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ADAM KENDON

Gesticulation and Speech: Two Aspects of the Process of Utterance[1]

When a person speaks there is always some movement in the body besides the movements of the jaws and lips that are directly involved in speech production. This speech-associated movement may be slight and comprise not more than a minor bobbing of the head or occasional movements of the eyes and eyebrows. Quite often, however, movement may be observed in other parts of the body as well, most notably in the arms and hands. These movements may become complex and extensive and they are generally recognized as being intimately linked to the activity of speaking and are often regarded as part of the speaker's total expression. These hand and arm movements, here to be referred to as *gesticulation*, have been the object of attention by numerous workers. Early workers include Austin (1806), Bacon (1875), Ott (1892), and Mosher (1916) who were interested in gesticulation as a part of public speaking and their studies were mainly prescriptive. Systematic descriptive analysis is much more recent, although the most notable work still remains that of Efron (1941 [1972]).

Most workers have been explicit in noting that gesticulation, as we here refer to it, is to be distinguished from other kinds of bodily movement that can be observed in interaction, and several studies show clearly that it is an integral part of speaking. Thus Ekman and Friesen (1969) distinguished 'illustrators' and 'emblems' from movements in which the individual touched or manipulated his own body or his clothing, which were termed 'self-adaptors'. Freedman (1972) distinguished 'body focused' movements from 'object focused' movements and showed that 'object focused' movements occurred only during speech, whereas self-touching occurred at other times. Kimura (1976) in a recent paper has presented a number of observations which suggest very strongly that these movements are controlled by the same part of the brain that controls speech production. Thus she observed the movements right-handed subjects made during periods of speaking as compared to periods of silence and found not only that

gestural or free movements only occurred during speaking, but that these movements were made predominantly by the right hand. This was in sharp contrast with self-touching movements which were observed to be made equally often by either hand. Right-handed subjects who, nevertheless, had gestured during speech mainly with the left hand, were tested for speech lateralization using the dichotic listening technique. She reports a significant relationship between hand preference in gesturing and lateralization of speech function as assessed by this technique. She also observed left-handers and found that they tended to use both hands during speaking. This is in accord with suggestions that speech is more bilaterally organized in left-handers than in right-handers. Kimura also reports a number of studies of patients with left hemisphere lesions with consequent aphasia, who also showed apraxia. In particular they had difficulty in copying sequences of gestures. The intimate relationship between speech and gesticulatory hand movements is further supported by recent observations that suggest that movements of the hands coordinative with movements of the speech organs may be present from birth (Trevarthen 1977), and Ingram (1975) has observed that children as young as three years engaged in gestural movements with the dominant hand when speaking in a conversation.

Movements that are closely associated with speech appear to be phenomenally distinct from other movements. Thus, Kendon (1976) showed 20 individuals a film of a New Guinea highlander addressing a large gathering. The observers who did not hear the sound track of the film, were asked to describe what movements they saw the man make. All of them recognized that he was speaking to a large gathering, all of them recognized the same segments of movement as being related to his speech and all of them distinguished these quite sharply from other movements that, they were all agreed, had nothing to do with his speech. Thus arm extensions, elaborate movements of the hands in the space in front of the body, were all recognized as belonging to his speech performance. Self-touching, postural movements, movements involved in the manipulation of an axe — these were all regarded as being quite separate.

In this paper we shall review findings from some detailed studies of the organization of these gesticulatory movements and how this is related to the organization of concurrent speech. As we shall see, this work shows that this bodily activity is so intimately connected with the activity of speaking that we cannot say that one is dependent upon the other. Speech and movement appear together, as manifestations of the same process of utterance. That is, in the translation of 'ideas' into observable behavior which may be read by others as being reportive of those ideas,

the output that results is manifested in both speech and movement. While we shall here concentrate upon the phrasal structure of gesticulation and its relation to the phrasal structure of speech, we shall also take note of the way in which the 'ideas' being expressed in speech are also encoded in the movement patterns being produced. It will be clear that the manner of encoding is, in each case, quite different. In gesticulation we see patterns of movement that are enactive or depictive of the ideas being expressed, yet such expressions are concurrent with, indeed they often somewhat precede, verbal expression. This suggests that the formulation of ideas, in a form of action which is iconic or analogic to those ideas, is as fundamental a process as the formulation of ideas in verbal form.

THE RELATIONSHIP BETWEEN GESTICULATION AND THE STRUCTURE OF SPEECH

The movements of gesticulation and their relationship to speech may be analyzed by a close inspection of examples recorded on 16mm sound film. By use of a hand-crank operated time–motion analyzer, it is possible to examine and reexamine the film frame by frame or by short stretches of several frames at a time. A detailed map may be made of the movement patterns observable, which can be plotted on a chart to show their development in time to the nearest frame. Using standard sound-film rates, this means that we can analyze the behavior to the nearest twenty-fourth of a second. Such a map of the movement patterns may be matched with a phonetic transcript of the concurrent speech, which can also be plotted against the frames of the film it matches. In this way, the relationship between body-motion and speech may be examined to the nearest twenty-fourth of a second (or to smaller intervals of time, if the appropriate film speed is used). Details of these procedures were first described by Condon and Ogston (1966, 1967b) and an account may also be found in Kendon (1970, 1972, 1977).

The first work in which this approach was used was that of Condon and Ogston (1966, 1967b). In this work an extremely detailed study of the flow of movement in relation to the speech flow was undertaken. This showed that as the speaker speaks his bodily movement is rhythmically coordinated with his speech rhythm. One of Condon's principal concerns, in this work, has been to explore the degree to which this synchrony of speech and movement is precise. Its principal significance for our present concern is that it shows that the individual, in speaking, acts as a whole, that speech is not a disjunct action system but that it

continuously mobilizes the muscular systems of the whole body.

