# LETTERS TO THE EDITOR

*After the appearance, in the first number of* Diogenes, *of Emile Benveniste's article, 'Animal Communication and Human Language', we received the following letter from Professor Karl von Frisch, some of whose works were referred to in that article. We are glad to publish this letter.*

To the Editor in Chief:

You sent me the first number of the first volume of *Diogenes*; which number contained the article by E. Benveniste, 'Animal Communication and Human Language'. Since in Benveniste's description of my bee experiment there were certain errors (this had been brought to your attention by Prof. Koehler of Freiburg), you asked me to formulate my own position towards the article.

As a matter of fact, the description of the dances performed by the bees is not quite as it should be. And for the reader it must be hardly intelligible. That applies especially to the wagging-dance. In this dance, a bee, having found a source of food at a considerable distance from the hive, communicates to the other bees the exact distance of the find and the exact direction leading to it. The bee does not *fly* (p. 2) during the dance—which would not even be possible in the hive—it *crawls*; first a brief half circle to the left; then, wagging its abdomen vigorously, straight back to where it began; next a half circle to the right; again straight back, etc. The dance takes place on the vertical surface of the comb in the inside of the hive. The straight line described by the bee as it wags its abdomen indicates the direction of the food site. A straight line traced out towards the top of the comb means that the food site is in the same direction as the sun. A straight line 40° to the right means that



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the food site lies 40° to the right of the direction of the sun, etc.

When the sky is clouded over, the bees are *not* capable of finding their bearings by polarised light, as is maintained on p. 4, for the simple reason that light from an overcast sky is not polarised. Bees can, however, in contrast to us, perceive the sun behind a layer of clouds. It is the blue light of the open sky that is polarised; and this is of great importance for the bees in finding their bearings. Especially since—again in contrast to us—they can sense the direction of vibrations of polarised light.

The author then attempts to define the differences between human language and 'bee language'. He does not quite do justice, however, to the achievements of the bees. The transmitted message by no means contains only three items of information: the existence of a source of food, its distance, and its direction (p. 5). It also contains exact information as to the type of flower that is to be flown after. This, because every type of flower has its *specific* odour; and that odour is present in the nectar which is given in tiny portions to the other interested bees. Moreover, by varying the liveliness of the dance, the scout bee can communicate the *value* of the discovered source of food. In such a message, several factors are taken into account: the quantity of nectar, its sweetness (sugar content), the distance of the source from the hive (nearby sources are more profitable, since they demand less expenditure of time), and a number of other circumstances beside.

Benveniste considers it another substantial difference that the bee's message consists entirely in the dance, without the intervention of any 'vocal' organ. But as far as we can be sure, bees have no means of hearing; thus a language employing sound would be senseless. Besides, even among humans we have a *sign* language: that of the deaf and dumb. That the sign language of bees is based upon *visual* perception, and therefore cannot take place in the dark, is false. Almost without exception the dancing is done in dark hives. The particulars to be communicated by the dance are received through the sense of touch and the sense of smell.

Also it is not correct that the content of these messages always concerns but one fact, viz., food, and that the only variations of this theme concern the question of space (p. 6). According to my student, M. Lindauer, scout bees, out reconnoitring for the site of a new hive, return to report on suitable nesting places. And this they do by dancing, just the way they do when they have found a source of food. Since, however, several different scouts discover several different sources of food, the community must agree on a definite site for its hive, if possible, on the best. And this actually happens. It is facilitated by the fact that the dances communicate more than just the location of the sites. According to the degree of liveliness, they also impart information as to the quality. In determining the quality, many circumstances are taken into account: wind protection, warmth, smell, etc. Thus a remarkable



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phenomenon comes about. Bees that have found less favourable sites are moved by the livelier dances of their fellows to visit these other sites also. By this means they are usually won over. After several hours a general agreement is reached. Of course at this point the development is usually interrupted. The beekeeper interferes and captures the swarm.

I agree with M. Benveniste completely that the 'language' of bees is something quite different from human language. Therefore I would place the expression between quotation marks. But one may easily be permitted to say that 'bee language', its fertile expressiveness and its many-sided, functional employment, far transcends everything else we know of communication among animals.

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*Professor Benveniste, to whom, as is customary, we have passed on Professor von Frisch's letter, has sent us the following reply:*

To the Editor in Chief:

I have not seen the German translation of my article, which gives rise to Mr. von Frisch's remarks, and I am only responsible for the original text where I summarised in a few words the description of the behaviour of the bees as given in Mr. von Frisch's little book (*Bees*, 1950) which I quoted in my article. The only correction I have to make is the one concerning the 'flight', and this correction has already been made by J. B. S. Haldane, *Diogenes* No. 4, p. 61, n. 1, and does not alter in any way my own conclusions.

As far as the rest is concerned, I feel it necessary to rectify in my turn several of Mr. von Frisch's assertions.

1. I had written: 'The message passed on contains three items of information; or, more precisely, only three have been identified until now: the existence of a source of food, its distance, and its direction' (p. 5). Mr. von Frisch says that we should add another item: that the scent conveyed by the bee gives an indication as to the importance of the food source. This, however, would entail the confusion I wanted to avoid. I have restricted my observations to the data implied by the dance, leaving aside those that the bees could obtain through tactile or olfactory impressions which, moreover, have no remarkable characteristics. The only question arising is: 'Are the bees informed through the *dance* of the scout about the *nature* of the flower visited?' Mr. von Frisch himself shows that they are not.

2. Mr. von Frisch thinks that a language consisting of sounds would be *senseless* among the bees as they have no sense of hearing. I fail to grasp the purport of this remark. I did not mean to imply any inferiority in the anatomical constitution of the bee, but just to state this obvious fact: that the function of man's phonic and acoustic organs has its counterpart in gesture and sight among the bees.

3. Mr. von Frisch alleges that 'even among humans we have a *sign language*: that of the deaf and dumb'. He falls



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prey to the common illusion concerning *gesture language*. Must we remind him that the *deaf and dumb language* is altogether artificial and conventionally formed and that a *gesture language* independent of a vocal language has never been found anywhere? There is no possible comparison, here, with the bee *language*.

4. Finally Mr. von Frisch considers as incorrect my referring the message of the bees exclusively to food. He cites as an example Lindauer's experiments which are undoubtedly very interesting and enlarge the scope of the problem. But the way in which this *emendation* has been introduced will mislead the uninformed reader. Let me repeat that my only source was Mr. von Frisch's book published in 1950. Now Lindauer's observations are not mentioned at all there: his name does not even appear in the bibliography. In 1950 Mr. von Frisch published the conclusions which I summarised and which refer only to food, as the reader may easily ascertain. Now he is availing himself of Lindauer's experiments which were *made known* in 1951 (cf. Haldane, *loc. cit.*, p. 68, n. 9) to *rectify* what I had written following his own book, *published in 1950*. I find this procedure rather strange. A comparative glance at the dates will show that Mr. von Frisch is actually correcting and completing his own observations through my article. He might have said so.

E. BENVENISTE



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