TABLE 1. BIKITAITE: ANGLE TABLE
Monoclinic: prismatic—2/m

$a:b:c=1.7434:1:1.5434$ $\beta=114°34'$ $p_0:q_0:r_0=0.8853:1.4033:1$
$r_2:p_2:q_2=0.7126:0.6309:1$; $\mu=65°26'$ p_0' 0.9734, q_0' 1.5434, x_0' 0.4571

Forms	ϕ	ρ	ϕ_2	$\rho_2=B$	C	A
c 001	90°00′	24°34′	65°26′	90°00′	—	65°26′
b 010	0°00′	90°00′	—	0°00′	90°00′	90°00′
a 100	90°00′	90°00′	0°00′	90°00′	65°26′	—
m 110	32°16′	90°00′	0°00′	32°16′	77°11′	57°44′
n 210	51°36′	90°00′	0°00′	51°36′	70°59′	38°24′
s $\bar{1}02$	−90°00′	1°42′	91°42′	90°00′	26°16′	91°42′
t $\bar{1}01$	−90°00′	27°18′	117°18′	90°00′	51°52′	117°18′
o $\bar{1}12$	− 2°12′	37°38′	91°42′	52°18′	44°48′	91°21′

a perfect {100} cleavage and a good, though less easily developed, {001} cleavage. Across these cleavages there is a conchoidal fracture.

The specific gravity, determined by suspension in bromoform, was reported earlier as 2.34 ± 0.04. The calculated specific gravity is 2.29. The specific gravity redetermined with the Berman balance using larger fragments is 2.29.

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THE APPLICATION OF A MULTIPLE GUINIER CAMERA (AFTER P.M. DE WOLFF) IN CLAY MINERAL STUDIES

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The type of Guinier camera used by us for an x-ray investigation of clay minerals is characterized by a combination of four cameras in a compact unit, using a single focusing monochromator and a single film, and by an asymmetric disposition of the camera relative to the monochromator. According to GUINIER (1945, p. 147.) and DE WOLFF (Delft 1948, p. 207.) we can enumerate the following advantages:

1. An exceptionally high resolving power in the 2θ-range for which the camera is suited, i.e. $2\theta < 70°$. The resolving power ($1° 2\theta = 4$ mm.) is essentially much better than with a Debye-Scherrer camera of the same dispersion, because the focusing property eliminates to a large extent the influence of the thickness of the specimen. In addition, pairs of diffraction lines corresponding to both wavelengths of the α-doublet can be made to coincide for any desired value of 2θ, while their separation is much reduced in a region extending considerably on both sides of this value.

The fact that only a restricted 2θ-range is covered by the Guinier camera is not a handicap: all characteristic lines of clay minerals fall within the obtained range.

2. A low background intensity arising from the absence of white radiation.
3. The possibility of taking simultaneous exposures of four samples for serial work or comparison purposes. This ability is very important in the field of clay mineralogy, since many samples possess small differences in their qualitative or quantitative composition or in their degree of crystal perfection.
4. Very low-order reflections can be made visible, i.e. up to ca. 30 kX. (LIPPMANN, 1954, p. 131).

However, BRINDLEY (1951, p. 8) points out that the arrangement of the specimen is likely to give rather weak basal reflections, since the basal planes will tend to be aligned in the plane of the specimen.

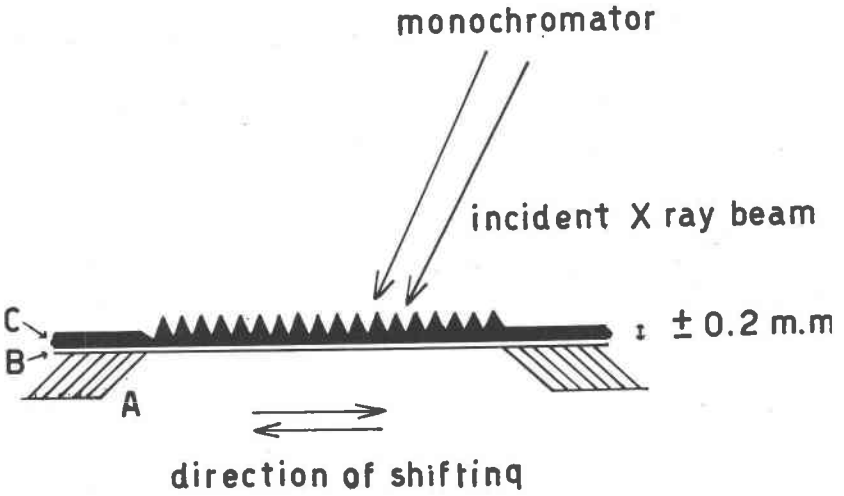

FIG. 1. Design of the sample holder (A), with cellophane (B) and the rippled clay surface (C).

In a study on the possibilities of a Guinier camera after VON WOLFF (Göttingen, Germany) in clay mineral research, LIPPMANN (1954, p. 251–254) describes the difficulty of obtaining basal reflections. He therefore was advised to employ another technique, giving exclusively non-basal reflections, which are in some cases characteristic too.