Condon's work has been conducted at very fine levels of organization. He has examined the synchrony of bodily movement with speech at the verbal, syllabic and phonic levels of the organization of speech. Here we shall be concerned with much higher levels of organization. As Condon (1976) himself has pointed out, at the level of the phrase and above, we tend to observe parts of the body differentiating out in movement, so that the head, the arm or the hand, or at times the whole trunk performs phrases of movement that are sustained over syllabic groupings at the level of phrases and, as we shall see, at still higher levels of organization.

In the first study to be considered here, fully reported in Kendon (1972), an extended utterance was analyzed which was taken from a film made in a London pub in which eleven people, who had gathered over drinks with an American anthropologist, were discussing the differences between British and American national character. In the utterance analyzed the speaker maintained a continuous discourse for about two minutes. He directed his utterance to the anthropologist, but in such a way that it also served as an address to the whole group.

The speech stream was segmented into intonation tune units, following criteria given by Kingdon (1958). This yields units which are the equivalent of Tone Units, as these are defined by Crystal (Crystal and Davy 1969). The relationship between these Tone Units was then examined, and they were found to participate in four levels of organization. First, the Tone Units were found to combine into groupings termed *locutions*. These generally comprised complete sentences. Locutions were found to combine into Locution Groups and these in turn were organized into Locution Clusters. Locution Clusters may be thought of as the paragraphs of the discourse. They are set off from one another by a pause or by a marked change in voice quality, loudness or pitch range, and there is generally a clear shift in subject matter. The Locution Clusters are themselves combined into the highest level of organization of all, the Discourse, which is here the equivalent of one speaker turn.

It was found that each level of organization distinguished in the speech stream was matched by a distinctive pattern of bodily movement. Thus for the duration of the Discourse the speaker sustained a bodily posture that contrasted with the posture he sustained before and after it. For each of the Locution Clusters within the Discourse, he used his arms differently. Over the first of the three Clusters distinguished he used his right arm only, over the second Cluster he used his left arm only, while over the third he used both arms together. Within each Cluster, each Locution Group was contrasted in the way in which the head moved over

each of the Locutions within it. Each Locution began with the speaker's head held erect or raised and tilted to one side. As the Locution unfolded the head was lowered to be brought to a low central position or to a lowered left tilt position. Locution Groups were distinguished according to whether the head movement pattern was a forward lowering or a forward lowering combined with a leftward tilt, over each Locution within the Group. Successive Locutions within a Group were distinguished from one another not only by the head movement cycle we have just described — each Locution starting with the head in a raised position — but also in the pattern of movement in the hand and arm employed. For example, in the second Group in the Discourse analyzed, over the first Locution the left arm was fully extended and retracted; over the second Locution gesticulatory movement was confined to forearm rotation and movement in the wrist and fingers; over the third Locution the forearm was raised by flexion at the elbow and a succession of lowering movements were then observed. Finally, at the level of the Tone Unit, distinctive movement patterns could again be observed. Thus over the first Tone Unit in the first Locution of the second Group, the left arm was fully extended, it was retracted over the second Tone Unit, and extended again over the third.

The paralleling of organization in the speech stream and gesticulatory stream revealed in this example, together with certain details having to do with the relative timing of the nuclei of the Tone Units and the nuclei of the gesticular phrases, led to the conclusion that it is 'as if the speech production process is manifested in two forms of activity simultaneously: in the vocal organs and also in bodily movement' (Kendon 1972: 205). Analyses of other examples, taken from other sources, have served to reinforce this conclusion. Furthermore, some additional features of the speech–gesticulation relationship have become apparent that allow us to go further in our understanding of how far back in the speech production process the organization of concurrent bodily movement has its origin.

We shall now consider some findings from some other analyses of gesticulation structure in relation to utterance structure. Space does not permit a full presentation which will be reserved for another publication. In this new work a number of examples of extended utterances have been analyzed, all of them taken from a film made in Philadelphia at the Eastern Pennsylvania Psychiatric Institute. The film, known as ISP 001 63, is of five psychiatrists and a social worker meeting to discuss a patient that the social worker and one of the psychiatrists had been interviewing. The film contains many examples of extended utterances, with a good deal of gesticulatory activity.

In this work the speech in selected extended utterances has been analyzed into Tone Units and their various groupings according to procedures already described in Kendon (1972) and outlined briefly above. In analyzing the structure of the gesticulation, however, we made use of the concept of the Gesticular Phrase.

In forelimb gesticulation the limb is typically lifted away from the body as it performs one or more complex movement patterns, and then it is returned to what may be called its *rest position*. Gesticular Units, thus, may be demarcated as extending from the moment p begins the excursion of the limb to the moment when the limb is finally at rest again. Within such an excursion the limb may perform one or more *phrases* of gesticulation. A phrase of gesticulation, or G-Phrase is distinguished for every phase in the excursionary movement in which the limb, or part of it, shows a distinct peaking of *effort* — 'effort' here used in the technical sense of Rudolf Laban (Dell 1970). Such an effort peak, or less technically, such a moment of accented movement, is termed the *stroke* of the G-Phrase. It is usually preceded by a *preparation* — that is, by a phase in which the limb moves away from its rest position to a position at which the stroke begins. The stroke is then succeeded by a *recovery* or *return* phase in which the limb is either moved back to its rest position or in which it is readied for another stroke.

