86	14.43
Fe_2O_3	.39	.98	1.41	1.23	2.00
FeO		Trace			
MgO	3.32	4.13	5.22	4.30	6.15
CaO	Trace	1.52	2.71	2.26	2.12
Na_2O	.17	.22	.50	.42	.50
K_2O	.26	.27	.08	.28	.52
H_2O-	11.84	13.68	16.78	14.23	15.78
H_2O+	9.19	6.43	6.92	7.12	6.55
TiO_2	Trace	.06	.10	.06	.20
P_2O_5				.02	.02
SO_3	.11				
MnO			.03	.15	.05
	99.83	100.15	100.07	100.52	100.62

MORDENITE

From Marysvale, Utah. Analysis by W. T. Schaller, record 3073.

SiO_2	67.35	H_2O-	5.13
Al_2O_3	11.49	H_2O+	8.82
CaO	3.87		99.40
K_2O	.11		
Na_2O	2.63		

MUSCOVITE

A. From Waynesville, N. C. Partly leached or decomposed. Collected by W. S. Bayley. Analysis by George Steiger, record 3245.

B. Collected by W. T. Schaller at Harding mine, 9½ miles due east of Embudo, N. Mex. Analysis by E. P. Henderson, record C–636.

C. Collected by W. T. Schaller from east side of Rio Grande, 1 mile southwest of Cieneguilla and about 9 miles northeast of Embudo, N. Mex. Pink. Analysis by E. P. Henderson, record C–632.

D. Fine-grained micaceous material coating quartz, apparently a variety of muscovite, from Melones, Calaveras County, Calif., submitted by C. S. Ross. Analysis by J. J. Fahey, record D–124.

E. From sedimentary beds, Graves County, Ky., submitted by C. S. Ross. Analysis by J. G. Fairchild, record D–289.

F. Collected by C. F. Park, Jr., from Battle Branch mine, Auraria, Ga. Analysis by R. E. Stevens, record D–412.

	A	B	C	D	E	F
SiO_2	40.79	44.80	45.16	50.60	49.37	45.42
Al_2O_3	29.98	37.72	35.61	31.07	29.21	33.52
Fe_2O_3	8.07	.67	2.95	3.00	1.54	1.47
FeO	2.48					1.11
MgO	2.71			.72	2.77	1.22
CaO	.45			None	None	1.12
Na_2O	.38	1.40	1.03	None	.14	1.34
K_2O	3.47	10.66	10.32	6.43	9.72	8.06
H_2O-	1.20	4.52	4.36	.13	.75	5.89
H_2O+	9.34			7.47	6.88	
TiO_2	1.28			.83	.19	.39
F		.20				
MnO			.63			None
Li_2O		Trace	None			
Mn_2O_3		.21				
Rb, Cs		None				
	100.15	100.18	100.06	100.25	100.57	99.54
Less O		.08				
		100.10				

NONTRONITE

A. From Woody, Calif. Described by E. S. Larsen and George Steiger in Am. Jour. Sci., 5th ser., vol. 15, p. 1, 1928. Analysis by George Steiger, record 3112.

B. From Chevy Chase, D. C. Analysis by L. T. Richardson, record D–67.

C. From Santa Rita, N. Mex. Analysis by R. C. Wells, record D–432.
D. From Sandy Ridge, N. C., in arkosic sedimentary rock.
E. From Spruce Pine, N. C., in altered pegmatite. Samples B–E submitted by C. S. Ross. Analyses D, E by L. T. Richardson, record D–67.

	A	B	C	D	E
SiO_2	47.51	46.65	40.48	41.38	41.88
Al_2O_3	.37	17.65	6.00	9.84	11.90
Fe_2O_3	35.17	18.39	29.33	27.47	26.20
FeO	None	Trace	.26	Trace	Trace
MgO	1.40	Trace	.31	Trace	.10
CaO	2.50	1.21	2.90	Trace	.67
Na_2O	.09	.55			.52
K_2O	.06				
Ti, Sr	None		None		
H_2O-	7.16	5.55	15.39	12.10	7.67
H_2O+	5.90	10.81	5.65	9.25	10.78
	100.16	100.81	100.32	100.04	99.72
Specific gravity	2.495				

PENNINITE

From brucite deposit, Paradise Range, Nev., collected by Eugene Callaghan. Analysis by J. J. Fahey, record D–184. $(Na,K)_2O$ less than 0.10 percent.

SiO_2	36.56	CaO	0.02
Al_2O_3	11.80	H_2O-	.43
Fe_2O_3	None	H_2O+	13.19
TiO_2	None		100.42
FeO	1.27		
MgO	37.15		

PHLOGOPITE

From Verdiolite quarry, near Easton, Pa., collected by W. S. Bayley. Partial analysis made on 4 grams by J. G. Fairchild, record C–520.

SiO_2	42.16	Na_2O	0.30
Al_2O_3	11.08	H_2O-	None
Fe_2O_3, FeO	.58	Loss on ignition	2.14
MgO	29.52	F	1.10
CaO	None		96.84
K_2O	9.96		

POLLUCITE

From Tin Mountain, S. Dak. U. S. National Museum no. 96487. Analysis by R. E. Stevens, record D–370.

SiO_2	45.66	H_2O-	2.17
Al_2O_3	16.64	H_2O+	.42
Fe_2O_3	.22	TiO_2	None
FeO	.10	Li_2O	.22
MgO	.29	Rb_2O	None
CaO	.36	Cs_2O	31.80
Na_2O	2.12		100.14
K_2O	.14		

POTASH CLAY

A–B. Two gouge clays from Thunder Mountain district, Idaho, collected by C. P. Ross. Analyses by J. G. Fairchild, record C–993.
C, Potash clay from Evansville, Tenn., submitted by C. S. Ross. Analysis by J. G. Fairchild, record C–993.

	A	B	C		A	B	C
SiO_2	57.02	47.50	55.27	K_2O	6.45	7.90	6.21
Al_2O_3	26.10	31.52	20.73	H_2O-	8.20	9.92	4.87
Fe_2O_3	.92	1.18	2.18	H_2O+	None	Trace	6.50
FeO	.38	.50	.41	TiO_2	.50	.72	.30
MgO	.50	.72	3.82	SrO	Trace	.64	None
CaO	Trace	.64	Trace		None	.19	Trace
Na_2O	None	.19	Trace		99.57	100.06	100.29

RECTORITE

From Hot Springs region, Ark., submitted by C. S. Ross. Analysis by J. J. Fahey, record D–108.

SiO_2	47.10	K_2O	0.16
Al_2O_3	33.97	H_2O-	8.34
Fe_2O_3	.31	H_2O+	6.27
MgO	.01		100.46
CaO	.42		
Na_2O	3.88		

ROSCOELITE

A. From Paradox Valley, Colo., collected by F. L. Hess. Analysis by R. C. Wells, record 2918.

B–D. From Colorado, collected by F. L. Hess. Analyses by W. T. Schaller, record C–734.

	A	B	C	D		A	B	C	D
Insoluble SiO_2	47.27	78.36	76.79	77.21	TiO_2	0.06			
Soluble SiO_2		7.97	9.09	8.49	V_2O_3	15.26	0.96	1.65	1.23
Al_2O_3	19.18	6.23	4.44	------	BaO	Trace	------	.01	------
Fe_2O_3	1.69	------	------	------	FeS_2	.13	------	------	------
MgO	.93	------	------	------	Li, Se	Traces	------	------	------
CaO	.06	------	------	------		99.29	97.37	95.74	------
Na_2O	.24	------	------	------					
K_2O	8.68	(1)	(1)	(1)					
H_2O-	1.62	3.85	3.76	------					
H_2O+	4.17								

[1] Present.

