

jets into two chambers, one containing sea water and the other distilled water. After an equal number of bubbles has burst in each chamber an expansion is made; a dense cloud of tiny droplets is then observed in the space above the sea water but not above the distilled water. It appears that the bursting bubbles produce very small salt particles which can act afterwards as condensation nuclei during the expansion.

Bubbles of 3-mm. diameter produce 100–200 of these nuclei, the majority of which are estimated to have salt contents between 10^{-15} gm. and 2×10^{-14} gm., while smaller bubbles of only 0.5 mm. diameter burst much more violently and produce comparable numbers of nuclei. It seems entirely reasonable that these nuclei, representing the residues of droplets with diameters 0.4–1.0 μ , should be produced by the break-up of the bubble film into filaments in the manner suggested by Knelman *et al.*

The cloud chamber experiments suggest that if foam patches are largely composed of bubbles greater than 0.5 mm. diameter, disintegration of the bubble films will be a much more important mechanism for the production of salt nuclei than break-up of the jets, since the latter produce only small numbers of relatively large drops which will quickly fall back into the sea.

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¹ Woodcock, A. H., Kientzler, C. F., Arons, A. B., and Blanchard, D. C., *Nature*, 172, 1145 (1953).

² Knelman, F., Dombrowski, N., and Newitt, D. M., *Nature*, 173, 261 (1954).

³ Blanchard D. C., *Nature*, 173, 1048 (1954).

Linguistic Studies in Polynesia

IN an article entitled "Comparative Philology and Polynesian Studies", published in *Nature* of October 10, 1953, Prof. Alan S. C. Ross points to the need of a scientific study of the Polynesian family of languages, and suggests a plan for such studies. Our purpose in commenting on Prof. Ross's article is two-fold: (1) to show that structural linguistics, the recent development of which Prof. Ross disparages, may be of help in Polynesian studies; and (2) to express a somewhat different picture of the present status of Polynesian and Malayo-Polynesian studies.

The development of structural linguistics in the past few decades may be considered a natural growth of a new science from preoccupation with purely technical collection of data, to an analysis of those data on a higher level of abstraction. Such a growth would seem to hold true of disciplines as diverse as astronomy, physics and grammar. Accurate amassing of detail no longer suffices. The desideratum is now analysis and synthesis of the data.

A good many languages have been studied by the new descriptive techniques, both of the 'exotic' variety and the well-known European ones. Each language, however, is approached with fresh eyes, with awareness of methods used elsewhere, but with realization that other descriptions cannot serve as exact models for the next language to be described.

Yet in his discussion of a method for Polynesian studies, Prof. Ross first suggests that Polynesian grammars be written on the model of ancient Indonesian, such as Old Javanese. He then rejects this idea, but without stating any reasons for his

rejection. (A good reason is that only fragments of Old Javanese grammar are found in modern Hawaiian, for example). Then he proposes to eliminate grammars altogether, and "to relegate all that would be in them to the dictionaries". There seems to be a danger, however, that such a procedure would eliminate a unified approach and synthesis of the disparate phonetic and morphemic data into wholes.

Prof. Ross suggests that most structuralists are uninterested in comparative studies; yet Isidore Dyen of Yale University, who is probably the most productive Malayo-Polynesianist alive to-day, is both a descriptivist and a comparativist. At least two linguists (Robert A. Hall, jun., and George L. Trager) have insisted that the only acceptable comparative work is that which utilizes descriptive techniques at every stage, on both phonemic and morphological levels. Far from "despising" comparativism, most structuralists thus feel that with their techniques they can immeasurably advance comparative studies, or conversely, that comparative studies without revivification on each time-stage by structural analysis and synthesis are of doubtful validity.

As to the present status of Polynesian studies, we would point out that Polynesia itself is far more complex than Prof. Ross indicates. By our count there are at least twenty-three languages or dialects in Polynesia (not just five "principal" ones). For some of these there are fairly complete dictionaries; but for others the data are nearly non-existent, particularly for the 'outliers' in Melanesia, which are in particular need of study. Samuel H. Elbert has recently published a paper¹ that establishes a tentative system of sound shifts for twenty Polynesian languages or dialects, draws up a tentative family tree for sixteen of them, and suggests time dates for their separations from the central stock.

At the present time a joint research programme in the Oceanic field is being conducted by Yale University, the University of Hawaii, and the Bernice P. Bishop Museum. This programme, supported by a grant from the Carnegie Corporation, is directed toward understanding the processes of culture change that have been and still are operating in this island area, with particular reference to the Malayo-Polynesian-speaking peoples. Prof. Ross states in his article that "anthropologists rather naturally tend to regard linguistics as a subordinate subject". It is interesting to note that, although this programme is indeed anthropological, one of its initial, major efforts involves library and field research conducted by professional linguists with the aim of gaining a fuller knowledge of the historical relationships among the Malayo-Polynesian languages. Polynesian is an important concern in this effort.

Prof. Ross's suggestion of a New Zealand centre for the study of the comparative philology of Polynesian merits serious consideration. However, in view of the severe financial limitations under which universities supporting linguistic research are at present working, perhaps a more feasible approach is the furthering of co-operative endeavour among scholars and institutions everywhere with a current interest in the Pacific. There is much to be done in the Polynesian area, and all workers are welcome.

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¹ Elbert, S. H., *Southwestern J. Anthropol.*, 9, 147 (1953).