Gesticular Phrases, like Tone Units, may be grouped in various ways, so that a Gesticular Unit, or G-Unit, may contain more than one G-Phrase, and sometimes more than one grouping of G-Phrases. Description is further complicated by the fact that both limbs may be used simultaneously, at times performing in unison, but at other times showing considerable differentiation in the way they are employed.

Several of these features will now be illustrated with a specific example. In Figure 1 a G-Unit and its internal structure is diagrammed in relation to the speech it co-occurred with. In Figure 2 three sketches of S are presented to show his general posture and two main features of his gesticulation. The example is taken from the film ISP 001 63 already mentioned. In this example, the psychiatrist who is presenting the case, S, is commenting on the difficulty he has had in getting the patient in question to give a coherent account of herself. The passage we are concerned with is as follows, transcribed to show its organization into Tone Units:

this patient has been a *prob*lem/ so far as a *his*tory is concerned/uh y'know a very *form*al one/ uh or *any* kind of a history/ cos she talks very very *rap*idly/and *moves* very quickly/from one area to *another*/

We are concerned here with the gesticulation that occurs in association with the final five Tone Units in this passage.

It will be seen from Figure 1 how a single G-Unit extends during the passage of speech in question. It is recorded as beginning at frame 11084, the earliest point in which gesticulatory movement can be observed, in this case in the left hand, to frame 11250, when both limbs have returned to a stable, non-gesticulatory position.

This G-Unit, however, will be seen to contain three manual G-Phrases, regarded as being organized into two groupings or Parts, the first Part containing two G-Phrases, both enacted by the left hand; the second Part contains one G-Phrase only, enacted by the right arm. These G-Phrases are regarded as belonging together in a single G-Unit because, in the first place, between G-Phrase 1 and G-Phrase 2 the hand does not return completely to its rest position. Secondly, as will be clear from the diagram, G-Phrase 3 begins before the recovery phase of the preceding G-Phrase is completed. G-Phrase 1 and G-Phrase 2 are grouped into Part I because they are very similar in form and in the space they make use of. G-Phrase 3 is regarded as belonging to a separate Part, in this case because it is enacted by a different limb. In other examples, where the gesticulation is confined to one limb only, distinct Parts are recognized if the limb moves to an entirely new spatial area for enactment, or if it engages in a sharply distinctive movement pattern.

G-Phrase 1 and G-Phrase 2 are very similar. For both, the fingers of the left hand are extended and spread to assume an 'umbrella' hand form (i.e. with palm facing down, all digits are extended and abducted, but all are partly flexed at the A-joints). At the same time this development of the 'umbrella' form occurs, the wrist extends slightly, lifting the hand away from the chair arm on which it has been resting (see Figure 2). In each of the two G-Phrases, this development of the hand posture and the concurrent wrist extension is regarded as constituting the *preparatory* phase of the G-Phrase (p_1 and p_2 in Fig. 1). In the *stroke* (S_1 and S_2) in each G-Phrase, the wrist is flexed rapidly, moving the 'umbrella' hand sharply downwards. In both, the stroke is followed by a *hold* (h_1 and h_2) in which the hand, still in its 'umbrella' form, is held still in the position it reached at the end of the stroke. Thereafter, in G-Phrase 1, the fingers slowly flex and draw together into a 'loose bunch' form. This is regarded as a *partial recovery* (Pr_1) because the hand does not return all the way to the position it was in before the onset of the G-Phrase. After the hold (h_2) following the stroke in G-Phrase 2, however, the fingers are drawn fully together, but, at the same time, the arm is moved off the chair arm, into S's lap. The forearm is then supinated and the hand spread, to form a support for the folder S is holding (see Figure 2). Note that in this case