The present author, however, in cooperation with MR. A. KREUGER of the Netherlands Organisation for Pure Scientific Research, has tried to obtain distinct basal and non-basal reflections by making very fine parallel ribs on the surface of the specimen in order to give the clay crystals favorable orientations to the x-ray beam (Fig. 1). First the clay is embedded in paraffin wax, glycerol, ethylene diamine or any desired medium. Then the clay-paste is mounted on the cellophane of the

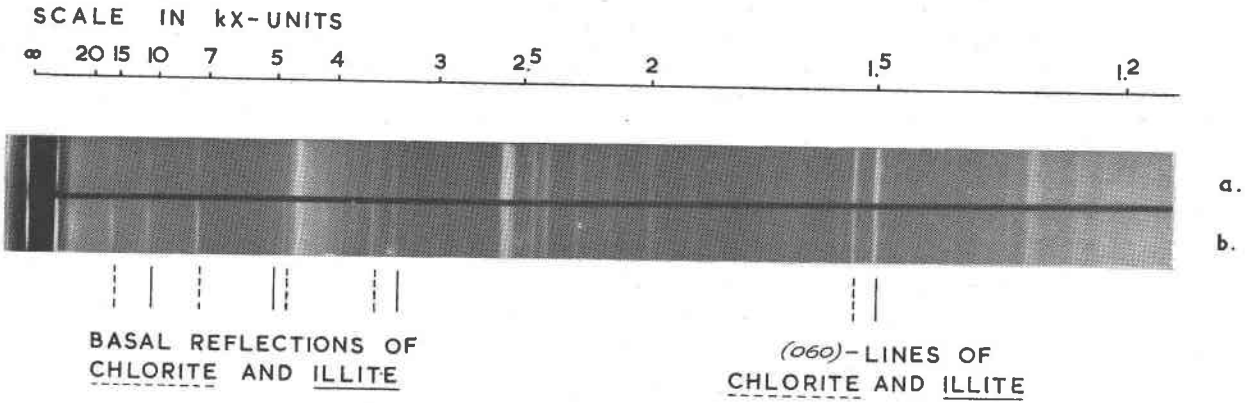

FIG. 2. a) Film taken of sample mounted by the previous methods. b) Film taken of sample mounted with the saw-tooth surface. In both cases the same clay sample was used containing chlorite, illite and quartz (fraction $<1\mu$). CuKx radiation, 35 KV, 20 ma., exposure time 4 hours.

FIG. 3. Film of kaolinite samples. a) reasonably well-crystallized kaolinite from Surinam. b) Poorly crystallized kaolinite from Surinam, and c) Very poorly crystallized kaolinite from Chile, collected by Dr. W. Weischet (Münich). CuKx radiation, 35 KV, 20 ma., exposure time 4 hours.

sample holder. Saw-like ribs are made on the clay surface (thickness ca. 0.2 mm.) using a knife blade.

The differences obtained by the old (BRINDLEY, 1951; LIPPMANN, 1954) and the new methods are illustrated by Fig. 2.

Figure 3 shows the advantage of photographing several samples on a

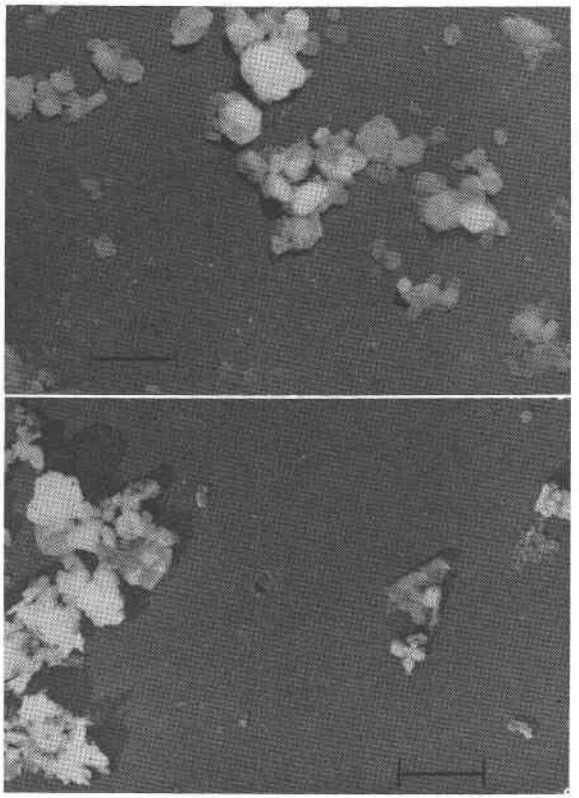

FIG. 4. Electron micrographs of kaolinite samples 0-34-15 (above) and V-56-200, (below) showing the difference in crystallization. Pd-shadow.

single film for comparison purposes. For all three diagrams kaolinite samples (fraction $<1\mu$) from Surinam and Chile are used. In the upper diagram the high resolving power of the Guinier camera enables us to see how in sample 0-34-15 (Northern Surinam) the (020)-, ($1\bar{1}0$)-, ($11\bar{1}$)-, ($1\bar{1}\bar{1}$)-, ($02\bar{1}$)-, (021)- and (002)-lines are clearly separated: a well crystallized kaolinite. The middle diagram is obtained from a rather poorly crystallized kaolinite of a sample derived from the Voltzberg area (V-56-200) in Surinam and shows a broadening of some of the lines together

with a decreased intensity. Some lines have even disappeared. The last diagram shows the fewer, broader and weaker lines, characteristic of a very poorly crystallized kaolinite (Chile, W9.).

From the same three samples electron micrographs have been made to investigate the particle size and the degree of crystal perfection. The results appear in good agreement with the *x*-ray examinations. Since in all samples the clay particles are about the same size, it seems likely that the broadening and the decreasing intensities of the lines, as shown in Fig. 3, are not only caused by decreasing particle size but in addition by crystal imperfections (cf. Fig. 4).

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MINERALOGICAL CHANGES IN WEATHERED SEDIMENTARY IRONSTONES

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The sedimentary ironstones of Liassic and Oolitic ages vary in the state of oxidation of their iron content from ferrous in the green ores to ferric in the red-brown ores which have undergone weathering at deposition or on exposure. Taylor (1) has surveyed the principal physical, chemical and mineralogical changes which accompany weathering. Loss of