SAPONITE

A–C. Three specimens submitted by C. S. Ross. Analyses A, B by L. T. Richardson, record D–67; C by J. G. Fairchild, record D–75. A, Utah; B, C, Glasgow, Scotland.

D. Hydrous magnesium silicate occurring as angular fragments in magnesitic clay in the Currant district, west of Ely, Nev. Submitted by Eugene Callaghan and W. W. Rubey. Analysis by Charles Milton, record D–426.

E, F. Saponite from Hector, Death Valley, Calif., submitted by C. S. Ross. Analysis E by J. G. Fairchild, record D–289; F by R. E. Stevens, record D–355.

	A	B	C	D	E	F
SiO_2	62.96	40.16	40.12	40.76	57.50	51.26
Al_2O_3	13.24	8.03	7.34	1.10	.68	.36
Fe_2O_3	2.66	8.50	8.69	.37	.24	.09
FeO	------	3.83	3.55	------	------	------
MgO	7.78	19.40	19.90	33.40	25.98	23.25
CaO	.86	1.91	.85	Trace	.47	2.60
Na_2O	.31	------	------	.05	2.48	3.47
K_2O	.36	------	------	None	.45	.10
Li_2O	------	------	------	------	------	.60
H_2O-	12.66	11.15	19.56	8.90	3.52	11.56
H_2O+	9.22	7.60		12.04	6.88	5.14
CO_2	------	------	------	.87	------	1.35
TiO_2	------	------	.10	.01	.02	------
P_2O_5	------	------	------	------	.34	------
SrO	------	------	------	------	------	Trace
	100.05	100.58	100.11	99.50	98.56	99.84

SCHRÖTTERITE

A. From Styria, submitted by C. S. Ross. Analysis by J. J. Fahey, record D–200.

B. Hyaline coating on a lump of sandstone collected by H. Ries at Gardner mine, 4 miles northeast of Huron, Ind. Analysis by George Steiger, record 3248.

C. A poorly defined species received from W. S. Baldwin, Dalton, Ga. Analysis by E. P. Henderson, record C–667.

	A	B	C		A	B	C
SiO_2	4.34	10.70	10.80	TiO_2	None	None	
Al_2O_3	41.41	[1] 54.53	33.61	CO_2	2.07		
Fe_2O_3	.86	.37	.73	P_2O_5	9.23		14.03
MgO	.22		.98	SO_3	.08		
CaO	.20			CuO	1.80		
$(Na, K)_2O$	.10			ZnO	4.30		
H_2O-	20.92	5.26	39.95				
H_2O+	14.43	29.48			99.96	100.34	100.10

[1] Includes P_2O_5.

SEARLESITE

From Searles Lake, Calif., described by Larsen and Hicks, Am. Jour. Sci., 4th ser., vol. 38, pp. 437–440, 1914. Analysis by W. B. Hicks after deducting impurities, record 2908.

SiO_2	58.41
B_2O_3	17.48
Na_2O	13.73
K_2O	1.07
H_2O	9.31
	100.00

SEPIOLITE

From Duchesne County, Utah. Collected by W. H. Bradley and described in Prof. Paper 158, pp. 1–7, 1930. Analysis by E. T. Erickson, record C–964.

SiO_2	35.92	TiO_2	0.10
Al_2O_3	1.16	CO_2	1.14
Fe_2O_3	.26	Loss on ignition, excluding CO_2	42.06
MgO	16.34		
CaO	1.88		98.86

SERENDIBITE

From Warren County, N. Y., submitted by E. S. Larsen. Analysis by W. T. Schaller, record C–732. Formula: $4SiO_2.3Al_2O_3.2CaO.4MgO.B_2O_3$.

SiO_2	26.30	MgO	15.44
Al_2O_3	34.05	B_2O_3	8.37
FeO	2.76		
CaO	13.30		100.22

SERICITE

A–E. From a pegmatite near Amelia, Va., collected by J. J. Glass. Analyses A, B, E by R. E. Stevens; C, D by J. G. Fairchild, record D–175.

A, B. Purple mica. Compact sericitic mineral associated with albite and topaz.

C, D. Alteration product of topaz.

E. Sericite (metasericite) apparently an alteration product of oligoclase; Be, spectrographic tests by George Steiger.

F. From Pend Oreille district, Idaho, associated with pyrite, molybdenite, and gouge in a seam of contact-metamorphic minerals in granodiorite. Sample purified by Edward Sampson. Analysis by J. G. Fairchild, record C–418.

G. From Climax district, Colo., collected by J. W. Vanderwilt. Analysis by J. G. Fairchild, record D–6.

	A	B	C	D	E	F	G
SiO_2	46.81	46.80	48.06	47.22	49.16	50.26	49.14
Al_2O_3	36.09	35.84	32.14	32.00	30.81	32.12	32.27
Fe as Fe_2O_3	.28	.27	1.24	1.33	1.53	.88	1.16
TiO_2	.01	.01			.04	.24	.02
MgO	.62	.56	1.39	1.25	2.22	.77	1.81
CaO	.29	.29	Trace	Trace	.15	None	.80
Na_2O	.68	.60	.17	None	.48	None	.23
K_2O	10.24	10.08	9.21	8.89	10.90	10.04	10.88
H_2O-	.42	.64	2.06	3.14	.15	.26	4.42
H_2O+	5.00	5.05	5.46	5.64	4.73	4.69	
P_2O_5			Trace	.12			.04
MnO			.20	.14			
F, Li			None	None		None	
Be	None		None	Present			
S						.06	
	100.44	100.14	99.93	99.73	100.17	99.31	100.71

SERPENTINE

[See also Antigorite.]

Serpentine of the picrolite type from Bellows Falls, Vt., submitted by C. S. Ross. Analysis by J. G. Fairchild, record C–993.

SiO_2	39.92	CaO	None
Al_2O_3	.44	H_2O+	13.80
Fe_2O_3	5.68	TiO_2	None
FeO	Trace		
MgO	39.10		98.94

SHATTUCKITE

From Shattuck Arizona mine, Bisbee, Ariz. Analyses by W. T. Schaller, records 2928 and 2926.

A. From heavy solution.

B. Deep-blue spherulites.

C. Pale-blue massive mixture of shattuckite and plancheite.

	A	B	C		A	B	C
SiO_2	39.68	37.91	39.92	H_2O	5.94	5.83	6.41
CuO	54.80	55.51	53.20	ZnO	Trace	------	------
FeO	.16	.43	.83				
CaO	.05	------	None		100.63	99.68	100.36

SPADAITE

A, B. From Cane Springs mine, Gold Hill, Tooele County, Utah, collected by T. B. Nolan. Analysis by W. T. Schaller, record C–1057. Described in Am. Mineralogist, vol. 16, pp. 231–236, 1931. A, Material as analyzed; B, recalculated after deducting insoluble, wollastonite, and H_2O at 110° C.

C. Nickeliferous spadaite or a related nickel-magnesium silicate from Webster, N. C. Similar material has been described as genthite, garnierite, and nickeliferous deweylite. Specimen collected by J. T. Pardee. Analysis by Charles Milton, record D–300. Optically it consists of a crystallized gel, brown spherulites, of fairly high birefringence, and index about 1.46. The analysis approximates $RO.SiO_2.H_2O$.