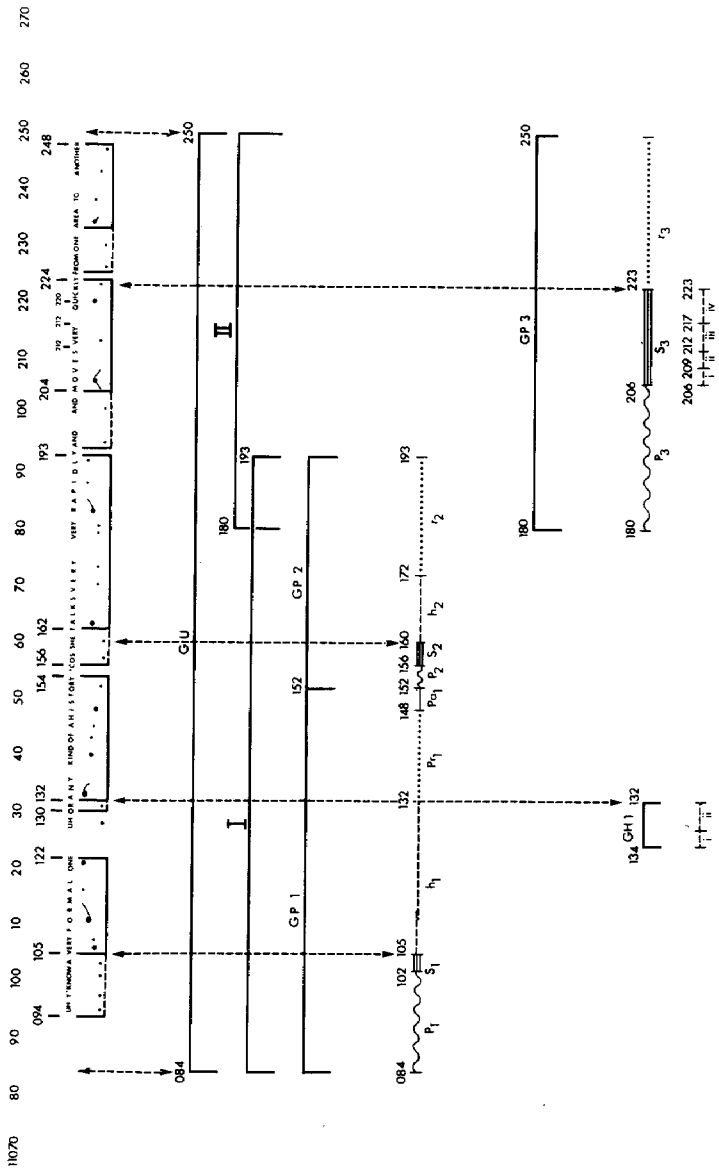

Figure 1. *Diagram to show the organization of a Gesture Unit and its relationship to the vocal aspect of the utterance. The utterance is taken from the film ISP 001 63, frame nos. 11070–11270. The boundaries of tone units are shown by solid vertical lines immediately below the text. The head section of each tone unit is marked by a continuous horizontal line, the pre-head section by a dotted line. Intonation patterns for each tone unit are written below the text. GU = Gesture Unit; GP = Phrase; P = preparation; S = stroke; h = hold; Pr = partial recovery; Pa = pause; r = recovery; GH = Gesture Phrase in Head. Vertical broken arrows indicate relationship of components of the gesture phrases with components in the vocal aspect. For further explanation see text*

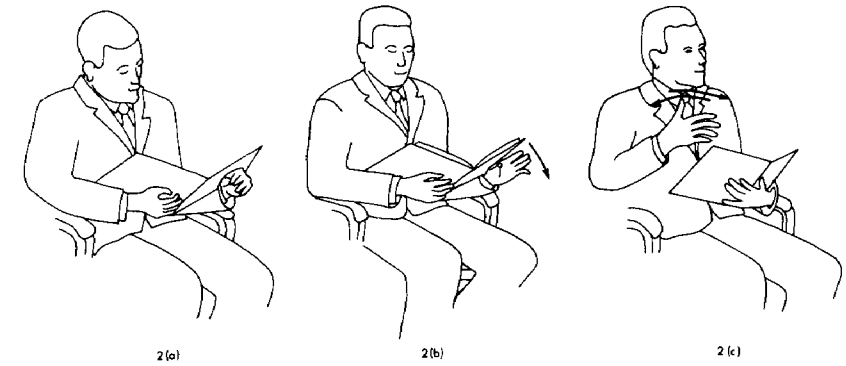

Figure 2. *Tracings from ISP 001 63 to illustrate the hand positions in the Gesticular Unit diagrammed in Figure 1. (a) Position of hands prior to the Gesticular Unit; (b) 'Umbrella' form of left hand in G-Phrase 1 and G-Phrase 2; the arrow shows the direction of movement in the stroke phase of the Phrase (c) position of right hand in G-Phrase 3; arrows indicate pattern of movement in the stroke of this Phrase*

the limb is moved, not to a rest position, but to a position in which it is employed in a non-gesticulatory activity.

G-Phrase 3 is likewise analyzed into a preparatory phase (P_3), in which the arm is lifted upwards through flexion of the upper arm (at the shoulder joint); a stroke (S_3) in which the upper arm is rotated inwards and outwards twice, serving to sweep the hand in to the center of S's gesture space and out again; and a recovery phase r_3 in which the arm is lowered again, and then moved to reassume the position it had before, supporting the folder. The stroke, in this case, is a *complex stroke*, analyzable into four components.

Finally, note should be taken of the segment marked GH1, which occurs during h_1 in G-Phrase 1. This is a gesture of the head, in this case a *head-shake*. As may be noted from the diagram, it is integrated with the gesticulatory activity in the limbs and, as we shall observe later, it bears the same relationship to the speech structure as the other gestural units do. However, for the present it is convenient to treat head gestures separately and we have not considered this as part of the gesture phrase organization described for the forelimbs.

A detailed analysis of the relationship between the phrase structure of the gesticular flow and the organization of the speech flow has been carried out on five extended utterances from the film ISP 001 63 from

three different participants. There are three general statements that may be made from these analyses.

First, just as we found in the analysis summarized earlier and reported in Kendon (1972), so here, in the two examples in which there were divisions in the discourse at the Locution Cluster level, these Clusters contrasted in their concurrent gesticulation in terms of the way the limbs are involved in gesticulation. Thus in F42, an extended utterance by the social worker, which divides into four Clusters, over the first she uses only her left arm in gesticulation, over the second she uses both arms equally, while over the third she uses both arms, but the right arm is dominant. Similarly, in S134 (an utterance of the psychiatrist who presented the case to the group), the discourse is divisible into three Clusters. Over the first, which is very short, S uses his left arm; over the second, he uses his right arm; and over the third he again uses his left arm.

Second, in all of the examples we have analyzed so far, each Locution has its own G-Unit. That is, boundaries of Locutions are associated with the gesticulatory limb either at the rest position, or with it being in the phase of return to that position. Furthermore, within each G-Unit, the pattern of movement observed is different. This also confirms what was found in the previous analysis: each Locution is associated with a distinctive unit of gesticulatory activity.

Third, whereas in the previous example, as we saw, each Tone Unit was differentiated with a distinct pattern of gesticular organization — each Tone Unit was found to be matched with a distinct G-Phrase — in the other examples we have analyzed this relationship between Tone Units and G-Phrases has been found to be somewhat more complex. In F42, for example, in which there were 26 Tone Units, twenty of these had a corresponding G-Phrase. Of the other six Tone Units, three, occurring in succession, shared a single G-Phrase (which extended over the entire sequence of the three), while the other three Tone Units each had associated with them not one but two G-Phrases. Likewise, in D43, and in S134, we find groupings of Tone Units covered by a single G-Phrase.

