sell, show that the stage is now set for important developments in our understanding of human evolution, and particularly of the mechanisms of race formation. New and powerful methods of investigation can readily be evolved through cooperation of anthropologists and population geneticists. Whether our generation will or will not see the realization of these possibilities will depend on how quickly a majority of anthropologists and geneticists perceive the opportunities that are within their grasp.

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Technical Papers

Minerals from Pumiceous Tuff in Japan

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In Japan tuffaceous rocks predominate, especially in the young Tertiary beds. These tuffaceous rocks commonly alter to clays, especially in the case of pumiceous tuff. The writer carried on detailed mineralogical studies on the alteration products, among which several clay minerals have been identified. These data may offer some contribution to the problems of crystallization of natural glass in various geological environments and also to the knowledge of the clay mineral resources in Japan.

In the study of the alteration products of the pumiceous tuff mineralogy, optical, chemical, and thermal properties, x-ray powder patterns, and, in some cases, electron micrographs were taken into account. Although the original rocks appear essentially homogeneous, several alteration products are found, including minerals of the montmorillonite and glauconite-celadonite groups, kaolin, and allophane.

Montmorillonite alteration. The minerals of the montmorillonite group comprise the main mineral component of the bentonites and acid clays in the northeastern part of Japan, where pumiceous tuff is distributed over a wide area. These clays are important as raw materials in certain nonmetallic industries. The color of the montmorillonite is commonly white or gray. The x-ray powder lines of cristobalite often mingle with those of montmorillonite. Rarely, zeolite crystals are associated with the clay. The clay from Yokote-machi, Akita Prefecture, is notable for its strong absorptive properties.

The green-colored montmorillonite has been found in two localities: one is in the clay zones surrounding one of the ore bodies of the Hanaoka Mine, Akita Prefecture, and the other is an alteration product from the inclusions in "Oya-ishi," a tuffaceous rock which is an important building stone in Japan. The green-colored clay from the Hanaoka Mine occurs in the clay zones enclosing the ore bodies. Sericite immediately surrounds the ore masses, and montmorillonite encloses the sericite. The green clay, which partly tarnishes to brown color in daylight, has been identified as montmorillonite containing about 6% ferric iron. The inclusions in "Oya-ishi" are volcanic rock fragments in the tuff. Some of them exhibit flow structure. The inclusions may turn brown, black, yellow, or white upon exposure, but unweathered specimens are normally green. The green-colored part quickly tarnishes in daylight, to gray to black (within 1 hr) and finally to brown (in a few weeks). The clay forming the inclusion swells and becomes pasty when wet. Under the microscope, the altered part of the inclusion appears as an aggregate of very fine clay flakes; the aggregate shows the vesicular texture of the pumiceous volcanic rock; the centers of some vesicules are filled by limonitic matter. Unweathered green-colored inclusions contain about 13.4% ferric iron, part of which may be limonite; but it is clearly shown from the mineralogical studies that the green mineral is a peculiar variety of montmorillonite high in iron.

Kaolin and allophane alterations. Some pumice beds alter to allophane—for example, the "Kanuma Soil," which forms the surface material in much of Tochigi Prefecture. Limonite commonly imparts a brown color to the clay, which is composed mainly of silica, alumina, and water, but the ratio of silica to alumina is not constant. Some pumiceous rocks alter to hydrated halloysite. The clay near Schichinoe-machi, Aomori Prefecture, is one example. Such clays are abundant in northeastern Japan, and they are characteristically associated with carbonaceous material. The Schichinoe clay is white and isotropic. Its mineralogical properties approximate those of hydrated halloysite, but never agree perfectly with those of typical halloysite. Unlike typical hydrated halloysite, this clay is very easily dissolved in sulfuric acid; the absorptive water content is somewhat larger than that of typical hydrated halloysite; the powder lines are extremely diffuse; the electron micrograph shows mainly irregular and round grains; the differential thermal analysis curve suggests that a small amount of montmorillonite is contained in the interstratified lattice with hydrated halloysite. Apparently the clay is composed of hydrated halloysite mixed with small amounts of allophane and montmorillonite.

Alteration to glauconite-celadonite. Some tuffaceous rocks are very bright green in color. The green tuff is mainly composed of alteration products from pumice. The mineralogical properties of the green mineral approximate those of the mineral glauconite-celadonite, but the alkali content is less; the water content is higher, and the refractive indices are lower. The mineral may be a variety of glauconite and celadonite, bearing somewhat the same relation to the latter as the hydrous micas bear to muscovite. Thus, in spite of the essential homogeneity of the original acidic volcanic rocks or pumiceous tuffs, the alteration products differ because of differences in environment that affect the alteration process. Where the rocks do not undergo leaching, montmorillonite may be produced. In this case, iron and magnesium are retained in the crystal lattice of the clay mineral; when iron is unusually abundant, the peculiar green montmorillonite may be produced. Leaching conditions, on the other hand, yield kaolin or allophane. The leached condition may be caused by surface water or the environment accompanying some coally matter. In these cases, the iron is not retained in the crystal lattice but is converted into limonite. The conditions that favor alteration to glauconite-celadonite are obscure, but it is inferred that the alteration may take place under sea water.

