montmorillonite(?). The montmorillonite is secondary and appears to be associated with the iron oxides.

With the possible exception of the calcite, all the major constituents are of sedimentary origin and have undergone little or no change since deposition. The kaolin was transported as kaolin and laid down in a continuous blanket over many thousand square miles. This suggests deposition in a large shallow freshwater lake, an idea supported by the nature of the flora and the presence of lignite lenses in the clay beds. The shallowness enabled streams to build natural levees and carry sand for some distance into the lake.

Such a large blanket of relatively pure kaolin must indicate a source area (to the west) that was subject to deep intensive weathering but little erosion at the close of the Paleocene epoch. This is about the time of formation of the bauxite and kaolin deposits of the Gulf Coastal Plain, and possibly also of the kaolin deposits in the Pacific coastal states. The end of the Paleocene epoch seems to have been a time of intense and rapid weathering over much of the country.

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Spirodiscus Ehrenberg Identified as *Ophiocytium* Nägeli

EHRENBERG'S work, the *Infusionsthierchen* (*1*), is an important landmark in the history of protozoology and a minor one in the history of bacteriology. In this work, Ehrenberg set up a family Vibrionia, with five genera, *Vibrio, Bacterium, Spirillum, Spirochaeta,* and *Spirodiscus.* Among these genera, the first four include most of the bacteria as known at the time. *Spirodiscus,* on the other hand, is clearly not a bacterium. It appears to have remained unidentified until the present.

A single species, *Spirodiscus fulvus,* was listed. It had been named without description in an earlier publication (*2*). In the original description (*1*) the main points were as follows:

Dreissigste Gattung: Scheibenspirale. Spirodiscus. Spirodisque.

Character: Animalia e familia Vibrioniorum, divisione spontanea imperfecta (et obliqua ?) in catenam filiformem s. cochleam rigidam disciformem accrescens. . . .

99. Spirodiscus fulvus, gelbbraune Scheibenspirale. Tafel V. Fig. xiv.

Sp. cochlea lenticulari, obsolete articulata, fulva, 100-mam lineae partem fere lata. . . .

The organism had been found at Syrjanofskoi, in the Altai Mountains, in fresh water among confervas.

Some of the points of this description, as "imperfect spontaneous division," appear to be without objective meaning. The figure to which the description refers consists of four little drawings whose appearance and size may be understood by the statement that they look like pods of bur clover, *Medicago,* and are colored with brown and green stripes. The characters to which anything identified as *Spirodiscus* must conform are these: it is a freshwater organism with cylindrical pigmented cells more or less compactly coiled and having an overall diameter of about 20 μ, that is, 1/100 of a line.

Here it is pointed out that the organism known as *Ophiocytium parvulum* (Perty) Braun conforms to the characters stated. No other organism is known to do so. It is accordingly maintained that *Spirodiscus fulvus* is *Ophiocytium parvulum.*

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Basaltic Magma at Hawaii Is Saturated in Silica

MODERN knowledge of the geology of Hawaiian volcanoes has established that most of the lava of all the separate volcanoes has been erupted in a stage of primitive shield-building activity. A small volume has been added to many of the volcanoes in a declining phase of the primitive shield-building stage, and a very small amount has been erupted at a few volcanoes in a stage of decadent activity. The petrography of the rocks of the primitive shields is monotonously similar through all exposed depths within a given volcano and among all the different volcanoes. The rock types present are picritic basalt, olivine basalt, and basalt, with olivine-hypersthene basalt important in a few volcanoes.

The differences in mineralogy of the shield-forming rocks are entirely in the amount of olivine and hypersthene present and, apparently, can have been caused by the concentration or removal of phenocrysts of olivine and hypersthene. Rocks formed in the declining phase of the shield-building activity commonly contain phenocrysts of augite and calcic plagioclase but, otherwise, are similar to those making the bulk of the shield.

A most important difference does not appear in the gross mineralogy and, commonly, is not even apparent in microscopic mineralogy. This is the fact that the abundant olivine basalt of the primitive shield is chemically a silica-saturated rock, whereas the apparently similar olivine basalt erupted during the declining phase is chemically undersaturated in silica. Deficiency of silica is indicated by normative olivine and sometimes nepheline in the rocks of the Hawaiian province. The significant abundance or scarcity of silica can be compared straightforwardly if the percentage of normative olivine and nepheline is not used, but rather a figure is computed from the chemical analysis that states the percentage of silica needed to form saturated normative minerals. The computed abundance or scarcity of silica has been compared with

TABLE 1. Percentage of SiO_2 present in amount greater or less than that required to form saturated normative minerals.