An examination of just which Tone Units are grouped by a single G-Phrase and which co-occur with one or with more than one G-Phrase suggests that the G-Phrases are manifestations of the 'idea units' the utterance is giving expression to and are linked to the output of Tone Units only as closely as this itself is linked to the expression of 'idea units'. For example, in F42, Locution 4 is as follows:

(10) (11) (12)
/but all *through*/ you you *sensed*/ that she and *fa*ther/
(13) (14)
are being very se*duc*tive/ with each *o*ther/

(nuclear syllables of each Tone Unit are in italics). A single, though complex G-Phrase occurs over Tone Units 11 to 14, in which the forearm is moved back and forth in front of the body, with the hand held with the palm oriented inward. This movement would seem to embody two items in an interplaying relationship with one another. Thus, though it takes a succession of Tone Units to specify 'patient' and 'father' and their 'relationship', a depiction of their relationship is here given in a single G-Phrase. On the other hand, also in F42, we have the Tone Unit 'and supposedly re*buffs* her' and in association with this two G-Phrases are performed. In association with 're*buff*' the hand is held with the palm facing the body, the upper arm rotated inward at the shoulder so that the forearm crosses the body. As the nuclear syllable of 'rebuff' is uttered, the thumb is moved rapidly outwards in a pushing-away movement. This, however, was preceded by a movement of the whole arm, in which the arm was raised and then lowered slightly and also moved towards the body. However, as it is so moved it also is moved in a series of rapid, in–out motions of small amplitude. This rapid back and forth movement is not uncommonly seen in association with expressions such as 'partly', 'more or less', 'somewhat'. Here it appears, thus, that in the single Tone Unit in which the idea of 'rebuff' and of its *supposed* character is given expression, these two aspects are given separate expression in two G-Phrases.

In D29 and D43 we find examples of a single G-Phrase, here taking the form of a sustained hand position, being held over two or three Tone Units which are all linked by a common theme. In D43 and also in S134 we find groups of Tone Units in which only one conveys new information, the others serving to link this piece of new information with the previous or succeeding argument of the Discourse. Here a G-Phrase associated with the new information is performed, but it co-occurs with the Tone Unit grouping (Locution) as a whole, and does not mark out the separate Tone Units.

A further instance is provided in the example given in Figure 1. There, it may be noted, there are five Tone Units but only four G-Phrases. S says that the patient moves very rapidly from one area to another, taking two Tone Units to express this, but there is only one G-Phrase, G-3. This is a complex phrase in which the hand is moved back and forth quickly from one place to another. A rapid back and forth movement of the hand, thus, embodies in one unit of movement the idea that is also expressed in two units of speech.

The degree to which the different levels of organization in discourse are marked by separate G-Phrases appears to be a matter of some variation, at least below the level of the Locution, and further analyses

will be needed before we will be in a position to specify anything about what factors might be related to this. However, it would appear that whereas the structure of the movement pattern in gesticulation is closely integrated into the rhythmical structure of the co-occurring speech stream (Condon and Ogston's work has shown how very close this is), in terms of the phrasal organization of the gesticulation a distinct phrase of gesticulation is produced for each unit of meaning or 'idea unit' the utterer deals with. This means that the phrases of gesticulation that co-occur with speech are not to be thought of either as mere embellishments of expression or as by-products of the speech process. They are, rather, an alternate manifestation of the process by which 'ideas' are encoded into patterns of behavior which can be apprehended by others as *reportive* of those ideas. It is as if the process of utterance has two channels of output into behavior: one by way of speech, the other by way of bodily movement.

FURTHER ANALYSES OF THE RELATIONSHIP BETWEEN SPEECH UNITS AND GESTICULATION UNITS AND PHRASES

An examination of the relationship in time between the nucleus of a Tone Unit and the stroke of its associated G-Phrase shows that the stroke of the G-Phrase is completed either before the Tone Unit nucleus, or just at its onset. This phenomenon was reported in Kendon (1972) and it is confirmed in our later analyses. Thus in F42, in which there were 22 Tone Units with a matching G-Phrase, in 15 instances the stroke was completed either before or simultaneously with the onset of the tonic syllable; there were six instances in which the stroke was completed by the end of the tonic syllable; and only one instance in which the stroke continued after the tonic syllable. In all instances the gesture phrase *began* well before the tonic, and in most instances it began before the onset of the head of the Tone Unit. In none of the material we have analyzed is there an instance of a G-Phrase *following* its associated Tone Unit. It either co-occurs with it or precedes it. Where we are dealing with the first Tone Units of a Discourse, furthermore, if gesticulation occurs during the first such Unit it always begins before speech begins. Usually only the preparatory phase of a G-Phrase is enacted before speech, but occasionally complete phrases are enacted. An example of this was described in Kendon (1972).

Once again, this point is illustrated in Figure 1. There, it will be seen that the stroke of G-Phrase 1, GH 1 and G-Phrase 2 is in each case completed before the onset of the head section of the Tone Unit with

which it is associated. G-Phrase 3 is enacted concurrently with the head of Tone Unit 4 but, as we noted above, in its form it expresses the idea the verbal expression of which is not completed until the completion of Tone Unit 5, in this sequence.

The appearance of G-Phrases somewhat in advance of the appearance of speech phrases with which they are associated means, of course, that the G-Phrase must have been organized at least at the same time, if not a little in advance of its associated speech phrase. Thus the G-Phrase must be seen as originating simultaneously with the origination of speech and not as a product of the speech production process.