	A	B	C		A	B	C
Insoluble residue	8.68	------	------	MgO	24.72	31.81	15.5
SiO_2	43.69	54.05	50.0	NiO	------	------	16.5
Fe_2O_3	.22	.30	4.8	H_2O	20.87	13.52	12.1
FeO	.27	.35	------				
CaO	1.58	------	------		100.03	100.03	98.9

TALC

A–D. Samples collected and studied by J. S. Diller. Analyses by J. G. Fairchild, record C–177.

A. Indian talc, believed to come from Sandun, about 275 miles northwest of Madras, showing some chlorite.

B. German talc, believed to be from southern Fichtelgebirge, Bavaria. Very little chlorite.

C. Italian talc. Some pale-green chloritic material.

D. French talc, said to be from Luzenac. A little chloritic material.

E, F. White talc from Riggs, Calif. Analyses by R. C. Wells, record 2874.

G. From Dublin, Harford County, Md. Analysis by J. G. Fairchild, record 3256.

	A	B	C	D	E	F	G
SiO_2	61.00	61.37	61.52	61.44	60.88	63.36	58.68
Al_2O_3	2.12	1.96	.84	1.52	.36	.46	3.75
Fe_2O_3	None	None	None	None	.10	.09	------
FeO	1.74	1.47	1.27	.97	.33	.30	5.52
MgO	29.83	30.23	31.38	31.55	28.85	27.60	26.80
CaO	None	None	None	None	4.28	3.49	None
H_2O	5.56	5.37	5.42	5.19	4.50	3.92	5.33
	100.25	100.40	100.43	100.67	99.30	99.22	100.08

TOPAZ

From Old Einstein silver mine, 9 miles west of Fredericktown, Madison County, Mo. Collected by C. S. Ross. Partial analysis by E. P. Henderson, record C–658.

SiO_2	32.65
Al_2O_3	54.67
Fe_2O_3	1.78
F	Present

TOURMALINE

From a vein northeast of Gold Hill mine, Quartzburg, Boise County, Idaho. Submitted by Louis Klein, of Boise. Partial analysis by W. T. Schaller, record C–749.

SiO_2	37.14
Al_2O_3	35.02
FeO	1.93
CaO	.10
MgO	8.89

URANOPHANE

From Lusk, Wyo., collected by F. L. Hess. Analysis by W. T. Schaller, record C–495–c. A, as received; B, with impurities deducted.

	A	B		A	B
UO_3	45.5	67.2	Quartz	2.1	------
CaO	20.9	6.5			
SiO_2	9.4	13.9		100.1	100.2
H_2O+CO_2	22.2	[1] 12.6			

[1] H_2O.

ZINNWALDITE

From Morefield mine, Amelia County, Va., collected and purified by J. J. Glass. Analysis by J. J. Fahey. Determination of cesium by R. E. Stevens, remaining alkalies by R. C. Wells, record D–318.

SiO_2	43.70	H_2O-	0.08	Cs_2O	0.10
Al_2O_3	22.96	H_2O+	1.35	F	5.52
Fe_2O_3	.59	TiO_2	.32		101.58
FeO	11.67	Li_2O	1.92	Less O	2.32
MgO	.03	Na_2O	.74		99.26
CaO	.02	K_2O	9.58		
MnO	1.96	Rb_2O	1.04		

TITANATES

BRANNERITE

From Stanley Basin, Idaho, submitted by F. L. Hess. Analysis by R. C. Wells, record D–252. Described in Franklin Inst. Jour., vol. 189, p. 225, 1920. Calculated age about 37 million years.

SiO_2	0.6	Ce_2O_3	None	CO_2	0.2
TiO_2	39.0	Yt_2O_3[1]	3.9	Fe_2O_3, Al_2O_3, P_2O_5	Traces
FeO	2.9	ZrO_2	.2		100.0
CaO	2.9	BaO	.3		
UO_2	10.3	SrO	.1	Specific gravity	5.42
UO_3	33.5	H_2O	2.0		
ThO_2	4.1				

[1] Average molecular weight 350.

COLUMBATES, TANTALATES

COLUMBITE

Two analyses of material from the collection of F. W. Clarke, locality unknown but probably Middletown, Conn.

A. Analysis by R. C. Wells, record C–285.

B. Analysis by J. G. Fairchild, record D–85.

	A	B		A	B
Insoluble		2.25	NiO, CoO	Traces	
Cb_2O_5	66.0	61.38	SnO_2	None	
Ta_2O_5	13.1	16.03	H_2O		Trace
SiO_2	.9		TiO_2	None	0.50
FeO	12.7	12.50		100.3	99.11
MgO	.2				
CaO	.1				
MnO	7.3	6.45	Specific gravity	5.63	5.63

MICROLITE

From locality 2 miles southwest of Ohio City, Colo., found in 1932 by E. B. Eckel. Material purified further by J. J. Glass. Analysis made for T. S. Lovering by J. G. Fairchild, record D–332. Calculated age, 765 million years.

Insoluble+SiO_2	0.92	F	1.51	As_2O_5	Trace
Al_2O_3	.10	MnO	.11	BeO	None
Fe_2O_3	1.91	Ta_2O_5	68.47	PbO	0.40
MgO	.04	Cb_2O_5	4.48		98.41
CaO	9.19	SnO_2	.95	Less O=F	.64
Na_2O	2.94	UO_2	1.69		97.77
K_2O	.25	UO_3	2.40		
H_2O	2.84	ThO_2+rare earths	None		
TiO_2	.10	ZnO	None		
P_2O_5	None	CuO	.04	Specific gravity	5.604
Cl	None	Bi_2O_3	.07	Pb/U	.106

POLYCRASE

From Brazil. Described by Hess and Henderson in Franklin Inst. Jour., vol. 200, p. 235, 1925. Analysis by E. P. Henderson, record C–533.

TiO_2	34.88	Rare earths	29.28	U_3O_8	6.48
Cb_2O_5	20.31	Fe_2O_3	.78	H_2O	2.04
Ta_2O_5	Trace	Al_2O_3	.44		100.07
ThO_2	5.22	PbO	.64		

SAMARSKITE

A, B. Analyses of two portions of a specimen selected according to their radioactivity from material from Petaca, N. Mex. Described by Hess and Wells in Am. Jour. Sci., 5th ser., vol. 19, p. 18, 1930. Analyses by R. C. Wells, record C–1065. A, More radioactive part; B, less radioactive part.

C. Specimen from collection of F. W. Clarke, locality unknown. Analysis by J. G. Fairchild, record D–84. The presence of silica was not definitely determined.

	A	B	C		A	B	C
Cb_2O_5	41.39	41.29	52.00	ZnO	0.04	0.05	Trace
Ta_2O_5	7.27	1.19		MgO			Trace
TiO_2	4.29	1.38	2.33	CaO	4.22	2.98	1.01
SnO_2	.02	.02		PbO	.43	.11	.53
UO_2	4.85	1.88	10.16	Bi_2O_3	.02	.04	
UO_3	7.67	3.84		H_2O			1.02
ThO_2	1.58	1.10	.80	Ignition	2.06	3.27	
CeO_2	.31	.56	None	Undetermined	.27	1.03	.85
La_2O_3	Trace	Trace			98.80	98.38	98.23
$(Y,Er)_2O_3$	17.64	37.69	16.93				
Fe_2O_3	5.85	1.36	12.22				
MnO	.89	.59	.38	Specific gravity	5.22		5.49

D–F. Samarskite from the Spinelli quarry, 6 miles east of South Glastonbury, Conn. Received through Charles Palache. Purified by Harry Berman and C. M. Alter. Analysis by R. C. Wells, record D–430. Pb/U+0.36 Th=0.0388. Age by logarithmic formula 289 million years.

