Naturally in low homes they are apt to pick up more slang expressions than in more refined ones. In this connexion I am reminded of the opinion of Mr Douglas Dewar, who from his experience of some talking birds, perhaps particularly of low homes in India, says: "If you want to make a bird talk quickly, use plenty of bad language in front of it." But from my practical experience I differ. Anyway it does not make any difference to the main conclusion. Of course, vocabularies of a profane nature have also been heard in some cases from birds, particularly those residing in low homes; but even they were started with good words. Mr Dewar's suggestion of teaching through gramophone records under the name of *Polly's Lesson* attracted my attention, but I have not as yet been able to experiment with it.

In cases where no response was perceived at all or where the talking stopped at the babbling stage, the birds were examined from anatomical and physiological points of view under all possible tests, both in regard to the organs and the sense of hearing, and since no defect of either nature was detected we may fairly conclude that the non-response was not the result of deafness or any other ear disease, but that it was possibly due to lack of development of the speech centre in the brain. In these cases it was noticed that at the very appearance of the teacher the bird became annoyed and irritated, while other members of the family never disturbed their normal mood. In such cases they even preferred to go without food than to take it from the teacher's hand. Thinking that the aversion might be against the particular individual teacher and not to the act of learning at all, further attempts were made, with someone else, but even so no appreciable response was experienced. Along with the teachable birds the birds of unteachable quality, such as doves, pigeons, etc., were also tried, but though they have the power of hearing, no articulative effort was shown at all.

A few specimens of the talk of these birds are given below, with their phonetical analysis. They are represented in International Phonetic characters. The meanings of the expressions are also given in English.

1. Parrot: captured at the age of three months; began to babble after two months' attempt; formed a vocabulary at the age of ten months, present age three years. Language as follows: ʈai ʈo bɒ te go, se sɒb kɒpale kɒre (*All is due to fate*). The lady of the house used to use this expression and the bird learned it by himself on hearing it. chatu khabe. o ma kothi, ma (*Will you eat? Oh mother, where are you?*) This sentence was uttered as the time for feeding approached. In the meantime a hawker passed by shouting: ɖoi ɖoi ɖoi (*Curd, curd, curd*), and the bird also repeated the same word three times.

Analysing these expressions phonetically it was found that s and r were not formed completely, and instead the bird gave the vowel ɔ. The elements m, p, b and ʈ, c and a few vowels were tried. The vowels and the consonants k and ʈ were distinct to a great extent.

2. Mayana: present age five years; teaching began at the age of six months. babu pɹoʈo. ku ku ku (whistle). ma, raɖhe kriʃnɒ ram

ram. ma, kɒta bajlo. ha ha [*Gentleman read on* (whistle). *Mother, names of God and Goddess. Mother, what is the time? Ha Ha* (laughing)].

The elements excepting r and ʈ are more or less distinct. Vowel sounds are not very intelligible in all words.

3. Cockatoo: present age fifty years; teaching commenced at a very early age. The master stated that the bird was purchased before his birth, and was left to him by his grandfather. khoka, babu eseche. o ke kakaʈua (*You boy! Some gentleman has come. Who is he? Cockatoo*). This expression was uttered just as I entered the house where the bird was. The vowels and consonants in the words were very distinct.

4. Mayana: present age six months; taught particularly with elements only and special care was taken to keep the bird away from hearing human speech. Four elements were tried, which were p, b, t, k, and c, ʈ. After six months' effort, a little attempt at babbling and ʈ and k were heard. Whistling was often heard during the time of teaching.

The articulation of the parrots and cockatoos sounds more akin to the human sound quality than that of the mayana, which in my opinion is particularly due to the more fleshy structure of the tongue of the former birds.

Though the articulation of these birds is not always very distinct to strangers, yet at times it creates an astounding effect on them. In this way they babble, form vocabularies, express their ideas in meaningful sentences, and when necessary they command, ask for food and inform the master of visitors' calls. Their understanding of human speech also is good, though limited in extent, since they have only a restricted sphere of ideas. Both their power of imitation and of articulate expression are natural, and it is even more surprising that they can imitate any sounds from the crack of a whip and the exhortation of a bullock-cart driver to the throat-clearing operation of men.

In conclusion I should like to say that the statement made in this paper is not claimed to be in any way exhaustive; it is simply an account of my limited experiments. I shall be very glad and encouraged if this short account of my original work can create some interest in scientific circles.

40. Prof. S. K. Chatterji (Calcutta): *Phonetics in the study of classical and sacred languages in the East.*

This paper was illustrated by some twenty-nine lantern slides, and in it the following topics were described and discussed: (i) the indication of tones in Veda chanting by means of the gestures of the hand and the fingers, (ii) the methods followed in Ancient and Mediaeval China and Japan to ensure the proper articulation of Sanskrit, (iii) Arabic phonetics and the diagrams used in books of Arabic phonetics, and (iv) the transliteration of Hindi (Braj-bhakha) words in a seventeenth-century treatise in Persian on Braj-bhakha language and literature.

