

52. *Phenocryst distribution in the Siroyama  
hornblende andesite mass exposed near the  
town of Kanbara, Sizuoka prefecture,  
and its geologic interpretation.*

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Mt. Siroyama, situated behind the town of Kanbara, Sizuoka prefecture, consists of hornblende andesite intruding the Kanbara Plio-Pleistocene conglomerate beds. On the summit of this mountain there is a small isolated patch of a Miocene fossil bearing sandstone, surrounded by the hornblende andesite on all sides except the east, on which last mentioned side there is a thrust fault. The Miocene sandstone, which is called the Siroyama sandstone beds, contacts with the hornblende andesite, intercalating at its boundary a thin layer of tuffaceous sandstone. The senior writer<sup>1)</sup>, therefore, concluded from these geologic facts that the sandstone might be a xenolith, derived from the roof of the magma reservoir of the hornblende andesite.

In order to obtain further details of the nature of the xenolith and the intrusive phenomena of this andesite mass, the writers examined the inner structure of the andesite mass.

As to the inner structure of an igneous body, H. CLOOS<sup>2)</sup> has made a close study of this subject in connection with various igneous masses, the results obtained with a trachyte intrusive mass, the "Quellkuppe" of "Drachensfels" on the river "Rhein", being of particular interest.

In Japan, Prof. M. MORISITA,<sup>3)</sup> following the the method of CLOOS, studied the structure of the quartz diorite mass in the Tanzawa mountainland. F. C. PHILLIPS, recently examined the orientation of minerals in some olivine-rich rocks by means of the polarisation microscope with universal stage.

Judging from the results of these studies just mentioned, it would seem that these igneous masses have a certain structures as inferred

1) Y. OTUKA, *Bull. Earthq. Res. Inst.*, **16** (1938), 2, pp. 415~451.

2) H. und E. CLOOS, *Zeitschr. f. Vulk.*, **11** (1927), p. 33.

3) M. MORISITA, *Journ. Geol. Soc. Japan*, **40** (1933), pp. 325~327.

4) F. C. PHILLIPS, *Geol. Mag.*, **75** (1938), 885, pp. 130~134.

from the orientation of the crystals distributed. The writers, therefore, expecting to be able to ascertain the inner structure of any igneous mass by examining the orientation of its phenocryst distribution made a study of the Siroyama hornblende andesite mass in the manner to be described. In this study, the junior authour mainly occupied himself with determining the orientation of phenocryst distribution which is the most laborious part of the study.

### Has the hornblende andesite a certain structural orientation in the distribution of its phenocrysts?

As the trachyte and the quartz diorite studied by H. CLOOS and M. MORISITA consisted of large crystals, it was an easy matter for them to examine the orientation of phenocryst distribution with the naked eye, but in the case of the phenocrysts in the Siroyama hornblende andesite mass, the crystals were so microscopically small that it was difficult to say whether there was any orientation at all of phenocryst distribution. The writers verified the existence of orientation in the hornblende andesite in the following way:

1. Collecting samples of the hornblende andesite from the field localities, which original situations are recorded, size about (5 cm)<sup>3</sup>.
2. Preparing three thin sections from each sample, every plane of which sections must be perpendicular to one another e. g., the horizontal, the meridionally vertical, and the equatorially vertical.
3. Determining the orientation of the long axis of the phenocrysts scattered in these thin sections.
4. Calculating the frequency of occurrence of similarly orientated phenocrysts.

Fig. 1a, b, c show the frequency of these orientated phenocrysts in every three section. These figures show a certain orientation, according to which most all the phenocrysts are arranged, every thin section showing an orientation in the distribution of its phenocrysts. Should, however, orientation in these three sections be at random (haphazard) with respect to one another, a certain orientation would be lacking from one plane as determined by the remaining two of orientations. Although these three orientations shown in Figs. 1a, b, c are included in one plane, it is possible to find

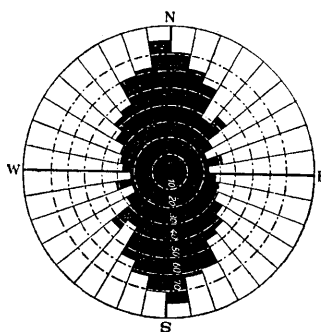


Fig. 1a.

a certain orientation in the phenocryst distribution also in the hornblende andesite mass.