D, Smith's method; E, Fenner's method; F, Mean.

	D	E	F		D	E	F
SiO_2	0.03	------	0.03	MnO	1.75	------	1.75
Cb_2O_5	42.00	------	42.00	ZnO	None	------	None
Ta_2O_5	14.73	------	14.73	MgO	.02	------	.02
TiO_2	1.40	------	1.40	CaO	.33	------	.33
UO_2	8.00	7.70	7.85=6.91 U	PbO	.30	{0.362 / .340}	.334=310 Pb
Ce_2O_3	.53	------	.53	H_2O-	.06	------	.06
$(La,Tb)_2O_3$, etc.	1.55	------	1.55	H_2O+	.59	------	.59
Y_2O_3	12.47	------	12.47	Undetermined	.46	------	.46
ThO_2	3.62	3.32	3.47=3.05 Th		99.77	------	99.504
FeO	2.11	------	2.11				
Fe_2O_3	9.82	------	9.82				

BORATES

AMMONIOBORITE

From Larderello, Italy. Described by W. T. Schaller in Am. Mineralogist, vol. 18, pp. 480–492, 1933. Analysis by W. T. Schaller, record C–1074.

NH_4	9.78
B_2O_3	74.18
H_2O (by difference)	16.04
	100.00

HYDROBORACITE

From Ryan, Calif. Collected by H. S. Gale. Analysis by W. T. Schaller, record C–316.

CaO	14.06	Fe_2O_3	0.12
MgO	10.14	SiO_2	.23
B_2O_3	47.71	CO_2	Trace
H_2O-	None		
H_2O+	27.37		99.63

KERNITE

From Kern County, Calif. Analysis by W. T. Schaller, record C–901. Described by Schaller in Prof. Paper 158, pp. 146–163, 1930.

A. As analyzed.

B, C. Comparison of the loss of water from octahedral borax, $Na_2O.2B_2O_3.5H_2O$, and ordinary borax, $Na_2O.2B_2O_3.10H_2O$, respectively, with that from kernite given under A.

	A	B	C		A	B	C
Insoluble	None	------	------	H_2O at 110°–200°	9.08	10.82	5.08
Na_2O	22.63	------	------	H_2O at 200°+	6.45	5.31	3.91
CaO	None	------	------		99.89	------	------
B_2O_3	50.76	------	------				
H_2O at −110°	10.97	16.03	38.47	Total H_2O	26.50	32.16	47.46

LUDWIGITE

From the Little Cottonwood district, Utah. A magnesium variety of ludwigite described by B. S. Butler and W. T. Schaller, Washington Acad. Sci. Jour., vol. 7, p. 29, 1917. Analysis by W. T. Schaller, record D–232.

FeO	2.55	H_2O	0.49
MgO	38.34	Insoluble	.61
Fe_2O_3	40.74		100.09
B_2O_3	17.36		

PROBERTITE

From Kern County, Calif. Described as kramerite by W. T. Schaller in Prof. Paper 158, pp. 139–146, 1930. Analysis by W. T. Schaller, record C–977. Average of three analyses.

SiO_2, soluble in HCl	0.57	B_2O_3[1]	49.35
Al_2O_3, soluble in HCl	.42	H_2O (total)	25.40
Insoluble in HCl	1.74		100.93
Na_2O	8.34		
CaO	15.11		

[1] B_2O_3 determination probably a little high, owing to the reactivity of the separated SiO_2 and Al_2O_3 from the residue (clay). Sample may have contained a little admixed borax.

TINCALCONITE

From Kern County, Calif. Described by W. T. Schaller in Prof. Paper 158, pp. 163–164, 1930. Analyses by W. T. Schaller, record C–980.

A. Coating on kernite.

B. From seam in clay associated with kernite and borax.

	A	B		A	B
Insoluble in H_2O	0.48	0.90	H_2O	30.59	30.93
Na_2O	20.80	20.72		99.39	99.74
B_2O_3	47.52	47.19			

ULEXITE

From Kern County, Calif. Analysis by W. T. Schaller, record C–901. Described in Prof. Paper 158, pp. 138–139, 1930.

Na_2O	7.09
CaO	14.06
B_2O_3	42.94
H_2O	35.54
Insoluble	.10
	99.73

NITRATES

NITER

A, B. Efflorescent salts collected by G. R. Mansfield 10 miles west of Homedale, Idaho. Water-soluble part. Analyses by R. K. Bailey, record 2983.

	A	B		A	B		A	B
Cl	0.09	0.18	Na	31.13	13.74	Ca	1.61	1.77
SO_4	19.39	4.62	K	.39	19.75		100.00	100.00
NO_3	47.25	59.91	Mg	.14	.03			

C. Niter from Riley, Oreg. Analysis by R. K. Bailey, record 3047. Soluble, 27.55 percent. NO_3=52.29 percent of soluble part.

SODA NITER

From Confidence field, Inyo County, Calif. Collected by L. F. Noble and described in Bull. 820, 1931. Analyses A and B by E. T. Erickson, record C–146, and R. K. Bailey, record C–260.

A–B. Best hand-picked specimens.

C. Composition of soluble salts (43.12 percent of sample).

Occurrences of nitrates in the United States are summarized in Bull. 838 by G. R. Mansfield. Many chemical tests have been made, but the percentage of nitrate in average samples is generally too low to have any commercial importance.

	A	B	C		A	B	C
Na	6.00	6.01	33.30	BO_3			0.65
K			.51	NO_3	22.18	22.21	23.19
Mg			.23	ClO_3			Trace
Ca			.70	NH_4, IO_3, I			None
Cl			35.34				
SO_4			6.08				100.00

PHOSPHATES AND ARSENATES

ALUMINUM PHOSPHATE

From Tacubaya, Mexico. Analysis by J. G. Fairchild, record C–654. Does not appear to be any known mineral. A little Na_2O is also present.

Al_2O_3	17.74	$(NH_4)_2O$	3.96	H_2O (ignition)	32.63
Fe_2O_3	.89	P_2O_5	33.07	Insoluble	.80
MgO	.30	SO_3	1.74		98.97
CaO	.44	N_2O_5	4.69		
K_2O	2.71				

ARSENIOSIDERITE

A. From Romanèche, France.

B. Material collected by B. N. Moore at the Gallinger-Root mines, 2 miles northwest of Ludlow, San Bernardino County, Calif. Both analyses by Charles Milton, record D–452. The small sample of B available contained a little psilomelane, hematite, and siliceous impurities.

	A	B		A	B		A	B
SiO_2	3.07	[1] 18.59	MgO	0.17	-------	H_2O-	0.30	0.53
Fe_2O_3	36.45	27.03	MnO	Trace	0.84	H_2O+	8.06	8.45
Al_2O_3	Trace	2.41	As_2O_5	37.65	31.16		100.02	100.94
CaO	14.14	11.93	P_2O_5	.18	-------			

[1] Includes insoluble.

AUTUNITE

From fault block on southeast side of Temple Mountain, Utah. Submitted by F. L. Hess. Analyses by W. T. Schaller, record C–314–a.

A. Impure material as analyzed.

B. Recalculated with impurities deducted.

	A	B		A	B		A	B
UO_3	21.11	63.01	H_2O	7.07	21.11	Insoluble	64.22	-------
CaO	2.14	6.39	Se	Trace	-------		97.72	100.00
P_2O_5	3.18	9.49	SO_3	Trace	-------			

CRANDALLITE

From Tintic district, Utah. Analysis of impure material by W. T. Schaller record 3074.