Further indication that the gesticulation associated with speech is an alternate manifestation of the same encoding process is provided by an examination of the relationship between G-Phrases and speech phrases in which there are pauses or hesitations. For example, in many cases where a Tone Unit has already begun, and a pause occurs between the prehead and the head onset, if a G-Phrase is also underway it may continue to completion despite the interruption in the flow of speech. Indeed from several examples we have analyzed it seems that the speech is only resumed once the stroke of the G-Phrase has been completed. In these cases it would seem that, despite the pause, p had already organized the *semantic* structure of the next part of the utterance, for the G-Phrase that is performed in the pause is well formed, clearly embodying the content of what is also produced in speech. Such within Tone Unit pauses where kinesis continues reflect, thus, an interruption in the *speech* production process but not an interruption in the process of utterance.

An example may be given to illustrate this phenomenon (full details must await another publication). The example is F2, taken from the beginning of the film ISP 001 63, where the participants are settling in their seats and discussing in an informal fashion what is going to happen in the main part of the session. F makes a joke based on a scene in Wilder's *Some Like it Hot*. She says: /they wheel a big *tab*le in/ with a big with a big (pause) *cake* on it/ and the *girl/* jumps *up/* (here someone else fills in for her with the phrase 'with a machine gun').

This speech, which here comprises but one Locution, may be divided into four Tone Units. For the first three of these there are three corresponding G-Phrases, and the form of movement in the stroke in each of them has a clear relation to the content of what F is saying. Thus in G-Phrase 1 F sweeps her left arm inward in a horizontal motion — this is associated with 'they wheel a big table in'. In G-Phrase 2, co-occurrent with Tone Unit 2, F makes a series of circular motions with the forearm pointing downwards and with her index finger extended, here describing in movement the shape of a cake. In G-Phrase 3 she raises her arm rapidly

until it is fully extended vertically above her. This is clearly a 'jumping up' movement, the action taken by the girl she refers to, though this action, it will be seen, is not referred to verbally until the last Tone Unit, during which F is only recovering from the previous G-Phrase, not producing a new one.

Looking at the relationship in time between the components of these G-Phrases and the flow of speech, it appears first that the stroke of G-Phrase 1, the horizontal inward movement of the left arm, commenced precisely at the same moment that F's speech began, but its preparation, the lifting of the arm to the position from which it commences the inward sweep, began 19 twenty-fourths of a second before this. This exemplifies the anticipatory character of gesticulation mentioned above. Second, it will be noted that the second Tone Unit is broken up. The prehead is spoken twice and then there is a pause of 26 twenty-fourths of a second before the rest of the phrase is uttered. It is during this pause that the rotary movements of the second G-Phrase are produced. The head section of the Tone Unit, '*cake* on it', is uttered as the limb recovers from the stroke. Here, then, though speech was arrested, this portion of the utterance was continued to completion kinesically.

In the next G-Phrase, as we have seen, F raised her arm rapidly to a vertical position. This movement matched precisely the tonic of the Tone Unit — this is the word 'girl' — but, as we have also already noted, the form of the movement referred, not to the girl but to her action of jumping up which is nevertheless given verbal expression in the next and final Tone Unit. Thus though in terms of phrasal organization F's speech and gesticulation become once again aligned, in terms of the semantic content the gesture was well in advance of the verbal reference.

As we have seen, phrases of gesticulation tend to appear a little in advance of their associated speech phrases, and their preparation begins sometimes well in advance. This suggests, as we have said, that the processes of speech-utterance and gesture-utterance begin at one and the same time. The temporal priority of gesture may partly be due to the fact that for a given idea to be expressed in words it must be strung out in time, whereas the same idea may be expressed in gesture within a single movement or pose of the hand. However, the observation that speech production may be interrupted while gestural production is not, may also suggest that the process of gestural encoding is more readily accomplished than that of verbal encoding and so may be faster for this reason.

MODES OF IDEATIONAL REPRESENTATION IN GESTICULATION

We have argued that gesticulation is a second output of the process of utterance. Insofar as utterance makes use of the vocal channel, use is made of a complex code, language. In the kinesic channel, however, the movement patterns that are employed in gesticulation do not appear to have properties that are like the lexical and syntactic character of spoken language though they do appear to share, in the dynamics of their organization, some of the prosodic features of speech, at least in the speakers of English to which this sort of analysis has been confined. Thus we have seen how gesticular phrases may be distinguished in terms of nuclei of kinesic emphasis, much as Tone Units may be distinguished in terms of nuclei of vocal prominence. There is also some reason for thinking that intonation tunes may have their parallel in kinesic organization. Thus Birdwhistell (1970a) has reported that a lowering of a gesticulating body part co-occurs with a falling terminal juncture in speech and that where a gesticulating body part is sustained or held at the end of an utterance, the pitch of the voice is also either sustained or raised. Several examples of our own, which will be reported in detail elsewhere, show that in questions in which the pitch of the voice is raised or held, concurrently the head or hand is also raised or sustained.

However, gesticular movements, although shaped in part in parallel to the prosodic structure of the concurrent speech also are patterned in ways that are clearly related to the content of what is being expressed. Furthermore, in the various poses the hands may assume, we can also see manifestations of aspects of the content. The relationship between the content of gesticulation and the content of speech is a highly complex one and we cannot undertake a detailed review of this here. To date the most thorough treatment of this still remains that of Efron (1941). Here we will cite a few representative examples from our own material to show that the mode by which ideas are encoded in gesticulation is quite different from the way in which they are encoded in language.

