There is also a goodly number of the "old-time" minerals, notably a crystal of amethyst about 1½ x 5 inches from Chester Co., Pa., a reminder of the late Charles H. Pennypacker. Among the old English specimens is to be seen a group of reddish-purple fluorite cubes of remarkable clearness, from Derbyshire.

Mr. Carpenter's interest in local minerals is indicated by a good representation of excellent specimens found in this state, among which I would mention: a splendid example of the Bristol amethyst; amethyst crystals from Cumberland; fine transparent smoky quartz crystals, up to 1 x 2½ inches in size, from Graniteville; a remarkable polished section of agate, or, as it might more properly be termed, jasper-agate, about 8 inches across, mostly brownish red, banded and mottled with yellow and gray, unlike the dull gray of the usual Rhode Island agates, from Diamond Hill, Cumberland; attractive chalcopyrite with crystallized quartz, from Cumberland Hill; hornblende in a light-colored matrix from Pawtucket; cyanite from Woonsocket; and pyrite nodules and crystallized groups from Block Island.

GEL MINERALS (COLLOID MINERALS)

CYRIL W. GREENLAND

Cornell University

(Continued from page 124)

F. Cornu[11] proposed a very interesting theory to explain at least some of the gel minerals. He took, for example, aluminium hydroxide and passed into it dilute phosphoric acid. The resulting mass was a jelly consisting of aluminium hydroxide and adsorbed phosphoric acid. From a consideration of this reaction he proposed that, by a succession of adsorptions, various gel minerals may be produced in nature. These he designated as primary, secondary, tertiary and quaternary gel minerals. A series of this kind he believed to be represented in nature by:

1. $2Fe_2O_3+3H_2O$ (stilpnosiderite).
2. $2Fe_2O_3+P_2O_5+Aq.$ (delvauxite).
3. $2Fe_2O_3+P_2O_5+2SO_3+Aq.$ (diadochite).

[11] *Z. Chem. Ind. Kolloide*, **4**, 89, 1909.

Further studies may prove that other gel minerals belong to series such as this.

According to F. Cornu[12] the following groups of gel minerals occur in nature:

I. HYDROXIDE GROUP.

(*a*) Bauxite, ($Al_2O_3.nH_2O$). (*b*) Stilpnosiderite ($2Fe_2O_3.3H_2O$). (*c*) Opal and its varieties ($SiO_2.nH_2O$). (*d*) Psilomelanite ($xMnO_2+yMnO+z(BaO,K_2O,Li_2O)$). (*e*) Ilsemannite ($Mo_3O_8+nH_2O$), the only reversible hydrosol in nature [an apparent misinterpretation of this mineral, as pointed out in the first instalment of this article].

II. CARBONATE GROUP.

(*a*) Hydrozincite—hydrated zinc carbonate. (*b*) Baudisserite—magnesium carbonate (doubtful).

III. SULFATE GROUP.

(*a*) Glockerite—hydrated iron sulfate. (*b*) Vitriol-ochers—which consist mostly of glockerite. (*c*) Pissophanite—like glockerite but containing in addition aluminium.

IV. URANATE GROUP.

Gummite—an alteration product of uraninite (gel nature not certain).

V. HYDRATED PHOSPHATE GROUP.

(*a*) Delvauxite—hydrated iron phosphate. (*b*) Diadochite—similar in composition to delvauxite but in addition contains SO_3. (*c*) Variscite—from Leoben (described by Helmhacker). (*d*) Evansite—($3Al_2O_3.P_2O_5.18H_2O$). (*e*) Fischerite from Roman Gladna [in part]. (*f*) Plumbogummite—a phosphate of aluminium and lead of doubtful gel nature.

VI. HYDRATED ARSENATE GROUP.

(*a*) Pitticite—a hydrated arsenate and sulfate of iron found as an alteraation product of arsenopyrite. (*b*) Ganomatite—an alteration product of smaltite. (*c*) Lavendulite—a cobalt and nickel-containing copper arsenate.

VII. HYDRATED ANTIMONATE GROUP.

(*a*) Bleinierite—a hydrated antimonate of lead. Occurs as an alteration product of jamesonite and bournonite. (*b*) Thrombolite—a hydrated antimonate of copper. Occurs as an alteration product of tetrahedrite. (*c*) Antimony ochers in part.

VIII. HYDRATED SILICATE GROUP.

1. CHRYSOCOLLA GROUP.

(*a*) Chrysocolla,—$CuSiO_3.2Aq$. (Chrysocolla occurs with varying composition and different varieties containing such impurities as silica, iron and copper oxides.) (*b*) Pilarite. (*c*) Asperolite.