Insoluble	35.13	MgO	0.61	SO_3	2.47
Al_2O_3	25.16	H_2O-	.84	P_2O_5	17.61
SrO	1.44	H_2O+	12.26		100.40
CaO	4.88				

FERROUS PHOSPHATE

An unclassified iron phosphate, collected by F. W. Horton at Climax mica mine, near Custer, S. Dak. Analysis by E. P. Henderson, record C–1064.

Insoluble	0.97	K_2O	2.01	H_2O	1.11
MgO	1.87	Na_2O	6.42	F	Present
CaO	4.15	Al_2O_3	2.03		100.06
MnO	3.31	Fe_2O_3	1.50		
FeO	36.87	P_2O_5	39.82		

METATORBERNITE

From southeast end of block fault running through Temple Mountain, Utah. Collected by F. L. Hess and described in Bull. 750, p. 70, 1925. Analysis by W. T. Schaller, record C–314–a. A, As received; B, with impurities deducted.

	A	B		A	B		A	B
UO_3	35.86	55.82	As_2O_3	0.13	0.20	Insoluble	35.76	-------
CaO	.05	.08	H_2O	11.08	17.25		100.00	100.00
P_2O_5	[11.16]	17.37	CuO	5.96	9.28			

PHOSPHORITE

Although a large number of analyses of phosphate rock have been made in the Survey laboratory, most of them were restricted to the determination of P_2O_5 only. Those given below are also very incomplete, but they involve some additional constituents. A–F, collected by G. R. Mansfield, G–I by J. T. Pardee. Analyses by J. G. Fairchild, record C–564, C–577, C–579, and C–923, except E and F by R. K. Bailey, record C–220.

A. From Paradise Valley, Idaho, SE¼NW¼ sec. 22, T. 2 S., R. 39 E.

B. Same, NW¼ sec. 17, T. 2 S., R. 39 E.

C. Ammon quadrangle, Idaho, NE¼NW¼ sec. 17, T. 2 S., R. 39 E.
D. Portneuf quadrangle, Idaho, T. 6 S., R. 39 E.
E. Montpelier Canyon, Idaho.
F. Paris Canyon, Idaho.
G. Indian Creek, Madison Range, Montana.
H. Shaly phosphate, Huntsville, Utah.
I. Duff Hill, Philipsburg, Mont.

	A	B	C	D	E	F	G	H	I
Insoluble							6.34	12.27	
$(Al,Fe)_2O_3$	1.84	1.70	0.72	0.68			1.67	3.92	4.95
V_2O_3	None	None	None	.41	0.32	0.21			
F	1.57	1.00	1.32	.04	.42	.91			
Cr_2O_3				.06	.23	.18			
P_2O_5	37.15	20.45	27.56	31.98	31.73	32.76	32.26	31.38	29.02
$Ca_3P_2O_8$ (calculated)	81.10	44.65	60.20	69.80	69.37	71.52	70.45	68.54	63.35

TRIPLITE

A. Collected in the Black Hills, S. Dak., by F. L. Hess. Analysis by E. P. Henderson, record C–785.

B. From Sierra de Zapata, Catamarca Province, Argentina. Hand-picked dark-brown material. Analysis by E. P. Henderson, record C–949.

	A	B		A	B
SiO_2	1.16	0.28	Na_2O	0.96	0.27
MnO	37.27	34.84	K_2O	.36	.33
FeO	15.74	23.54	As_2O_5, V_2O_5, Al_2O_3	None	
Fe_2O_3	5.55		Li_2O, Zn, SO_3	None	
P_2O_5	31.27	31.50			
H_2O	1.24	1.58		102.44	102.23
F	7.10	6.41	Less O for F and Cl	3.02	2.69
Cl	.19	Trace			
CaO	1.60	3.48		99.42	99.54
MgO	Trace	Trace			

VARISCITE

From Lucin, Utah. Analysis by W. T. Schaller, record D–362. Originally described as lucinite in Bull. 610, 1916. Metavariscite is a dimorphic form of variscite. A, As analyzed; B, with quartz deducted.

	A	B		A	B
Al_2O_3	25.82	34.97	SiO_2	26.29	
P_2O_5	31.56	42.75			
H_2O	16.80	22.75		100.47	100.47

VANADATES

FERNANDINITE

Collected at Minasragra, Peru, by D. F. Hewett. Analysis with description by W. T. Schaller in Washington Acad. Sci. Jour., vol. 5, p. 7, 1915. Record 2948.

Insoluble in acid	12.18	MgO	0.06
V_2O_4	10.18	K_2O	.52
V_2O_5	55.42	H_2O	15.81
MoO_3	1.38		
Fe_2O_3	.79		99.69
CaO	3.35		

HEWETTITE

From Minasragra, Peru. Collected by D. F. Hewett. Analysis by W. T. Schaller, record C–315.

V_2O_4	0.43	MoO_3	0.99
V_2O_5	71.20		
CaO	7.15		100.81
H_2O	21.04		

MELANOVANADITE

From Minasragra, Peru. Collected by D. F. Hewett. Analyses by W. T. Schaller, record C–315.

A. Melanovanadite.
B. Alteration product, largely $V_2O_5.2H_2O$.
C. Matrix of alteration product.

	A	B	C		A	B	C
V_2O_4	34.1	7.8	13 34	MoO_3			1.58
V_2O_5	40.7	73.5	12.13	Insoluble	1.3	1.7	54.69
CaO	11.4	3.3	2.35				
H_2O-	8.9	9.0	9.71		103.4	103.3	93.80
H_2O+	7.0	8.0					

MOTTRAMITE

From Higgins mine, Bisbee, Ariz. Described as psittacinite by Taber and Schaller in Am. Mineralogist, vol. 15, pp. 575–579, 1930. Analysis by W. T. Schaller, record C–1075.

CuO	19.10	Manganese oxide	3.06
ZnO	None	Ignition loss	4.79
PbO	[1] 50.13		
V_2O_5	21.11		98.19

[1] Probably low

PASCOITE

From Crescent no. 3 claim, Crescent Creek, Henry Mountains, Utah. Analysis by W. T. Schaller, record 2945.

A. As analyzed.
B. Soluble portion.
C. Reduced, gypsum rejected.

	A	B	C		A	B	C
Soluble in H_2O	9.35			V_2O_5		37.1	65.3
Insoluble	90.60			H_2O			23.1
CaO		17.7	11.6				
SO_3		13.7			99.95	68.5	100.0

RAUVITE

From Temple Mountain, Emery County, Utah. Collected by F. L. Hess and described in Bull. 750, pp. 68–70, 1935. Analyses by W. T. Schaller, record C–314–a. A, as received; B, with impurities deducted.

	A	B		A	B		A	B
UO_3	20.82	27.92	As_2O_3	Trace		MgO	0.12	
V_2O_4	2.05	2.75	Fe_2O_3	2.39		SO_3	.13	
V_2O_5	36.33	48.70	H_2O-	7.77	10.42	Insoluble	24.06	
CaO	2.00	2.68	H_2O+	5.61	7.53			
K_2O	Trace		Se	Trace			101.28	100.00

SINCOSITE

From Sincos, Peru. Collected by W. S. Hutchinson, Boston. Analyses by W. T. Schaller, record C–317. See also Washington Acad. Sci. Jour., vol. 12, p. 195, 1922.