First, p may depict in gesture some object or action he is referring to in speech. Thus in the 'cake' example F2, given above, F performed movements that were analogous to movements that would be made of wheeling in a table or jumping up; she also made a movement that outlined the shape of the cake she was talking about. Movements characteristic of aspects of action are indeed very common. In F42, which we already have alluded to, F continues her description of the patient's relation to her father by saying 'and she doing things to annoy him, to attract his attention, to outrage him'. Over each of these three Tone Units she moves her hand outward in a rapid 'slapping' movement,

which has the dynamic character of actions that, addressed to another, would provoke or tease him. In D43, in asking why both the psychiatrist and the social worker F had had difficulty in getting the patient to tell her history, he says '. . . maybe it's because *Pete* doesn't want to *nail* down this attractive bit of *fluff* or something'. As he says 'nail down' he raises his right arm, hand posed as if it is holding something, and he performs a series of forward thrusts, an action sequence which has the character of knocking nails into something, as one might if one were nailing a notice to a door.

In these examples p appears to be creating a gestural form *de novo* to suit the immediate utterance. Sometimes, however, he makes use of a gestural form that is more or less conventionalized. Thus, in the example just mentioned, when D says 'bit of fluff' he raises both hands, palms facing inwards, and performs sinous in-out movements, thus performing a well-known gesture which means 'shapely woman'. Such conventionalized patterns may take on the status of gestures which can be given a meaning when presented in isolation. These have been termed 'emblems' by Ekman and Friesen (1969).

Gesticulation does not only depict objects, actions, or behavior styles of others that are being described. It may also be used to encode more abstract features of the utterer's discourse. For example, it may refer to the overall theme of the utterer's discourse, rather than to particular parts within it. For example, in the first part of D43, D says: /How about this *his*tory business/ you *Pete*'s having trouble getting a history/. As he says this, his hands are held forward, palms facing each other in a 'framing' arrangement. This double hand frame was sustained throughout the series of Tone Units in this part of the utterance, which are linked together by the theme of 'getting a history'. In other instances a sustained hand position may be observed which appears to mark the *kind* of utterance that is being produced. Thus we have collected many examples in which a sustained position of an open palm extended forward marks a question or an utterance in which p is putting forward an example for discussion.

Gesticulation may, in various ways, make visible the organization of the discourse. We have already referred to the way in which body use is differentiated in association with different segments of the discourse. However, at times one may observe gesticulatory patterns that appear to have this function particularly. Thus in a discourse recorded in the film TRD 009 (not described in Kendon 1972) the utterer, x, describes certain features of the British Northerner. As he does so, each Tone Unit is associated with a distinct rotary movement of the right arm, while he holds his left arm forward and slightly bent at the elbow. This is

sustained for this segment of the discourse, apparently framing or tying together the separate statements he is making.

The foregoing is intended to suggest that there are many different ways in which gesticulation may be related to the content of an utterance. Gesticulation and speech work together in an intimate relation of great flexibility and subtlety. However, as we have already suggested and as these examples must make clear, the mode of encoding of content is quite different in gesture from the mode of encoding in speech. Whereas in language highly conventionalized forms from an already established vocabulary are used, which are organized sequentially according to grammatical rules, in gesticulation encoding is presentational. Though conventionalized forms may be used, the utterer has considerable freedom to create new enactments which do not then pass into any established vocabulary. As far as can be seen at the moment, gesticulation is not composed of elements which are formed into constructions according to a syntax. They occur, rather, as a succession of enactments whose sequencing is governed by the order of presentation of ideas in the discourse.

The enactments of gesticulation described above are broadly of three sorts. There are movements of the sort performed in the 'cake' example in which the form of an object may be suggested. There are movements which consist in actions, which are the actions being directly described. There are also movements which suggest the arrangement of objects in space, the organization of space into sections or compartments, or the moving about of objects in space. Here the gesticulation seems to consist in the operations of spatial organization and reorganization of elements of the discourse themselves. It is as if, in the movements of the hands we can observe overt manifestations of the objects, actions and their organization into arrangements and sequences by which the goal of an utterance may be achieved.

Several recent lines of investigation have suggested that the process of thought often involves operations on mental images which are directly parallel to physical operations on actual objects (Metzler and Shepard 1974; Huttenlocher 1975). McNeill (1977) has described how, when subjects are asked to give an account of how they carried out a mental paper-folding task of the sort described in Metzler and Shepard (1974), as they spoke they performed enactments in gesticulation of the operations they were describing in words. In utterance, thus, one makes manifest in overt behavior the operations one is performing on one's mental representations of objects or actions. This is done both directly, in gesticulation, and also by means of speech.

It is of great interest to note, in this connection, that Blass, Freedman

and Steingart (1974), in a study of hand movements during speech in congenitally blind individuals, found that these consisted in complex movements in which the fingers of the hands were continually touching themselves. The mental representations of blind persons are largely haptic. If gesticulation is indeed the manifestation in movement of the operations one is performing on one's mental representations of objects or actions, whereas these are spatial in seeing persons, one would expect them to be tactile in blind individuals, as the observations of Blass et al. would suggest.

We earlier noted that Gesticular Phrases tended to emerge in advance of the segment of speech in which the same idea is encoded. This observation, also recently reported by Butterworth and Beattie (1976), suggests that Gesticular Phrases originate at a very early stage in the process of utterance. The way in which the content of the utterance appears to be manifested in the Gesticular Phrase suggests that the process of utterance has its origin in the organization and manipulation of mental representations of images and actions directly and not, initially, in the organization of forms that can be derived only from verbal language.

Recent developments in linguistic theory have led many to the view that it is the semantic organization of an utterance that is the starting point for the processes by which its surface structure is eventually generated (Maclay 1971; Leech 1974). Most particularly, in this connection, we may mention the views of Chafe (1970) who has argued explicitly for the position that the process of utterance generation proceeds through a series of stages, starting with the organization of semantic structures. The work on gesticulation we have reviewed here would suggest that this earliest stage in the process of utterance formation has, or can have, a direct expression in gesticular action.

