crystallization" in crystals of substances of polar character is not unusual and is not customarily assigned any special structural significance. In any case, the simultaneous occurrence of both hydrogen and hydroxyl ions in the lattice of a crystalline substance is simply untenable.

The question of how to represent a single molecule of a substance of this type, which would be expected to be bound more or less strongly by electrostatic forces to other polar molecules of the same or different constitution in its immediate vicinity, is difficult to answer with finality because of its doubtful real significance. But for pedagogic reasons, if for no other, depiction of the hypothetical isolated lecithin molecule as a zwitterion (I) cannot be seriously questioned as being superior to those others that have been used in the past.

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Ground Water in the Navajo Country

IN the semiarid Navajo country the ever-urgent problem is the development of adequate water supplies. The Navajo country in northeastern Arizona, northwestern New Mexico, and southeastern Utah occupies about 25,000 mi^2. This region is a high plateau that has considerable relief expressed by mountains, mesas, buttes, and deeply cut canyons. Most of the area lies between 5000 and 7000 ft above sea level.

The climate varies widely according to altitude and topography. The average yearly rainfall ranges between 6½ and 13 in. However, the yearly precipitation is as little as 1½ in. in the desert zones. The streams, which are mostly intermittent, drain radially from the central part of the area into the San Juan River on the north and into the Little Colorado River on the south. A few stretches of some streams have perennial flows sustained by snow-melt in the mountainous areas and by springs discharging from water-bearing rocks.

The occurrence of ground water in the Navajo country is directly related to the complex stratigraphic relationships of the geologic formations and their structural attitude. There are about 8000 ft of sedimentary rocks, which consist mostly of sandstone, siltstone, claystone, mudstone, and limestone. These rocks range in age from Pennsylvanian to Recent. Sandstone makes up about 30 percent of the rocks and comprises the principal aquifers in the region. The mudstone and claystone are impermeable to water and form the confining media which hydraulically separate the water-bearing formations.

There are a number of sandstone aquifers in the region from which ground water can be developed. In ascending order, these consist of the DeChelly sandstone member of the Cutler formation and the equivalent Coconino sandstone, of Permian age, the Wingate standstone and Navajo sandstone of Early Jurassic (?) age, the Entrada and Cow Springs sandstones of Late Jurassic age, the upper part of the Morrison formation of Late Jurassic age, the Dakota sandstone of Cretaceous age, the sandstones of the Mesaverde group of Late Cretaceous age, and sandstone of Tertiary age. The DeChelly and Coconino, the Navajo, and the Mesaverde yield the largest amounts of water in the Navajo country. Sandstones of the DeChelly and Coconino constitute the most widespread aquifer. However, development of gound water is feasible only in a fourth of the area of its occurrence, owing to its great depth below the surface, beyond the practical reach of wells, and to the high content of sodium chloride in the water in the deeper parts of the structural basin. The Navajo sandstone is a large wedge-shaped deposit that occurs only in the northwestern part of the region and pinches out to the southeast. This aquifer is within the practical reach of wells, and the water is of excellent quality for domestic and stock purposes. The sandstones of the Mesaverde group occur in the central and eastern parts of the region. Each of these sandstones is a separate aquifer, and in many areas they yield water of widely different quality. The best water is encountered near the recharge area, and as the water moves down dip toward the central portion of the basin it becomes highly mineralized.

In the Navajo country, the ground-water supplies are small when compared with the available supplies in such areas as southern Arizona and California. The problems of mineral contamination further reduce this usable amount to a half or a third of the amount of water available. Development of ground water for irrigation purposes is not feasible except in limited quantities for small garden plots. It seems desirable to obtain enough information to set up a "water budget" —an account of the disposition of all the rainfall—in order that information may be available on the total quantity of usable water, to serve as a basis for a stable economy for the Indian peoples in this region.

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Mesozoic Charophyta

THE Charophyta are green algae that live in quiet bodies of fresh or brackish water. They are common plants of world-wide distribution but are of little economic value and are not well known, even among botanists. Some species secrete calcite within the cells and have contributed extensively to nonmarine marl and limestone formation. On the death of the plant, the vegetative parts become broken and entangled, or the calcite disintegrates into a fine-grained mud, but the gyrogonites—the minute, sinistrally spiraled, ovoid bodies that represent the calcareous portion of the oogonia—are often preserved in abundance and are stratigraphically important fossils.

The oldest gyrogonites known are from rocks of Early Devonian age in Podolia (western Ukraine). All Devonian and Mississippian forms are composed of vertical units (*Sycidium*) or dextrally spiraled units (*Trochiliscus*). Post-Mississippian gyrogonites are sinistrally spiraled and, with the one exception of the Pennsylvanian *Paleochara,* consist of five units. By early Mesozoic time, the charophytes were apparently a well-established and standardized group and have undergone relatively little change in the Mesozoic and Cenozoic eras.