A. Green rectangular plates.
B. Selected crystals.
C. Nodules consisting of 45 percent sincosite, 5 percent gypsum, about 22 percent volatile hydrocarbon, 5 percent water, and 23 percent ash.

	A	B	C		A	B	C
V_2O_4	36.3	37.8	15.67	Insoluble	0.3	0.7	22.86
V_2O_5			.33	Ignition			12.86
CaO	12.1	13.3	8.81	SO_3			2.23
P_2O_5	31.7	31.1	14.72				
H_2O	19.9	17.1	14.51		100.3	100.0	100.90

UVANITE

Sample from San Rafael Swell, Utah. Described by Hess and Schaller in Washington Acad. Sci. Jour., vol. 4, p. 576, 1914. Analyses by W. T. Schaller, record 2950. A, impure; B, A reduced; C, picked material.

	A	B	C		A	B	C
Gangue	82.35		1.24	Fe_2O_3	0.18	1.02	
H_2O	4.60	26.00	18.28	MgO			0.04
V_2O_5	6.76	38.21	37.70	CaO	.22	1,25	1.73
P_2O_5	.07	.39	.06	K_2O	.10	.57	.30
As_2O_5	.02	.11	.05				
UO_3	5.74	32.45	39.60		100.04	100.00	99.00

ARSENATES

ARSENOBISMITE

An impure sample from the Mammoth mine, Tintic district, Utah, described by A. H. Means in Am. Jour. Sci., 4th ser., vol. 41, p. 125, 1916. Analysis by R. C. Wells, record 3009. After allowing for admixtures the mineral is calculated to be $2Bi_2O_3.As_2O_5.2H_2O$.

Insoluble in HCl:		Soluble in HCl—Con.		Soluble in HCl—Con.	
SO_3	16.60	Al_2O_3	0.44	P_2O_5	0.04
BaO	31.90	CuO	.12	Sb_2O_3	1.26
SiO_2	1.42	CaO	.62	PbO	1.12
Soluble in HCl:		MgO	Trace		99.14
Bi_2O_3	28.17	SO_3	.46		
As_2O_5	10.59	H_2O-	1.09		
Fe_2O_3	3.88	H_2O+	1.43		

SULPHATES

ALUNOGEN

From Pintado Canyon, N. Mex. Collected by E. S. Larsen. Analysis by George Steiger, record 3133.

Al_2O_3	16.59
SO_3	37.74
H_2O	44.64
Insoluble	.94
	99.91

ANHYDRITE

Banded material from Caesar Grandi well 1, Eddy County, N. Mex., collected by W. B. Lang. Analysis by E. T. Erickson, record D–223. The nature of the organic matter could not be definitely determined.

CaO	42.64	Carbonaceous matter	0.17
MgO	.02	Ignited insoluble in acid	.28
SO_3	51.52	R_2O_3	.03
CO_2	5.15		99.86
Organic matter soluble in chloroform	.05		

APHTHITALITE

Separated by F. C. Calkins from core, Government test 22, southeast corner sec. 26, T. 23 S., R. 30 E., Eddy County, N. Mex. Depth 1,449 feet. Analysis by J. J. Fahey, record D–109.

Insoluble in H_2O	0.06
NaCl (computed from Cl)	2.16
SO_3	46.35
K_2O	40.89
Na_2O	10.42
	99.88

ARGENTOJAROSITE

From Tintic Standard mine at Dividend, Utah, submitted by V. C. Heikes. Analysis by W. T. Schaller, record C–486. A, yellow-brown; B, brown.

	A	B		A	B		A	B
Ag_2O	[1] 17.96	[2] 18.00	Al_2O_3	0.47	None	Insoluble	0.29	0.29
K_2O	.51	.42	SO_3	[3] 27.75	[4] 28.15			
Na_2O	Trace	Trace	H_2O+	9.87	9.81		99.90	100.35
PbO	.79	.61	H_2O-	None	None	Density	3.64	3.66
Fe_2O_3	42.26	43.07	P_2O_5	None	None			

[1] Average of 17.94, 18.06, 17.87.
[2] Average of 18.31, 17.83, 17.86.
[3] Average of 7 determinations.
[4] Average of 5 determinations.

BARITE

A. From Castle Islands, Duncan Canal, Alaska. Analysis by W. C. Wheeler, record 2881. Zinc present but not determined.

B. Collected by Theodore Chapin at Lime Point, Prince of Wales Island, Alaska. Analysis by George Steiger, record 3082.

	A	B		A	B		A	B
SiO_2	5.05	0.42	BaO	58.60	64.94	SO_3	34.74	34.01
Fe_2O_3	.77	.12	PbO	.15	-------			
CaO	Trace	None	Ignition	-------	.19		99.68	99.84
SrO	.37	.06	MnO	Trace	-------			
MgO	Trace	.16	TiO_2	None	-------			

CELESTITE

A. Concentrate from Lead Hill mine, Saline Creek, Utah. Analysis for G. F. Loughlin by R. C. Wells, record 3095.

B. Near LaConner, Skagit County, Wash. Determinations by A. A. Chambers, record 3094.

C. Limestone partly replaced by celestite, Barstow, Calif. Analysis by R. C. Wells, record 3180. Described by Adolph Knopf in Bull. 660, pp. 260–261, 1918.

D–E. Average rock samples from locality 15 miles southwest of Aguila, Ariz., collected by B. S. Butler. Partial analysis by J. G. Fairchild, record C–1050. D, best rock; E, sample from 64 inches in five beds ranging from 7 to 20 inches in thickness in 8 feet of rock.

F. From Cady Range, near Argos, Calif., collected by B. N. Moore. Analysis by Charles Milton, record D–323.

	A	B	C	D	E	F
SiO_2	6.9	-------	-------	12.91	22.10	1.53
Al_2O_3	.6	-------	-------	None	-------	.92
Fe_2O_3	.3	-------	-------	.39	-------	.54
FeO	.3	-------	-------	-------	-------	-------
MgO	-------	-------	-------	None	-------	.11
CaO	.9	-------	39.5	.41	.29	.97
H_2O	.3	-------	-------	-------	-------	.56
TiO_2	1.0	-------	-------	-------	-------	-------
CO_2	1.9	-------	-------	.57	-------	.30
SO_3	34.8	42.23	-------	36.70	-------	41.08
MnO	Trace	-------	-------	-------	-------	Trace
BaO	None	-------	-------	None	.33	1.07
SrO	45.8	54.80	12.9	48.10	41.26	52.35
PbO	6.6	-------	-------	-------	-------	-------
	99.4	97.03	-------	99.08	-------	99.43

GYPSUM

A. From 60-foot bed near top of Minnelusa sandstone, Sundance Canyon near Rocky Ford, Wyo., collected by W. W. Rubey. Analysis by J. G. Fairchild, record C–941.

B–C. Two samples from Fish Creek Mountains, Imperial County, Calif., submitted by General Land Office. Analyses by J. G. Fairchild, record C–183. B, NE¼SW¼NW¼ sec. 29, T. 13 S., R. 9 E., San Bernardino meridian; C, SW¼NE¼SE¼ sec. 19, T. 13 S., R. 9 E. San Bernardino meridian.

D–G. Four samples from Big Horn Basin, Wyo. Analyses by W. C. Wheeler, record 3062.

H–I. Two samples from Panasoffkee, Fla., collected by R. W. Stone, described in Mineral Resources for 1918, pt. 2, pp. 293–296, 1921. Analyses by Chase Palmer, record C–139. H, Bear Island, 6 inches below surface; I, Soapstone Island, 2 feet below surface.