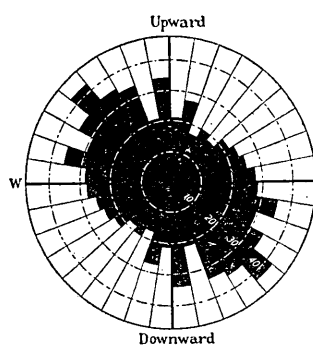


Fig. 1b.

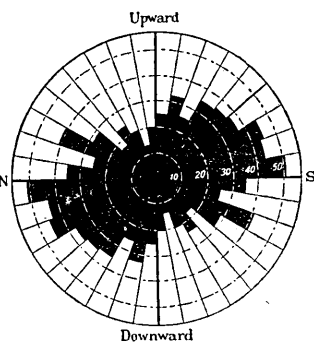


Fig. 1c.

### Limits of area similarly orientated.

Since, as just mentioned, the orientated structure in the Siroyama hornblende andesite was ascertained only in one small fragment of rock (5 cm)<sup>3</sup>, it was not yet known whether the orientation affects only that part whence the sample came, or whether it affects a larger area. In order to verify this point, the writers examined some specimens obtained a few meters away from the original locality. Examination of these samples showed orientated structure similar to those from the original locality, as shown in Figs. 2, 3, 4. From these facts, the writers conclude that the samples from the two localities separated by a few meters from each other are similarly orientated, whence it is presumed that the inner structure of the Siroyama andesite mass may be

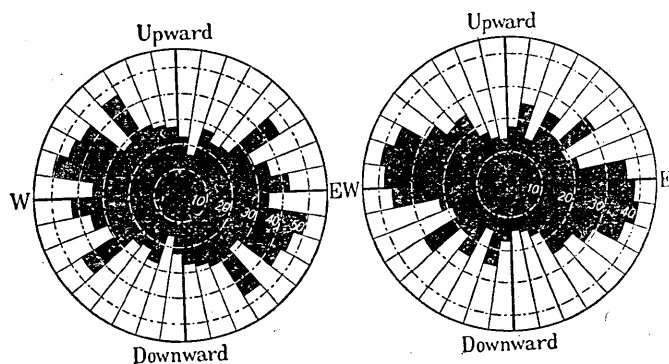


Fig. 2.

inferred from examinations of samples collected from localities separated by suitable distances.

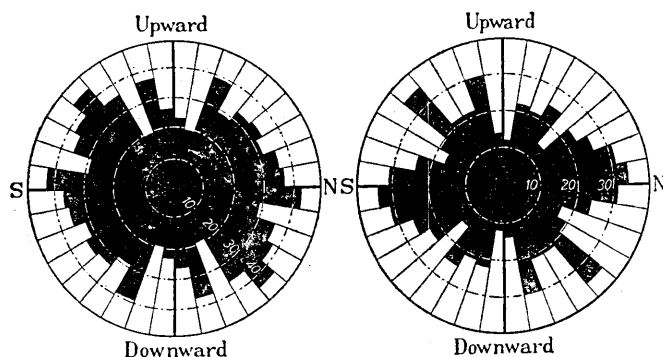


Fig. 3.

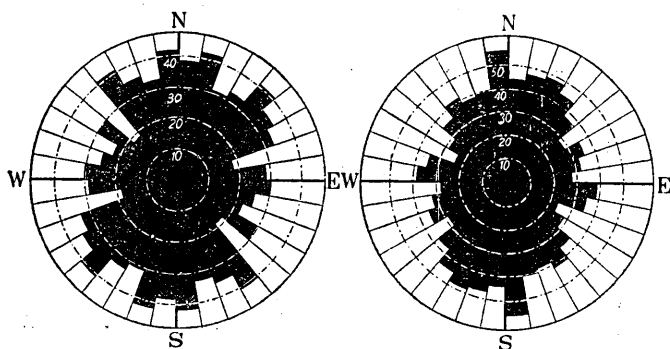


Fig. 4.

#### Orientation in the distribution of phenocrysts in the Siroyama hornblende andesite mass.

Using the foregoing method, the writers examined the orientation of phenocryst distribution in 12 samples of the Siroyama hornblende andesite. Fig. 5 shows the results of this examination, in which the orientation of phenocryst distribution is shown by dip-and-strike marks. The stream line-like structural lines referred to these dips and strikes, as shown in Fig. 5, are shown by dash-lines. Fig. 6 is a geologic section showing the inner stream line-like structural lines of the Siroyama hornblende andesite.

The relation between these stream line-like structural lines and the geologic boundary of the Siroyama hornblende andesite, reminds one of CLOOS's "Diskonform" contact.

