

THE MELODY OF LANGUAGE

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UNIVERSITY PARK PRESS
International Publishers in Science, Medicine, and Education
233 East Redwood Street
Baltimore, Maryland 21202

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21/ Intonation in Glottogenesis

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INTONATION "IN THE WIDER SENSE"

It has become somewhat commonplace to consider the superficial structure of "distal" communicative performance on a two-level basis: linguistic and extralinguistic. On the linguistic level, according to Hockett (1963, p. 19), "a speaker transmits, simultaneously, a nonintonational and an intonational message." The extralinguistic contribution to communication seems to correspond again, according to Trager (1958), to a two-level discrimination between "paralanguage" and "kinesics." The linguistic level is integrated by Sebeok (1968b, pp. 8-9) into "anthroposemiotics," whereas the extralinguistic side is equated to what he calls "zoosemiotics." In other words, we have on one hand a two-level macrostructure and on the other hand an underlying four-level structure consisting of linguistic segmental, linguistic suprasegmental, paralinguistic, and kinesic.

The interaction of linguistic segmental and kinesic levels constitutes a well-known dichotomy. In terms of Hockett's design feature 1, linguistic segmental messages are conveyed on the vocal-auditory channel, whereas kinesic messages travel the gestural-visual (haptic-optic) channel of communication. Man's "congenital"¹ predisposition toward dominance of vocal-auditory over gestural-visual can be explained as an evolutionary outcome of recent standing (Hewes, 1973). In between the two extremes of linguistic segmental and kinesic, the intermediary levels of linguistic suprasegmental and paralinguistic are far less well defined as to their nature and genesis.

The most common assumptions define intonational features of language as propositional or distinctive in nature and relegate paralanguage either to the emotional or the subliminal. Bolinger (1964, p. 841) introduces, for the meaningful nontonemic uses of fundamental pitch, the rather ingenious notion of the convertibility of intonational formatives into grammatical formatives.

¹Following R. W. Wescott's suggestion (in Hewes, 1973, p. 19), I substitute "congenital" for the rather ambiguous "innate."

For example, "interrogative particles may take over for interrogative intonations." However, Bolinger never loses track of the obvious fact that paralinguistic formatives (those characterized by Trager as vocal characterizers, qualifiers, and segregates) convert equally well into lexical formatives or paraphrases of some sort.² His conclusions should therefore not surprise us at all (1964, pp. 843-844):

Finding comparable meanings in intonation therefore requires us to put them in the most general terms, away from the polarity of likes and dislikes. And generalizing forces us back to emotion. The very thing that was ruled out of the system comes back at the heart of it; . . . *It is impossible to separate the linguistically arbitrary from the psychologically expressive.* (Italics are mine.)

The typology of intonation, then, Bolinger would add "in the wider sense," has to "start at the central theme and trace its metamorphoses." The central theme includes both the "linguistic suprasegmental" as well as the "paralinguistic." As a universal pivot, it inserts into the dichotomy of the linguistic segmental versus the kinesic; it seems to be "vocal-auditory," but also (Bolinger, 1964, p. 844) "is like gesture," and as such it is "suprasegmental" to both.

INTONATION AND LINGUISTIC PHYLOGENESIS

Little can be said about the intonation of languages such as Proto-Indo-European or Sumerian, removed both in time and accessibility. Since linguistic phylogenesis is, practically speaking, synonymous with the history of writing, it is understandably difficult to go beyond mere guesswork, based on comparative materials from modern languages, such as Hermann's (1942) assumption that the universality of high pitch in questions constitutes proof for a "genetic" kinship of all languages.³ There is possibly more to be said on the subject of tonic suprasegmentals (intonation in the wider sense) in a glottogenic perspective.

²Cf. also Lakoff, 1972, on problems relating to phenomena of a kind such as the German particle *doch* or Stockwell, 1971, and Wittmann, 1970, on aspects of correlation between deep structure and intonation.

³I was first introduced to Hermann back in 1961 while working as assistant to Bolinger, a fact that Bolinger generously acknowledged in his paper in 1964 (p. 836, fn. 24). In a subsequent letter he writes: "I have of course acknowledged your translation, but don't expect your reputation to be permanently established by a footnote. In other words, bear down on the scholarship, my lad, and the best of luck to you, and thanks from your friend." It is with this personal note in mind that I dedicate the conclusions of this paper to a great friend whose qualities of perception and vision took him beyond the narrow constraints of a single discipline to conclusions not always understood by Hall, Hockett, and Messing (1973).

There is, first of all, Hewes' (1973, p. 6) observation that the universality of individual language features may be the outcome of cultural diffusion rather than of congenital human propensities.⁴ This argument is quite useful when we wish to distinguish the social uses of individual signata from the full range of possible signantia that are species-specific to man. On the particular subject of intonation universals, Bolinger (1964, pp. 840-843) feels that:

The similarities among languages without apparent genealogical ties can hardly be the result of chance; but the differences that we find argue against heredity as the all-pervasive influence, powerful as it may be in the short run.⁵ On the one hand intonation seems to cling even when a community adopts a new language; on the other, it does not cling tenaciously enough to prevent dialects of the same language from diverging. . . . The paradox is resolved if we see intonation as tied with other forms of behavior such that it will change with a change in community manners as much as with a change in language. . . . This leads me to propose that in addition to heredity, certain underlying physiological or psychological traits are at work.