J. From Muddy Creek, Nev., collected by W. W. Rubey. Analysis by Charles Milton, record D–320.

K. From east slope of Big Horn Mountains, Wyo., T. 47 N., R. 83 W., collected by D. D. Condit. Analysis by A. A. Chambers, record 3088.

	A	B	C	D	E	F	G	H	I	J	K
Insoluble	0.24									0.2	
SiO_2				0.01	0.05	0.06	0.25	0.55	0.26		0.07
Al_2O_3		0.18	None	.17	.03	.05	.01	.52	.32	Trace	.11
Fe_2O_3	Trace										
MgO	.41	.27	0.12	.98	.44	.42	None				
CaO	32.72	32.54	32.48	33.74	32.92	32.72	34.20	32.39	32.30	32.8	32.81
H_2O	20.20	20.00	20.44	[1]19.50	[1]19.99	[1]20.03	[1]20.00	21.64	21.53	20.8	[1]20.40
CO_2	1.18	.67	None								
SO_3	45.33	44.35	45.42	43.92	45.74	45.18	45.50	44.10	45.00	44.9	45.42
Cl	Trace			None	None	None	None				
	100.08	98.01	98.46	98.32	99.17	98.46	99.96	99.20	99.41	98.7	98.81

[1] At 300°.

HALOTRICHITE

A. Zinciferous specimen from 900-foot level of Tintic Standard mine, Dividend, Utah. Submitted by W. T. Schaller. Analysis of a small sample by Charles Milton, record D–361.

Insoluble in HCl	3.98	MnO	None	H_2O-	26.21
Al_2O_3	10.61	CaO	0.34	H_2O+	15.16
Fe_2O_3	.43	MgO	Trace		99.24
FeO	6.67	PbO	.74		
ZnO	1.65	SO_3	33.45		

B. From Tonopah district, Nev., collected by T. B. Nolan. Analysis by Charles Milton, record D–150.

Fe_2O_3	13.84	BaO(?)	0.84	Ash	0.20
Al_2O_3	3.08	MgO	.18		98.61
FeO	.32	SO_3	39.40		
ZnO	1.50	H_2O-	13.23		
MnO	7.00	H_2O+	19.02		

JAROSITE

A. Impure material collected by Adolph Knopf from Arabia district, Nev. Analysis by J. G. Fairchild, record C–435.

B. From Lion Hill, Chloride Point mine, Stockton quadrangle, Utah, collected by James Gilluly. Analysis by E. P. Henderson, record C–1058.

C. Artificial crystals made and analyzed by J. G. Fairchild, record D–205. Described in Am. Mineralogist, vol. 18, p. 544, 1933, with other jarosites.

	A	B	C		A	B	C
SiO_2	1.7	1.43		SO_3	20.9	33.15	32.1
Al_2O_3		4.01		P_2O_5	None		
Fe_2O_3	60.9	40.22	48.1		99.3	100.12	100.0
Na_2O		.90					
K_2O	6.0	9.16	9.5				
H_2O-	.2	11.25	10.3				
H_2O+	9.7						

KORNELITE

From Tintic Standard mine, Dividend, Utah. Analysis by W. T. Schaller, record C–487.

Fe_2O_3	29.23
SO_3	43.15
H_2O	25.96
Insoluble	.86
Soluble residue	.62
	99.82

LANGBEINITE

From McNutt well 1, sec. 4, T. 21 S., R. 30 E., Eddy County, N. Mex., depth 1,430 feet. Analysis by J. J. Fahey, record C–1032.

K_2O	22.37	Loss on heating	0.25
Na_2O	.48	Insoluble in H_2O:	
MgO	19.15	Fe_2O_3	.02
SO_3	57.44	Other insoluble matter	.03
Cl	None		99.74
CaO	None		

LEONITE

From Joe W. Mitchell core, 1,368 feet 1 inch to 1,368 feet 3 inches, sec. 33, T. 20 S., R. 31 E., Eddy County, N. Mex. Analysis of impure material by E. P. Henderson, record C–1041. A, Material as analyzed; B, analysis recalculated after deducting 25.3 percent of kainite.

	A	B		A	B
K	3.97	------	H_2O	19.18	18.59
K_2O	18.95	25.74	Cl	3.61	------
MgO	12.42	11.31		99.74	100.00
SO_3	40.80	44.36			

MELANTERITE

Copper-bearing melanterite from Rico district, Colo., collected by E. B. Eckel and described in Am. Mineralogist, vol. 18, p 449, 1933. Analysis of wet material by R. C. Wells, record D–146. The analysis calculates roughly to $2[FeSO_4.7H_2O].(Cu,Zn)SO_4.7H_2O$.

$FeSO_4.7H_2O$	67.1
$CuSO_4.7H_2O$	24.9
$ZnSO_4.7H_2O$	4.2
Mg	None
Excess H_2O (by difference)	3.8
	100.00

MINASRAGRITE

From Minasragra, Peru. Collected by D. F. Hewett. Analysis by W. T. Schaller, record 2947, with preliminary description in Washington Acad. Sci. Jour., vol. 7, p. 501, 1917. A, as analyzed; B, minus impurities.

	A	B		A	B
V_2O_4	5.29	24.64	Insoluble in H_2O	66.16	------
FeO	.97	------	H_2O (by difference)	14.28	42.19
NiO	1.92	------		100.00	100.00
CaO	.46	------			
SO_3	10.92	33.17			

MIRABILITE

Analyses by R. C. Wells, record C–912 and C–666.

A. From Lake 32, east of Soap Lake, east of Malott, Wash.

B. From lake south of Cody, Wyo., S½NE¼ sec. 14, T. 52 N., R. 102 W. Partly dried Glauber's salt.

	A	B		A	B
Insoluble	0.08	0.3	Fe, Ca, B	None	
H_2O	50.90	49.5	Na_2SO_4	48.28	50.2
$NaHCO_3$	.33		Fe, Ca, Mg, Cl, CO_3		None
NaCl	.23			100.00	100.0
$MgSO_4$	.18				

PLUMBOJAROSITE

Two samples collected from Yellow Pine district, Nev., by Adolph Knopf. Described in Bulletin 620, pages 7–8, 11, 1916.

A. Analysis by R. C. Wells, record 3001, corrected in 1922. Specific gravity 3.458.

B. A bismuth-bearing variety. Analysis by R. C. Wells, record 2985.

	A	B		A	B		A	B
SiO_2	1.14	6.90	H_2O+	10.77	8.55	As_2O_5		0.09
Al_2O_3	.80	.14	TiO_2		.37	Au		.79
Fe_2O_3	38.90	32.24	CO_2		.43	PPd		.22
MgO	.49	.14	P_2O_5	2.53	Trace	Pt		.05
CaO	.45	.06	SO_3	24.60	24.08	Ag		Trace
Na_2O	.76	.52	PbO	18.44	16.75		99.92	99.88
K_2O	.10	.22	CuO		1.97			
H_2O-	.94	.02	Bi_2O_3		6.34			

POLYHALITE

A. From Bryant well of States Oil Corporation, 9 miles south of Midland, Tex., depth 2,305–2,425 feet, collected by D. D. Christner. Partial analysis by R. K. Bailey, record C–243.

B, C. From McDowell well, Glasscock County, Tex., depth 1,000–1,400 feet. B, Brick red; C, salmon-colored. Collected by R. S. Sternbergh.