If the writer be allowed to presume that, in an igneous mass that

consolidates direct from the molten stage as it wells up from the magma reservoir, the orientation in the distribution of the phenocrysts in the igneous mass makes a "konform" contact with the boundary surface of the magma reservoir; then the Siroyama hornblende andesite mass, after consolidation of the inner structure in the upper part of the magma reservoir, must have been pushed upward by the ascensional force of the still unconsolidated molten part of the magma that lay underneath it. The reason is that it may not be possible for the consolidated inner structure of the upper part of the magma reservoir to conform with the new contact surface that was formed by the welling up of the upper part of the magma reservoir; that is the inner structure of the Siroyama andesite mass, was formed before the establishment of the contact relation now seen near Siroyama.

This interpretation would imply certain fault contacts between the Kanbara conglomerate beds and the Siroyama horn-

blende andesite mass, which implication field observations have confined, seeing that the boundary plane is very smooth with large curvature, and its environs are greatly compressed.

The contact relation between the Miocene Siroyama sandstone xenolith and the inner structure of the Siroyama hornblende andesite mass is rather a "konform" contact, which relation is advantageous to the senior authour's theory of the Siroyama xenolith.

Structure map of  
Siroyama andesite  
by Y. OTUKA  
and  
S. Inomata.

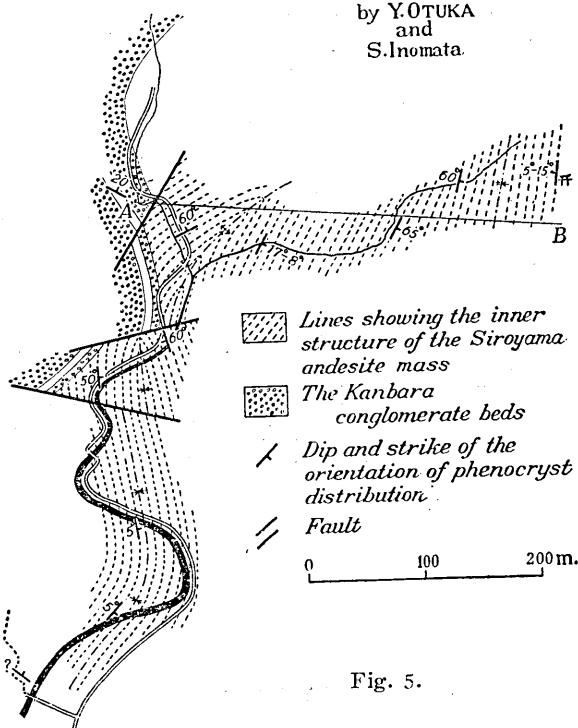


Fig. 5.

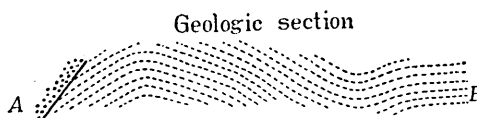


Fig. 6.

### Concluding Remarks.

To sum up,

1) There is a certain orientation in the distribution of the phenocrysts in the hornblende andesite.

2) The orientation not being at random (haphazard), the inner structure of the hornblende andesite mass may be inferred by examining the orientation of phenocryst distribution.

3) The inner structure of the Siroyama hornblende andesite is "diskonform" to its geologic boundary.

4) It seems that the inner structure of the Siroyama andesite mass conforms with the Siroyama sandstone xenolith.

5) The capture of the Siroyama sandstone xenolith occurred earlier than the contact between the Kanbara conglomerate beds and the Siroyama andesite mass.

In conclusion the writers return their thanks to Prof. H. YABE, Prof. S. TSUBOI, Dr. C. TSUBOI, Dr. H. TSUYA, Dr. R. TAKAHASHI, H. KUNO, and T. FUCHIDA for kindly interest and criticism in this study, and to S. WATANABE who kindly made many orientated thin sections from them.

### 52. 静岡県蒲原町の城山角閃石安山岩體中の

#### 斑晶配列方位とその地質學的解釋

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静岡県庵原郡蒲原町の城山角閃石安山岩體中の斑晶の長軸の方位を顕微鏡を用ひて決定し、此の安山岩體中の斑晶配列に就いて知つた。この結果によるに城山角閃石安山岩體は地下にあつて熔融してゐた當時にその岩漿溜の外境に接した一部を既に冷却凝固せしめられてゐたし、その當時の岩漿溜の屋根と思はれる城山砂岩層を破壊捕獲して推し上げ現在の状態に達したと言ふ解釋に都合のよい斑晶配列構造を示してゐることが解つた。この際この方法の吟味に就いても言及してゐる。