The use of Phonetics in India in the study of Sanskrit and the Vedas was described, and the methods of indicating pitch accent in Sanskrit (Vedic) MSS. were shown. In India at the present moment there is a method of expressing tone while chanting the Vedas by means of physical gestures, and these are worth studying, as a sort of visualized or pantomimic expression of tones. Three tones are recognized in Vedic—the *udātta* or high, the *anudātta* or low, and the *svarita* or combined rise and fall. In one system of tone-gestures, the head is moved up and down in front—it being raised for the high tone, kept in a normal position for the *svarita* tone, and dropped down in front for the low tone. In the second system, the right forearm is raised for the *udātta*, it is dropped down a little above the thigh for the *anudātta* (the Brahman chanting the Veda squatting on the ground), and it is kept in an intermediate position for the *svarita* tone. In the third system, the thumb and the index of the right hand are used for tone-gestures. The fingers are also used in taking count of the notes in singing the Sāma Veda. Slides were projected to illustrate this remarkable system of tone-gestures, which is extremely old.

The second topic discussed was illustrated by photographs of pages of two Chinese-Sanskrit dictionaries of the eighth century A.D., in which the Sanskrit words written in Chinese fashion, with characters from top to bottom, have their pronunciation expressed by means of Chinese characters (with Japanese *kana* transcriptions of the pronunciation also added by a later Japanese editor), and by reproductions of the facsimiles of the seventh-century Sanskrit MSS. preserved in Japan and studied there with transcriptions in Chinese and Japanese *kana* characters as in the edition of F. MAX MÜLLER and B. NANJIO.

The third topic illustrated and explained a number of drawings of the vocal organs depicting articulation of sounds, executed in the traditional style in books on Arabic phonetics which are in use among professional Qur'an chanters in Persia and India.

The fourth topic discussed the use of the Persian script in writing down very carefully words of Hindi in the Braj-bhakha dialect by an Indian Muhammadan writer of the end of the seventeenth century who composed a grammar and poetics and a general literary encyclopaedia of Hindi in the Persian language.

41. Mr J. R. FIRTH (London): *Phonological features of some Indian languages.*

The study of the speech behaviour of man is no simple task. It must be shared by many sciences. Experimental phonetics for example deals with certain aspects of a man's actual utterance. Actual speech events in time can be recorded fairly completely by means of the talking film, less completely by means of the phonographic disc or steel ribbon. The apparatus of experimental phonetics records only certain specific components of the speech act.

Linguistic phonetics and phonology deal with types and classes of events. A transcriptionist makes abstraction of certain features only of typical speech events and records them by means of his letters, the values of which depend on four sets of relations:

(i) The relations of the symbols to the general phonetic categories of sound types and their attributes, categories of similarity and identity, and categories of difference.

(ii) The actual contextual relations in any given transcription.

(iii) The systematic relations between the terms or letters of an alternance.

(iv) The relations between the letters considered as an intra-linguistic schematic notation for the symbolization of any given language material.

Thus the transcriptionist does not record actual speech events in any sense. He picks out certain features of a bit of speech, decides what general pigeon-holes they belong to and writes down the pigeon-hole labels in a certain order, according to certain rules. In such acts of symbolism the particular and general meet, but the record is nevertheless in general terms, all individuality of voice, pronunciation and tone necessarily ignored.

A transcription aims at symbolizing the essentials from the typological point of view. In order to make or use a transcription considerable technical skill is required. To begin with, the whole system of relations above suggested must be fully understood, and the notation correlated with bodily performances. It would be interesting to have a psychologist's analysis of all the skills required for such work.

From a study of speech events then, you build up a generalized transcription, and in the process two sets of relations have especially to be studied:

(1) The relation of the symbolized element, or letter if you like, to the type of context in which it appears, and

(2) The relations of the symbolized element to all other different symbolized elements that may also occur in the given type of context.

Under (1) the types of context in which such letters or symbols will appear can be listed and described. They may be described generally, such as initial, final, intervocalic, or more specifically for example by saying between initial **k** and final **p**, or say in initial position followed by iː in a stressed syllable.

It may be practically convenient to think of a language as having a sound system, or phonetic structure as a whole, but this is little more than a sum of all the possible alternances of sounds in all contexts. This is an "all-over" list, and not to be confused for example with a specific context of maximum alternance for a certain class of sound, e.g. the context in which the maximum number of plosives may alternate in English.[1]

Let us now apply these principles to Indian languages. From the linguistic behaviour of many typical speakers of Hindi we may

[1] See my article in *English Studies*, February 1935, and also TRUBETZKOY's *Anleitung*, para. 23, "Stellung der maximalen Phonemunterscheidung".