It is Bolinger's basic assumption that fundamental pitch, as it turns up in natural languages, reflects a natural condition of human speakers. He is therefore able to take into account evidence from developmental psycholinguistics such as the acquisitional primitive of the child's response to "melody" in general and to "suprasegmentals" in particular, or the observation that intonational contours are deep-structure related. He concludes quite simply:

A tension-relaxation dichotomy lies back of fluctuations in fundamental pitch, and its universality rests on our psychophysical makeup. It is extended by out-reaching metaphors, likewise shared among languages to the extent that they are obvious but are less shared, and differ from language to language, as they become more occult. The primary, transparent metaphor is the simulation of tension, still part of the physiological given: on the one hand nervous excitement, on the other, unfinished business. At a first remove, excitement, besides pitching high the entire length of an agitated utterance, gives us the rudiments of an accent system in which the pitch goes up only on the items that are exciting. Unfinished business, besides telling us that we are in the middle of an utterance, next transfers the high pitch of the middle to the end, enabling us to leave things like questions deliberately unfinished for the interlocutor to finish them. . . . Metaphors are overlaid on metaphors: a speaker reins himself in and holds down a high-pitched accent the way he controls his temper; this too is simulated and we get the reversed accents that are so common in Indo-European languages to signal restraint. At yet another remove a language using accents for the exciting of

⁴Cf. also Gelb's hypothesis (1952, pp. 212-220, 303-304) for monogenesis of writing through stimulus diffusion.

⁵"Heredity," as used by linguists, refers to the uninterrupted extragenetic transmission of code fixations and traditions through learning and teaching. The same is true of "genetic."

important items of discourse may exploit differences in order to show degrees of importance: a scheme of relative heights among accentual peaks. Meanwhile, much of this gets partially grammaticized. An accent language employing relative heights may distinguish old from new or topic from comment, with intonation getting a foothold in the syntax. But the foothold is with one foot; the other one is back there doing its primitive dance (Bolinger, 1964, p. 843).

If we are to take considerations of this kind seriously, the quest for universals of intonation and the genesis of tonic suprasegmentals must go beyond the phylogenetic reconstructions of traditional historical linguistics. Since, in Bolinger's own words (1964, p. 844), "the universality of intonation in the wider sense is hardly to be doubted," we must extend our interest in the matter to the question as to whether suprasegmentals as a level of communicative performance are species-specific to man or shared by a larger phylum of biological evolution.

GLOTTOGONIC ASSUMPTIONS: STATE OF THE ART⁶

Glottogonic research has been marred to this day by three basic assumptions, all closely related to subsisting negative attitudes of containment toward so-called anti-intellectual trends.

1. Glottogonic statements, because of the very nature of the enquiry, cannot be shown as either true or false.
2. No complex communicative skills exist below the level of man. Language therefore cannot be compared to animal systems of communication.
3. Intonation and paralanguage are incidental to human communication.

The first assumption led to the 1868 ban by the Société de linguistique de Paris against all papers dealing with language origins.⁷ The ban proved quite ineffectual against the proliferation of new ideas on the subject, particularly in the area of comparative psychology. The second assumption is clearly directed toward confining efforts to compare the propensity for language in humans and nonhumans:⁸

"In the beginning was the Word," the Logos, reason, the creative idea. Human existence begins with language. As Wilhelm von Humboldt says: man is only man because of language; he had to be human to invent language. The formula: *no language without man, no man without language*, lends a special interest to

⁶I cannot consider here all the varieties of far-fetched ideas on the subject. For a bibliography, see Hewes, 1971.

⁷Mémoires de la Société de linguistique de Paris 1: III.

⁸See Nehring's review (1964) of relevant literature, where he denounces the anthropocentric attitudes of most authors.

the question of the origins of language, and furnishes a clearly-defined starting-point for research (Révész, 1956, pp. 6-7).

These arguments rule out the possibility that our presumed ancestors at any time in human prehistory adopted from animals of any sort either the initiative for linguistic communication or the material for it. The same may be said of music. In view of all this we are entitled to eliminate the animal-psychology hypothesis once and for all from the question of origins, or for that matter from comparative and genetic linguistic science as a whole. We can consequently declare that the misleading expression "language," which has given rise to so many misunderstandings, is inappropriate for use in animal psychology (Révész, 1956, pp. 36-37).

It just does not belong to the nature of the beast to speak, or want to speak. . . . The chimpanzee has simply no built-in mechanism which leads it to translate the sounds that it hears into the basis around which to unite its own ideas or into a complex mode of behavior (Wiener, 1954, pp. 82-84).