2. DEWEYLITE GROUP.

(*a*) Deweylite—a hydrated magnesium silicate. (*b*) Cerolite—an aluminium-containing deweylite. (*c*) Saponite and related hydrated silicates of aluminium and magnesium. (*d*) Webskyite—an iron-containing silicate of magnesium. (*e*) Chloropheite and nigrescite—hydrated iron-magnesium silicates. (*f*) Genthite. (*g*) Garnierite.

[12] *Ibid.*, pp. 15–18.

3. Plombierite group.
   Plombierite—$CaSiO_3 + nH_2O$—a product of hot springs.
4. Aluminium silicate group.
   (a) Allophanite group—$Al_2SiO_5.nH_2O$.
   Allophanite, scarborite, kieseraluminite, collyrite, carolathine, allophanite containing copper and zinc, plumballophanite, samoite.
   (b) Halloysite group—$Al_2O_3.2SiO_2.2H_2O$.
   Halloysite, indianite, lenzinite, glagerite.
   (c) Montmorillonite group—$H_2Al_2Si_4O_{12} + nAq$.
   Montmorillonite, razumovskite, steargillite, confolensite, cimolite, severite, anauxite, erinite, hunterite.
5. Hydrated metal silicate group.
   Bergseife, bole, teratolite, iron-aluminium silicates; hisingerite, graminite, pinguite, iron silicates, containing an abundance of water.

IX. Organic gels.
Dopplerite, regarded as a calcium salt of humus acid.

In the same article Cornu proposed that when describing the gels of the mineral kingdom one should attempt to give their analogous crystal form. As an example, he presented the following table:

TABLE 2

Formula	*Crystal form*	*Gel form*
$Al_2O_3.nH_2O$	Hydrargillite	Bauxite
$Al_2O_3.H_2O$	Diaspore	Sporogelite
$Fe_2O_3.H_2O$	Goethite	Stilpnosiderite
$2Fe_2O_3.3H_2O$	Limonite	"
$SiO_2.nAq$	Chalcedony ? (containing very little water).	Opal
$MnO_2.nH_2O$	Pyrolusite	Psilomelanite
$2Fe_2O_3.P_2O_5.3H_2O$	Kraurite	Delvauxite
$AlPO_4.2H_2O$	Variscite	Gelvariscite
$2Al_2O_3.P_2O_5.8H_2O$	Fischerite	Gelfischerite
	Diadochite	Geldiadochite
$CuSiO_3.H_2O$	Dioptase	Chrysocolla
$H_4(Mg,Fe)_3Si_2O_9$	Serpentine	Webskyite
$CaSiO_3$	Wollastonite	Plombierite
$H_4Al_2Si_2O_9$	Kaolinite	Kaolin (clay)
$Al_2Si_4O_{11}.H_2O$	Pyrophyllite	Gelpyrophyllite
$H_4Fe_2Si_2O_9$	Nontronite	Unghwarite

Since the property of adsorption is so characteristic of gels in general, many attempts have been made, by means of dyestuffs, to obtain a method for the rapid recognition of gel minerals. E. Dittler[13] has published the results of the effect of certain dyestuffs on mineral powders, the great majority of which are gel minerals (Table 3).

[13] *Z. Chem. Ind. Kolloide,* 5, 93–100, 1909.