D. From Stassfurt, Germany. Analyses B–D by George Steiger, record 3287.

E. From Government test 17, depth 2,611 feet 6 inches, sec. 28, T. 20 S., R. 33 E., Lea County, N. Mex., submitted by W. B. Lang. Analysis by L. T. Richardson, record D–23.

	A	B	C	D	E
Insoluble	0.22	0.27	0.39	0.47	0.40
R_2O_3	.35				
MgO	7.05	6.48	6.16	6.52	6.97
CaO	18.14	18.75	18.54	18.42	18.66
Na_2O	2.06	None	.20	.09	
K_2O	15.63	15.66	15.37	15.36	15.66
H_2O	.35	6.07	6.50	6.43	6.39
SO_3		52.40	52.60	52.68	51.83
Cl		None	None	.69	.11
		99.63	99.76	100.66	100.02

SALINE CRUST

From a soda lake in sec. 14, T. 52 N., R. 102 W. sixth principal meridian, Wyoming, collected by J. D. Northrop. Analysis by J. G. Fairchild, record C–619. A, Analysis; B, hypothetical combinations.

A		B	
Cl	1.02	NaCl	1.68
SO_4	55.56	$CaSO_4$	9.81
Ca	2.89	$MgSO_4$	11.23
Mg	2.25	Na_2SO_4	58.66
Na	19.66	K_2SO_4	Trace
K	Trace	H_2O	10.93
Loss on ignition	10.93	Insoluble	8.01
Insoluble	8.01		100.32
	100.32		

SULPHOHALITE

From Searles Lake, Calif., described in Am. Jour. Sci., 4th ser., vol. 38, p. 273, 1914; see also idem, vol. 49, p. 76, 1920. Analysis by W. B. Hicks, record 2903.

SO_3	42.00
Na_2O	32.50
Na	11.35
Cl	9.19
F (by difference)	4.96
	100.00

SZOMOLNOKITE

From Tintic Standard mine, Dividend, Utah. Analysis by W. T. Schaller, record C–938.

FeO	38.94	SO_3	45.77	Fe_2O_3	0.59
ZnO	1.18	P_2O_5	.27	Insoluble	2.66
CuO	.20	H_2O-	None		100.15
PbO	.09	H_2O+	10.45		
(Mn, Mg)O	None				

THENARDITE

A. Collected by D. G. Thompson near Buckhorn Springs, 6 miles south of Muroc, Kern County, Calif. Analysis by R. C. Wells, record C–266.

B. From alkali lake in secs. 22, 23, and 26, T. 25 N., R. 89 W., Carbon County, Wyo., submitted by H. I. Smith. Analysis by R. C. Wells, record D–9.

C. Composite sample submitted by Irvin Lavine from dry lake deposits of Divide County, N. Dak. Described in Am. Inst. Min. Met. Eng. Contr. 97, 1936. Analysis by R. C. Wells, record D–397.

	A	B	C		A	B	C
Insoluble	0.2	11.06	5.8	Na_2CO_3	1.5	None	-------
$CaSO_4$	-------	-------	1.2	H_2O	.3	0.49	3.7
$MgSO_4$	-------	-------	1.6	Na_2SO_4	96.9	88.45	87.0
K_2SO_4	.3	-------	-------		100.0	100.00	100.2
NaCl	.2	Trace	.9				
$NaHCO_3$	.6	None	-------				

MOLYBDATES, TUNGSTATES, AND URANATES

CUPROTUNGSTITE

From Cave Creek, Ariz. Analysis by W. T. Schaller, record 2929. See Am. Mineralogist, vol. 17, p. 234, 1932.

	Hard, compact material		Soft material			Hard, compact material		Soft material	
Reagent	HCl	HNO_3	HCl	HNO_3	CaO	.88	1.08	1.72	1.74
Unattacked	71.75	71.84	33.14	34.08	MgO	.20	.12	.19	.34
H_2O (ignition)	4.35	4.32	6.43	6.46	Fe_2O_3	.61	.68	1.52	1.03
WO_3	13.10	13.24	35.47	35.26		98.74	98.97	98.36	98.17
CuO	7.85	7.69	19.89	19.26					

GUMMITE

Small segregations resembling clarkeite or gummite, in serpentine, north of Easton, Pa., collected by R. C. Wells and C. S. Ross. Analyses by J. G. Fairchild, record D–145–a, made on 0.52 gram concentrated from about 15 pounds of rock. Age (calculated), 590 million years.

U_3O_8	42.70=36.21 U
ThO_2	25.06=22.03 Th
CeO_2, etc	5.10
PbO	3.86= 3.58 Pb
Insoluble	5.90

PITCHBLENDE

From Lusk, Wyo. Rather impure. Metallic copper mentioned as seemingly present. Occurrence described by Larsen, Hess, and Schaller, Am. Mineralogist, vol. 11, pp. 155–164, 1926. Analysis by W. T. Schaller, record C–495–a. Determination of lead made on a ½-gram sample and probably not very accurate.

Quartz, insoluble HCl	18.02	CaO	8.91	CO_2	5.42
Cu, insoluble HCl	2.69	BaO	.15	H_2O-	2.72
S, insoluble HCl	.71	MgO	.46	H_2O+	5.54
SiO_2, soluble	7.64	Fe_2O_3 (total iron)	.63	Zn, As	Trace
UO_2	18.64	Al_2O_3	2.87	SO_3, rare earths, V	None
UO_3	17.06	K_2O	.35		100.41
CuO	7.23	Na_2O	.69		
PbO	.23	P_2O_5	.45		

THORIANITE

From Sherrer quarry, north of Easton, Pa., collected by G. W. Gehman. Average of two analyses by J. G. Fairchild, record D–154. Described in Am. Jour. Sci., 5th ser., vol. 26, p. 45, 1933. Age (calculated), 790 million years.

UO_2	4.44	R_2O_3	1.57	H_2O	4.39
UO_3	33.15	CaO	.97	Insoluble	7.86
ThO_2	38.47	MgO	.53		99.39
PbO	5.21	MnO	.31		
Rare earths	2.49				

TYUYAMUNITE

From west side of Mount Hillers, Henry Mountains, Utah. Submitted by F. L. Hess and described in Bull. 750, pp. 73–78, 1925. Analysis by W. T. Schaller, record C–314–a. A, as received; B, with impurities deducted.

	A	B		A	B		A	B
UO_3	52.22	57.68	BaO	0.26	0.29	H_2O+	5.45	5.94
V_2O_5	17.62	19.46	Fe_2O_3	1.10	-------	Insoluble	8.51	-------
CaO	5.36	5.92	H_2O-	9.34	10.18		100.33	100.00
K_2O	.47	.52						

URANINITE

From Wilberforce, Cardiff Township, Ontario, Canada, submitted by A. C. Lane. Determination of lead-uranium ratio by R. C. Wells, record D–1. Calculated age, 1,125 million years.

Pb	9.26
U	53.52
Th	10.37
$\frac{Pb}{U+0.38\ Th}$	.61

ZIPPEITE

A specimen from Grand Wash, 2 miles southeast of Fruita, Wayne County, Utah, collected by F. L. Hess and described in Bull. 750, pp. 70–73, 1925. Analysis by W. T. Schaller, record C–314–a. A, as received; B, with gypsum and carbonates, phosphates, and arsenates of copper and calcium deducted.

	A	B		A	B
UO_3	72.50	80.22	SO_3	11.11	10.76
CaO	.97	-------	Insoluble	1.96	-------
P_2O_5, As_2O_5	3.73	-------		100.00	100.00
H_2O	8.77	9.02			
CuO	.96	-------			

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