The mineral corresponds, therefore, in chemical composition to $CaO.B_2O_3.2SiO_2$ or $CaB_2Si_2O_8$. It agrees closely in composition with the mineral from the type locality, Danbury, Connecticut, the analysis of which is given for comparison. The loss on ignition in the two analyses probably represents hygroscopic water.

The same material used by the writer for analysis was examined optically. It shows a very low birefringence, is optically negative and has a large optic axial angle, nearly 90 degrees. The minimum and maximum refractive indices were determined by immersion methods, using monochromatic light, as follows: $\alpha_{Na} = 1.630 \pm .001$; $\gamma_{Na} = 1.636 \pm .001$.

On account of the low birefringence of the mineral the value for the beta index was not determined, but since 2V is close to 90 degrees, this value can be assumed to be approximately intermediate between the values for alpha and gamma.

E. S. Larsen[4] gives the values of the indices of refraction of the mineral danburite as follows: Alpha = 1.632; Beta = 1.634; Gamma = 1.636.

The specific gravity of the mineral from La Sirena was determined as 2.93. The values quoted in Dana's System of Mineralogy vary between 2.97 and 3.02.

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[4] Larsen, E. S. The Microscopic Determination of the Non-opaque Minerals: *U. S. Geol. Survey, Bull.* **679**, (1922).

THE CRYSTULE; A UNIT MEASURE OF MATTER

Charles Keyes, *Des Moines, Iowa*

Amidst a wealth of stimulating discussion on the different phases of matter which held the rapt attention of the large majority of the members at the recent Toronto Meeting of the British Association for the Advancement of Science, the outstanding prospect was the unit mass and its relationships to the world about it.

It made little difference in what branch of science it happened to be, the fundamental unit of make-up was the prime consideration, whether in description, in discussion or in speculation. Of all the departments of knowledge in which there were read papers aplenty, and over which there was invariably warm controversy, physics, chemistry, biology, astronomy, geology, mineralogy, the last mentioned science alone stood unabashed for want of a crisp, self-defined title for its unit characteristic. This was all the more surprising because of the fact that the idea of a crystal unit consituted the basic concept of the new chemistry, the chemistry of the solid, in strong contradistinction to the chemistry of the liquid, of the last century. This is the chemistry of the geologist, the mineralogist, and the crystallographer.

When science first begins to take on modern aspect its philosophic setting is strictly anthropocentric in character. Earth, our planet, is the central unit of all. Presently, this circumscribed outlook begins to grow in one direction, outwards, giving other basic units of measurement for the phenomena about us, the larger ones for stellar or solar systems and for the universe. In opposite direction, inward, there arises the concept of mass, or mineral, or rock, and beyond the powers of ordinary vision, the molecule, the atom and, finally, the electron. With the growing importance of crystallographic mineralogy, with the optical expression of internal structure, comes the realization that the molecule of our liquid chemistry is not the crystal unit of our solid chemistry.

For this clumsy term, crystal-unit, or unit-cell, or some polyglot phrase, may be substituted some such simple and expressive word as crystallule, or *crystule*, a little piece of ice, which, as the molecule is the smallest portion of a liquid or gas which has all the properties of the whole, is the simplest form of a solid which possesses all the properties of the crystal substance.

The crystule of quartz for instance, we now know, consists not of what the chemist tells us, of a simple molecule of silicon dioxide, but of three such molecules linked together in peculiar fashion. No single molecule of silicon dioxide can possibly be quartz; neither can either of the separate atoms of silicon or of oxygen be quartz. To the application of the X-ray to crystal analysis is due mainly our most recent unprecedented advancement in crystallography and the understanding of the chemistry of the solid; and it is the particular function of this line of inquiry to point out the basic arrangement of the atom and the molecules in the crystule, and to explain the properties of minerals on the basis of such a plan.

So long ago as 1872, in a paper read at the Dubuque Meeting of the American Association for the Advancement of Science, Dr. Gustav. Hinrichs, from purely mathematical calculations, pointed out the fundamental dynamic differences in the make-up of the three states of matter. Because a half century ahead of his times his long forgotten communication to American scientists was little regarded by the men to whom it was presented; but it appears to have really anticipated by a full generation much that we are now hailing with so much delight in the field of crystallography and in the domains of the new solid chemistry.

But be that as it may, crystallographers have a broad and novel field of endeavor before them in the development of crystal tectonics, and in the adjustment of all the long puzzling peculiarities and properties of minerals to the new style of crystal architecture. In the term crystule may be found the basic concept of the new prospect.

PROCEEDINGS OF SOCIETIES

PHILADELPHIA MINERALOGICAL SOCIETY

Academy of Natural Sciences, October 9, 1924

A stated meeting of the Philadelphia Mineralogical Society was held on the above date with the president, Mr. Vaux, in the chair. Twenty-seven members, and eleven visitors were present.

The name of Mr. Albert Hallowell was proposed for active membership. The following officers were elected for 1924-1925: President: Mr. George Vaux, Jr.; Vice-president: Mr. Harry W. Trudell; Treasurer: Mr. Henry Millson; Secretary: Dr. Horace Blank.

Mr. Harold W. Arndt addressed the society on *A Ten-Day Trip to New England Localities.* Mrs. Arndt visited a number of New England localities in company with Mr. R. M. Lane of Great Barrington, Mass. The principal finds exhibited were from Canaan, Mass., tremolite in grayish crystals and white radiating masses in limestone; Lee, Mass., tremolite; Branchville, Conn., spodumene, beryl, and ilmenite; Chester, Mass., emery, diaspore, margarite, tourmaline and corundophilite; Stockbridge, Mass., calcite; Blanford, Mass., beryl; Richmond, Mass., goethite and gibbsite; Litchfield, Mass., cyanite; Granby, Mass., quartz crystals; Great Barrington, Mass., tourmaline; Roxbury, Mass., garnet.

Mr. Biernbaum described an excursion to the Ecton and Perkiomen mines on September 28th, accompanied by Messrs. Wills, Trudell, and Gordon. Calamine, aurichalcite, linarite, pyromorphite, chlorite, and dioptase? (very minute emerald-green rhombohedra) were found. Mr. Hoadley exhibited oligoclase from New York City and apatite from Anthony's Nose, N. Y. Mr. Benge reported on a trip to the Wheatley mines with Mr. Thatcher, where cerussite was found.

Mr. Vaux exhibited a number of striking specimens of apophyllite, natrolite, and calcite from the French Creek mines. The apophyllite was practically a solid mass with one surface covered with large crystals, measuring 28×30 cm. The natrolite occurred as snow white, compact radiations, 8 cm. in diameter, associated with small calcite crystals, forming a vein in crystalline limestone (hanging wall of the orebody). The calcite specimens exhibited resembled natrolite, consisting of white