MgO in the analyses (percent)	Primitive shield rocks		Declining or decadent stage rocks	
	No. of analyses	Range of SiO_2	No. of analyses	Range of SiO_2
12–14	3	−2.7 to −1.7	3	−15.4 to −10.1
10–12	1	1.0	2	−14.6 to −8.8
8–10	5	−1.4 to 1.3	2	−10.0 to −4.6
7–8	25	0.4 to 10.0	1	−14.2
6–7	7	1.6 to 4.7	3	−6.8 to −3.7
5–6	1	5.1	3	−4.3 to −0.6

the magnesia content (as the magnesia-rich minerals are the greatest variants) from 56 analyses of rocks whose field relationships are known, 42 of the primitive stage, and 14 of the declining and decadent stage (Table 1).

Where lavas of the declining and decadent stage of activity are present, they make up the surface of the volcanoes; hence, they have been more abundantly represented in collections of rocks from which analyses have been made. Consequently, among the published analyses of Hawaiian lavas, the olivine basalts of the declining and decadent stage are represented far out of proportion to their abundance in the total volume of Hawaiian lavas. Upon averages of these analyses has been based the prevalent concept that the Hawaiian basaltic magma is undersaturated in silica. This concept is apparently not soundly based. In fact, the use of "olivine basalt" as the name of the principal magma type is open to question, since the olivine present in most of the magma was not chemically in equilibrium and is an unstable relic mineral preserved in the rocks because quenching stopped the process of resorption before it was completed.

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The Helicopter and the Walkie-Talkie in Field Surveys

THE helicopter and the portable radiotelephone have become familiar working partners in triangulation surveys for mapping projects in mountainous areas of Alaska and the western states. The helicopter provides quick transportation for the triangulators, and the radio makes it possible to coordinate the activities of the large field crews employed.

A typical project, extending over 3000 mi^2 or more of desert mountains, can be triangulated in one season by seven or eight engineers with helicopters and radios. The helicopters operate a shuttle service from a base camp or from roads, thus landing the men with their instruments on mountain peaks and moving them from peak to peak as required. Each triangulation observing party carries a portable radiotelephone (walkie-talkie), and the operation as a whole is directed from a master transmitter mounted at the base camp or in a jeep. The men can talk to one another and to the helicopters over line-of-sight distances through the base radio. If necessary, a group conference can be held with each participant on a separate mountain peak.

Both horizontal positions and elevations are determined by triangulation, using optical-reading theodolites. This kind of surveying frequently requires measuring vertical angles reciprocally and simultaneously between two stations to avoid errors from atmospheric refraction. To carry out this operation, the triangulators use a "skirt" of fluorescent cloth around the instrument tripod as a signal. Radio contacts between observers make it possible for them to relocate stations quickly when the line-of-sight is blocked by trees or visibility is otherwise impaired. By these techniques, elevations have been extended as far as 50 mi across rugged mountainous terrain with an accuracy of about 2 ft.

Helicopters are usually operated in pairs, so that a means of rescue will be close at hand in case of accident, and as insurance against prolonged delays from mechanical failure. Although engineers working with helicopters save the time required for the arduous mountain climbing ordinarily involved in triangulation, helicopters are not as maneuverable at higher altitudes as they are near sea level, and landing on high peaks where cross winds are always blowing is a critical job, even for a skilled pilot. Taking off calls for still greater skill. Pilots prefer a peak with a sheer drop-off where they can dive immediately after taking off to gain flying speed. There have been no serious accidents in 5 yr of operation in topographic surveys, but it is still far from a routine means of transportation.

The value of helicopters and radiotelephone has been effectively demonstrated during 5 yr of use on surveys in Alaska, and the Geological Survey expects that their use will do a great deal to accelerate the mapping of large areas in Alaska and in the western United States.

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Sex Ratio and Fruit Setting in Mango (*Mangifera indica* L.)

SOME varieties of mango set fruit poorly although flowering profusely, whereas others with fewer flowers bear a good crop. To examine the probable cause of this phenomenon, observations were recorded on sex ratio and fruit set in the following varieties of mango: Romani (poor crop); Dashehari (good crop); and Langra (heavy crop).

The data in Table 1 show the number of hermaphro-