Charophyte records in the early Mesozoic are sparse and widely scattered. A few forms have been described from various Triassic and Lower and Middle Jurassic localities, but the oldest abundant gyrogonites in North America are from the Morrison formation of Late Jurassic age of the Rocky Mountain area. Gyrogonites are also common in the Lower Cretaceous rocks (Aptian) of the Gulf Coast and the Rocky Mountain area and in the Lower Cretaceous Bear River formation of southwestern Wyoming. In Europe, charophytes have been described from the Kimmeridgian of northern Germany, the Purbeck of England and Northern Europe, and the Aptian of central Hungary. Charophyta from the nonmarine Late Cretaceous are not well known, but they are again common in nonmarine rocks of the Cenozoic era.

Gyrogonites are abundant in the limestones and calcareous shales of the Salt Wash sandstone and Brushy Basin shale members of the Morrison formation in the Colorado Plateau. They are also abundant in the calcareous beds of the undifferentiated Morrison formation along the eastern flank of the Front Range in Colorado and in outcrop areas in New Mexico, Oklahoma, eastern Wyoming, South Dakota, and central Montana.

The gyrogonites from the Morrison are small, averaging about 450 μ in length, and none has been found enclosed in the utricle characteristic of the Lower Cretaceous family Clavatoraceae. Species occurring in the Brushy Basin shale member and not in the Salt Wash sandstone member are present in the northern and eastern outcrops of undifferentiated Morrison. In central Colorado, eastern Wyoming, and the Black Hills region, thin beds of limestone in the Morrison formation consist largely of broken and entangled vegetative parts of charophytes, but to date it has been impossible to associate these remains with the gyrogonites.

Most of the gyrogonites in the nonmarine Lower Cretaceous formations are enclosed in utricles. These forms belong to the Clavatoraceae and, because of their wide distribution and easily recognized characteristics, are excellent guide fossils. The genera *Clavator* and *Atopochara* attained almost world-wide distribution in Lower Cretaceous time.

The utricle-bearing gyrogonites of the Clavatoraceae are not known from the Lower Cretaceous Bear River formation, or from any formation of Late Cretaceous age. The Bear River charophytes fall readily into three specific categories, each species representing a different genus. Two species are ancient representatives of the modern genera *Tolypella* and *Chara,* and one species belongs to the extinct genus *Aclistochara.*

A monographic treatment of the Mesozoic Charophyta of North America is under preparation.

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Contamination of Photographic Emulsion Caused by Beta-Active Dust

IN the scanning of 16 cm³ of G-5 emulsion (1 by 3 in. Ilford plates, 400 μ thick, emulsion no. Z 6278) flown in July, 1952, for 8 hr at balloon altitudes, the beta-active speck reproduced in Fig. 1 has been found.

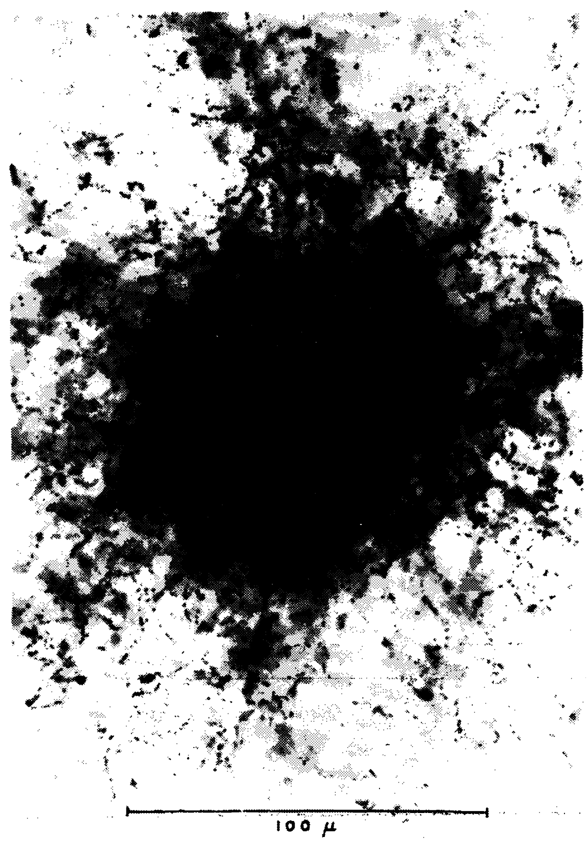

FIG. 1. Beta-active speck found in photographic emulsion.

The speck is similar to that recently described by Yagoda (*1*). The center of the speck is at 100 μ from the air surface of the developed emulsion, and at 40 μ from the glass surface. The black core has a diameter of $\sim 25\,\mu$, and the total number of beta particles emerging from it has been estimated to be around