DISCUSSION

The foregoing analyses are all based on occasions when a speaker is also engaged in obvious gesticulation. However, such gesticulation is not always present, and it would be very helpful for our further understanding of its significance if we knew more about the circumstances in which it is likely to appear.

Several writers have suggested that since the mode of representation of ideas in gesture is more primitive it is likely to be resorted to where the speaker is finding it difficult to express what he has to say in words (De Laguna 1927; Mead 1934; Werner and Kaplan 1963). In this view, it is

supposed that the prior enactment of ideas in movement facilitates their transformation into sentential form. Kendon (1972) described an example of an apparent working out in gesture of a complete utterance during a period of highly dysfluent speech. The observation reported above when F described the shape of a cake in movement during the pause in her speech that preceded the production of this word could also be interpreted in these terms. Butterworth and Beattie (1976) similarly suggest that gestural enactment may play a part in the facilitation of word search. Elzinga's observation (1978) that Japanese in conversation with other Japanese gestured much less than when they were conversing in English with Australians could also be interpreted in terms of this idea. Dobrogaev (1931: 127) reported an experiment in which subjects 'had to talk, trying to completely inhibit the gesticulatory movements of their extremities, their head, and mimic movements of the face — in general, the whole body. It turned out that no one could carry out such an inhibition completely . . . /furthermore/ the speech . . . lost its intonation, stress and expressiveness; even the very selection of words needed for the expression of content became labored; there was a jerkiness to the speech, and a reduction in the number of words used'.[2]

On the other hand, Ekman and Friesen (1972) have suggested that gesticulation is more likely to appear, the more excited and enthusiastic the speaker is, and the more dominant his role in the interaction. Consonant with this, Baxter, Winter and Hammer (1968) have reported a study in which they found that speakers produced more gesticulations when they were talking fluently on a topic with which they were familiar, than when they were talking about something they knew less well.

These observations and suggestions are not incompatible. If, as we suppose, the tendency to enact in movement the ideas that are to be encoded in speech is always present, the above observations and suggestions indicate some of the conditions in which such a tendency is enhanced. On the one hand, an increase in the energy level that someone engaging in an utterance employs will lead to the overt manifestation of gesticulation. On the other hand, where the speech component is inhibited or blocked, this same tendency again is enhanced. It is notable that children who are born deaf spontaneously resort to gesture as a mode of linguistic expression at the earliest opportunity (Goldin-Meadow in press; Goldin-Meadow and Feldman 1977). Where gesture is then sustained as the only mode of linguistic expression available, it becomes much elaborated and organized into a fully linguistic system (Kuschel 1973; Stokoe 1960, 1972; Friedman 1976, 1977).

Does gesticulation function communicatively? It is remarkable how few investigations there are that have tackled this question. Cohen and

Harrison (1973) compared the number of gestures used by a speaker in giving directions to another over a sound intercom system and the number employed when the directions were given face-to-face, and found there was an increase in the latter condition. This suggests that a speaker may add in gestures if the circumstances are such that they could be appreciated by his recipient. However, only Graham and Argyle (1975) appear to have tested directly the question of whether gesticulation improves the effectiveness of communication. In their study, subjects were faced with the task of describing geometric figures to recipients who had to draw the shapes described. A comparison of the degree of similarity of the shapes described and the shapes drawn in response to the descriptions served as a measure of communicative effectiveness. Twenty-four English and 24 Italian subjects took part. All subjects described one set of shapes with any gestures they liked, and another set without using gestures. It was found that for both English and Italian groups there was some improvement in communication when the gestures were used, but this improvement was much more marked for the Italians than for the English. This indicates that gestures may be used for information by recipients, at least those that serve to describe shapes. It also suggests that there may be cultural differences in the extent to which such gestures are attended to and made use of. Efron (1941) described the pictorial nature of Italian gesticulation, and there are several other authors who have discussed the propensity for the use of gesture by Italians (de Jorio 1832; Efron 1941; Lyall 1956). It is interesting that the findings of Graham and Argyle's study are in line with this.

Despite these findings, the fact that people can very readily carry on conversations over the telephone, or in situations of poor lighting where gesturing is hard to see, suggests that where speech is available gesticulation is not usually of central importance for linguistic communication. This makes its intimate and deep connection with speaking all the more striking.

In a previous paper (Kendon 1975), to which the present one is heavily indebted, it was suggested that this connection between speech and gesture is not incompatible with the idea recently revived by Hewes (1973a, 1973b) that the first form in which language emerged was gestural and that the development of vocal activity for language functions occurred at a later stage.

The fact that gesticulation tends to anticipate speech, that speech may be readily disrupted when concurrent gesticulation appears to go forward smoothly, and the fact that on occasion a gestural response may be given first before any speech whatever is begun, does perhaps provide a hint

that the gestural channel is easier and more readily called upon, that the process by which an idea is transformed into linguistically functioning public behavior is more swiftly accomplished gesturally, that there are fewer steps to the process than there are when a formulation of the 'idea' into speech language is to occur. The least we can say about this is that we would not, perhaps, expect a more elaborate and time consuming method of utterance to be the one that was first developed in language evolution. In these respects, thus, the findings reviewed in this paper are fully consistent with Hewes' argument in favor of a gestural origin for language.

NOTES

1. This paper includes material originally published in Kendon (1975). I am indebted to W. S. Stokoe, the editor of *Sign Language Studies* for allowing me to do this.
2. Translation by Margaret Kendon.