One point deserves special notice; that is, in spite of the acidic character of the original pumiceous rocks, an appreciable amount of iron is included in some of the alteration products. It is probable that the iron was not present in the original rock but was introduced or concentrated in the alteration process. It should also be noted that, in many cases, the alteration products do not consist of one type of clay mineral but mixtures of the several minerals. In such cases identification of the individual minerals is very difficult and can best be accomplished by differential thermal analysis. The complex mineralogical properties of Schichinoe clay offer an example and, in the experimental studies, the differential thermal analysis was very helpful.

The Effect of Magnesium Sulfate on Acid Inactivation of Renal and Intestinal Alkaline Phosphatase

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In studying the effects of various enzymatic digestions on histochemically demonstrable alkaline phosphatase, it became necessary to study independently the effect of HCl and $MgSO_4$ on alkaline phosphatase in histological sections and fresh tissue homogenates of kidney and intestine. It has been reported elsewhere (*1*) that renal phosphatase is distinctly more sensitive to inactivation by HCl than is intestinal phosphatase. The present data demonstrate that in the presence of $MgSO_4$, a well-known activator of alkaline phosphatase, the sensitivity of both renal and intestinal phosphatase to acid inactivation is increased.

Paraffin sections of mouse kidney and intestine fixed in cold acetone were prepared by the usual methods (*2*). Sites of alkaline phosphatase activity were demonstrated by the Gomori technique (*3*). In the manner previously described (*1*), sections were exposed to various concentrations of HCl with and without the addition of $M/100$ $MgSO_4$ at 37° C for ½ hr prior to staining for phosphatase. The observations recorded in Table 1 indicate that when exposed to HCl alone renal phosphatase is inactivated between pH 3.0 and 2.5, and intestinal phosphatase inactivated at about pH 2.0. When $M/100$ $MgSO_4$ is added to the HCl, the ranges over which inactivation of renal and intestinal phosphatases occurs are shifted to about pH 4 and pH 3, respectively.

TABLE 1

EFFECT OF $MgSO_4$ ON ACID INACTIVATION OF HISTOCHEMICALLY DEMONSTRABLE ALKALINE PHOSPHATASE IN MOUSE KIDNEY AND INTESTINE

Treatment	HCl only		HCl + $M/100$ $MgSO_4$	
pH	Kidney	Intestine	Kidney	Intestine
H_2O	++++	++++	++++	++++
5.0	++++	++++	++++	++++
4.5	++++	++++	+++	++++
4.0	++++	++++	++	++++
3.5	++++	++++	0	+++
3.0	++++	++++	0	+
2.5	0	+++	0	0
2.0	0	+	0	0
1.8	0	0	0	0

Figures on left indicate pH at which sections were treated with HCl or with HCl plus $MgSO_4$ at 37° C for ½ hr prior to staining for phosphatase. Amount of activity surviving treatment is recorded as the degree of blackening of the sections.

In comparable quantitative experiments fresh tissue homogenates (*4*) were treated with HCl or with HCl plus $MgSO_4$, followed by determination of residual phosphatase activity (*5*). Fig. 1 illustrates the results obtained with mouse intestine. Comparison of curves I and II shows the activating effect of $M/100$ $MgSO_4$ on alkaline phosphatase. The gradual merging of these two curves suggests that the enzyme that has survived treatment with HCl may be less subject to activation

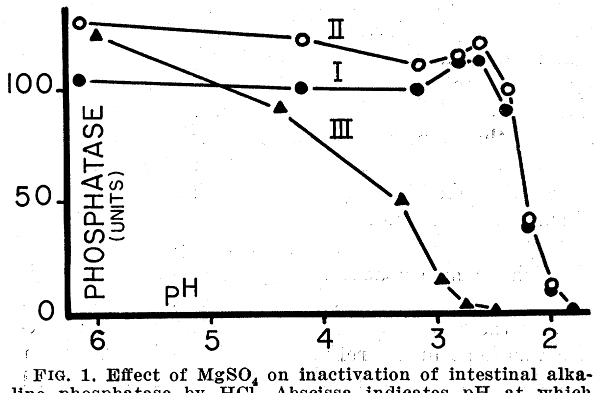

FIG. 1. Effect of $MgSO_4$ on inactivation of intestinal alkaline phosphatase by HCl. Abscissa indicates pH at which fresh tissue homogenates were treated at 37° C for ½ hr prior to phosphatase determinations. Phosphatase units are arbitrary. Curve I, homogenate treated with HCl only, no $MgSO_4$ in substrate; curve II, homogenate treated with HCl only, $M/100$ $MgSO_4$ in substrate; curve III, homogenate treated with HCl plus $M/100$ $MgSO_4$, $M/100$ $MgSO_4$ in substrate.