TABLE 3

HYDROXIDE GROUP

Mineral, locality	*Composition, reaction*	1 *Methyl orange*	2 *Fuchsin-B*	3 *Acid violet*	4 *Methyl-ene-blue +fuch-sin-S*	5 *Methyl-green+ rhoda-mine*
Limonite, Salzburg	$2Fe_2O_3.3H_2O$. Acid	Colorless	Very dark	Faint	Methyl-ene blue	Methyl-green
Umber	(Limonite with clay and man-ganese ox-ide.) Acid	Yellow	"	"	"	"
Xantho-siderite	$Fe_2O(OH)_4$. Acid	Colorless	Dark	"	"	"
HYDRATED PHOSPHATES, ETC.						
Torbernite (crystal-lized)	$CuO.2UO_2.$-$P_2O_5.12H_2O$. Acid	Orange	Medium dark	Faint	M. B. > F. S.	M. G. > Rhod.
Vivianite (crystal-lized)	$Fe_3P_2O_8.$-$8H_2O$. Faintly acid	Indif-ferent	Faint	"	M. B. = F. S.	M. G. = Rhod.
Pharmaco-lite (crys-tallized)	Alkaline	Yellow	Medium dark	Dark	M.B. = F. S.	M. G. = Rhod.
Pyromor-phite (crys-tallized). Globular aggregate	$Pb_5Cl(PO_4)_3$. Indifferent	Indif-ferent	Faint	Faint	M. B.	M. G.
Diadochite, Bohemia	Acid	Orange	Dark	"	M. B. > F. S.	M. G. > Rhod.
Erythrite, Joachimsthal	$Co_3(AsO_4)_2$. Acid	"	"	Medium dark	M. B.	M. G.
Bindheimite, Cornwall, England	—	Colorless	Medium dark	Faint	M. B. > F. S.	M. G. > Rhod.
Variscite, Vogtland	$AlPO_4.2H_2O$.	Indif-ferent	Faint	Very faint	M. B. = F. S.	—
Wapplerite (crystal-lized), Joa-chimsthal	Faintly acid	Yellow	Dark	Very dark	M. B. = F. S.	M. G. = Rhod.
Delvauxite	Acid	Colorless	Very dark	Faint	M. B.	M. G.
Pitticite, Felsobanya, Pitticite, Joachims-thal	—	Colorless	Medium dark	"	M. B. = F. S.	M. G. = Rhod.
ALUMINA-SILICIC ACID GROUP						
Dillnite, Schemnitz	Very acid	Orange	Very dark	Dark	M. B. > F. S.	M. G. > Rhod.
Myelin	Acid	Colorless	"	Faint	M. B.	M. G.

ALUMINA-SILICIC ACID GROUP

Mineral, locality	*Composition, reaction*	1 *Methyl orange*	2 *Fuchsin-B*	3 *Acid violet*	4 *Methyl-ene-blue +fuch-sin-S*	5 *Methyl-green + rhoda-mine*
Allophanite	Very acid	Orange	Very dark	Medium dark	M. B.	M. G.
Sphragidite (Lemberg)	Very acid	Colorless	"	"	M. B.	M. G.
Glagerite	Very acid	"	"	"	M. B.> F. S.	M. G.> Rhod.
Teratolite	Acid	"	"	Faint	M. B.> F. S.	M. G.> Rhod.
Orawitzite	Acid	Yellow	"	Medium dark	M. B.> F. S.	M. G.> Rhod.
Razumof-skite	Very acid	Colorless	Dark	Faint	M. B.	M. G.
Chromocher, Halle	—	"	"	Medium dark	M. B.	M. G.
Schrotterite	Weakly acid	Yellow	Medium dark	"	M. B.= F. S.	M. G.= Rhod.
Chloropal	Very acid	"	Very dark	"	M. B.> F. S.	—

TALC GROUP

Mineral, locality	*Composition, reaction*	1 *Methyl orange*	2 *Fuchsin-B*	3 *Acid violet*	4 *Methyl-ene-blue +fuch-sin-S*	5 *Methyl-green + rhoda-mine*
Cerolite	Very alka-line	Colorless	Dark	Dark	M. B.< F. S.	M. G.< Rhod.
Quinzite	Acid	Orange	Medium dark	Faint	M. B.> F. S.	—
Picrolite	Very alka-line	Yellow	Dark	Dark	M. B.< F. S.	M. G.< Rhod.
Pilinite	Alkaline	Orange	Medium dark	Faint	M. B.= F. S.	M. G.= Rhod.
Garnierite, New Cale-donia	Acid	Colorless	Very dark	Dark	M. B.> F. S.	—
Spadaite	Weakly alkaline	Yellow	Medium dark	"	M. B.= F. S.	—
Schweitzer-ite (light picrolite)	Alkaline	"	Very dark	"	M. B.< F. S.	—

MISCELLANEOUS

Mineral, locality	*Composition, reaction*	1 *Methyl orange*	2 *Fuchsin-B*	3 *Acid violet*	4 *Methyl-ene-blue +fuch-sin-S*	5 *Methyl-green + rhoda-mine*
Chrysocolla	Very acid	Orange	Dark	Medium dark	M. B.= F. S.	M. G.= F. S.
Gummite	(61–75% UO_3) Acid	Colorless	Very dark	Faint	M. B.	M. G.
Hydrozin-cite	Acid	Indif-ferent	"	Very dark	M. B.> F. S.	—
"Erbsen-stein"	$CaCO_3$. (Alkaline)	Yellow	"	".	M. B.= F. S.	M. G.= Rhod.

(*To be continued*)