sible chance in a section that no crystals should be intersected in a plane possessing the approximate maximum angle between the traces of the twinning plane and elasticity plane, and there is also a possibility that one might examine many sections with approximately equal angles of extinction to the right and the left of the twinning plane, as the method requires, without meeting such as possess an angle characteristic of the species, even were such present; hence the correct determination of the species by this method must remain to a certain degree a matter of chance. But when the feldspathic element is complex, a determination based upon this method would lead one to determine the whole of the feldspar as belonging to the species with the maximum angle of extinction. This method has been applied to a very considerable extent, but the considerations here advanced show that the method, although entirely correct in principle, and certainly of some value in lithological research, is not adapted to the final determination of the exact nature of the feldspathic constituent, and is likely to lead to erroneous conclusions.

All are familiar with the grand diversity of the secondary products that occur in these rocks, and which have enriched the mineral cabinets of the whole world. The contact, modifications, and structural features are none the less interesting; but it is not the intention to consider these questions here. It will be well to record the observation that they are sometimes so modified by quick cooling upon the exterior walls of the dikes in contact with the sandstones that they become cryptocrystalline, and contain long acicular feldspar crystals in a glassy ground mass, and in other microstructures resemble augite andesites. The occurrence of glass has not been heretofore noticed in these rocks. Excepting such local modifications the rocks are always like the ordinary old diabases, and even in microscopic features monotonously alike wherever fresh stones occur.

These rocks so characteristic of our Triassic are additionally interesting on account of the comparative absence of eruptive material intruded in the similar Triassic sandstones of Europe.

NATIONAL MUSEUM, *Washington, D. C., April* 5, 1881.

ON THE DETERMINATION OF FELDSPAR IN THIN SECTIONS OF ROCKS.

By GEORGE W. HAWES, Ph. D.

In my recent article upon the composition of the diabases * which intersect the Mesozoic red sandstones upon the Atlantic border, I suggested that the complexity of the feldspathic element in basic rocks is probably much greater than is commonly supposed, and that this complexity is liable to cause a serious error if the method of determination

* This volume, page 129.

by means of the measurement of the maximum angle between the twinning plane and the elasticity planes in thin sections cut in the zone with its axis perpendicular to the twinning is followed.

I wish also by means of an analysis to draw attention to the circumstance, that the absence of a twinning plane parallel to the brachypinacoid is by no means rare, and this is a circumstance bearing upon the same point and demanding recognition in lithological work.

At the St. Paul Island, Labrador, from whence the beautiful *striated* labradorite specimens are obtained, there are also found large pieces of feldspar with beautiful broad basal cleavage planes, which show no trace of striation, and basal sections of which in polarized light under the microscope show no trace of twinned structure.

A piece of this feldspar in the cabinet of Professor Brush, at New Haven, is of a bluish-gray color, its basal cleavage is much more perfect than is usually the case with labradorite, and its cleavage parallel to the clinopinacoid is very much poorer than usual. It only shows in the latter direction a conchoidal vitreous fracture, with mere traces of cleavage. Its dark color is imparted to it by a multitude of minute black needles, the larger of which are inlaid parallel to the vertical axis of the crystal. The intersection of an elasticity plane and the base is inclined 5° to the edge between the basal and brachypinacoidal cleavages, while the intersection of the plane of the optic axes and the brachypinacoid is inclined 17° to the same edge, and both inclinations are in the directions characteristic of labradorite.

An analysis of this feldspar by Mr. F. W. Taylor, of the National Museum, yielded him the following result:

SiO_2	53.56	÷	60.	.890	3.
Al_2O_3	27.78	÷	103.	.269	.93
Fe_2O_3	1.15	÷	160.	.007	
CaO	12.01	÷	56.	.214	
MgO	tr.				
K_2O	4.10	÷	62.	.066	
Na_2O	1.68	÷	94.2	.018	1.
	100.28				

SiO_2:	R_2O_3:	RO.	R_2O:	RO
3	1	1	1	2.5

The angles and analysis therefore show that this is a typical labradorite, and as it forms at the St. Paul Island a component of a coarse-grained rock, it may be considered as a type of a triclinic feldspar, which could not be determined in a thin section by means of any method based upon the existence of twinning planes.

I would also call attention to some other cases.

The diorite from Dixville Notch in the White Mountains, described on page 96 of my report on the Lithology of New Hampshire,* contains

* Geology of New Hampshire, by Prof. C. H. Hitchcock, vol. III.

large, clear, glassy crystals (microtine of Tschermak) of a feldspar simple in structure, my analysis of which proved it to be andesite. Some of the anorthosites described by Dr. T. Sterry Hunt in the Geology of Canada, 1863, were proven by his analysis to be composed of pure labradorite, and some sections of the same which he submitted to me for examination were found to be composed of a multitude of small grains, none of which were twinned. Some of the fine crystals of oligoclase from Bodenmais are simple crystals so far as the ordinary mode of twinning is concerned.

If feldspar habitually showed their cleavages in their sections? the optical method might still be followed with some certainty, but as they do not, when the grains are too small to allow cleavage fragments to be obtained for optical examination, the method followed by me* in the examination of the feldspathic constituent of the Triassic diabase is the most reliable.

In consideration both of the complexity of the feldspathic element in most rocks, and of the possibility of the simplicity of structure in triclinic feldspars, the very carefully developed methods founded upon the relation of twinning planes and elasticity planes in chance sections are liable to lead to wrong results.

NATIONAL MUSEUM, *April* 20, 1881.

ON CERTAIN CRETACEOUS FOSSILS FROM ARKANSAS AND COLORADO.

By C. A. WHITE.

In volume III of the Proceedings of the United States National Museum, pp. 157–162, five species of Cretaceous fossils (together with some Tertiary species) were described, but not then illustrated. Illustrations of those Cretaceous species are now given on the accompanying plate of this volume, together with those of two other Cretaceous forms which are for the first time described in this article.

The Arkansan species were collected by Mr. E. O. Ulrich in the vicinity of Little Rock, and by him presented to the Museum, together with a parcel of other fossils, mainly mollusca, which he found associated with them. The greater part of these Arkansan specimens are in the condition of mere casts of the interior of the shells, and therefore the determination of their specific and generic relations is not entirely satisfactory in all cases.

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*This volume, page —. The method of separating constituents of rocks by means of a heavy solution was first proposed, according to von Lasaulx, by Fleuvian de Bellevue and Cordier, at the beginning of this century. Church suggested the use of the solution of the iodide of potassium in iodide of mercury, in the Mineralogical Magazine in November, 1877.

Thoulet bettered the method and introduced improved apparatus. (Bulletin de la Soc. Minéral. de France, 1879, No. 1.) Victor Goldschmidt succeeded in increasing the special gravity of the fluid to 3.2. (Inaugural Dissertation, Stuttgart, 1880.)