No living animal represents a direct primitive ancestor of our own kind and, therefore, there is no reason to believe that any one of *their* traits is a primitive form of any one of *our* traits (Lenneberg, 1967, pp. 234-235; cf. also Lenneberg, 1971).

Anyone concerned with the study of human nature and human capacities must somehow come to grips with the fact that all normal humans acquire language, whereas acquisition of even its barest rudiments is quite beyond the capacities of an otherwise intelligent ape: a fact that was emphasized, quite correctly, in Cartesian philosophy. It is widely thought that the extensive modern studies of animal communication challenge this classical view; and it is almost universally taken for granted that there exists a problem of explaining the "evolution" of human language from systems of animal communication. However, a careful look at recent studies of animal communication seems to me to provide little support for these assumptions. Rather, these studies simply bring out even more clearly the extent to which human language appears to be a unique phenomenon, without significant analogue in the animal world. If this is so, it is quite senseless to raise the problem of explaining the evolution of human language from more primitive systems of communication that appear at lower levels of intellectual capacity (Chomsky, 1968, p. 59).

The third assumption is a direct corollary to the second. Narrowing down the definition of language so as to exclude paralanguage or kinesics from consideration is essential to establishing animal systems of communication as mere "finite behavioral repertoires" or "closed repertoires of calls," where every repertoire consists of a fixed, finite number of signals, and where each signal is associated with a specific range of behavior or emotional state:

The noise-making aspect of language, at least today, is only one incidental feature of our form of communication (the deaf have language without noise-receiving or making) (Lenneberg, 1967, p. 235).

... expressive gestures and sounds do not constitute a means of communication as such. . . . Very few words in human language can be derived from expressive sounds. . . . It is therefore much more likely that it is not the expressive sounds that have played a constructive role in the origin of language, but rather the reverse: the linguistic function has transformed some expressive sounds into a means of communication (Révész, 1956, p. 24).

Expressive gestures only become language when the natural eloquence of the human body is developed and transformed into a system of symbols on the model of an evolved language, as in the gestural language of the deaf-mutes (Bühler, 1934, p. 70; translated from the German).

As indications of the evolutionary priority of gesture language, [the communicative gestures of the chimpanzee] are irrelevant, simply because the chimpanzee has also expressive sounds, and makes use of them to a greater extent than gestures. Hence there is no proof that among anthropoid apes gestures preceded expressive sounds (Révész, 1956, p. 52).

Et il ne doit pas confondre les paroles avec les mouvements naturels qui témoignent les passions, et peuvent être imités par des machines aussi bien que par les animaux; ni penser, comme quelques anciens, que les bêtes parlent, bien que nous n'entendions pas leur langage (Descartes, 1637, p. 58).

Aprioristic attitudes of this kind, Fouts (1973, pp. 1-8) shows, have gained such wide acceptance that positive proof in the area is no longer considered a necessary prerequisite to the debate. The underlying anathema, in fact, comes through loud and clear: *Extra ecclesiam, nulla salus*. However, it shouldn't seem strange to us that fundamentalists would be hostile to apes and robots alike.

GLOTTOGONIC RESEARCH: RECENT DEVELOPMENTS

It is Hockett's basic merit to have shown that "human language as a whole can be compared with the communicative systems of other animals, especially the other hominoids, man's closest living relatives, the gibbons and great apes." Although his concept of a design feature framework was an unstable and evolving one [seven in 1958 (pp. 574-585), 13 in 1960, 16 in 1963, and 26 in 1968 (Hockett and Stuart)], he was bold enough to suggest that a comparative method modeled on that of the zoologist would further the investigation into the origin of language. However original this point of view may have been, many did not share it, and some rejected it outright (see Lenneberg, 1967, pp. 232-234).

The debate around the topic has been considerably enlivened through recent successful attempts to teach chimpanzees the rudiments of human language. Since the use of the vocal-auditory mode of communication seemed inappropriate when dealing with apes [cf. the discussions by Kortlandt (1968, 1973) and Fouts (1973, pp. 8-9), as well as Bryan's (1970) intelligent reply to

Carini, 1970], Gardner and Gardner (1969) and Premack (1970) independently came to base hominoid language acquisition on a gestural-visual model (see report on progress along these lines in Fouts, 1973). Obviously, the underlying language ability in these apes must be "homeomorphic" to the basic human ability under consideration, which is exactly Lenneberg's (1971) prerequisite to comparison of animal communication with language. It should therefore be useful to see how homeomorphic mapping for the two systems could be conceived in terms of an adapted set of design features.

Design features of communicative capacity, as understood here, are logical assumptions that we can make about congenital "hardware" propensities that favor and shape the development of communicative behavior in man and chimp.⁹ The inherent capacities of the two systems may be projected from a descriptive perspective correlating two frameworks of interpretation:

- A. Features characterizing the capacity of the channels of transmission relative to the sensory and modulating capacities of the receiving and emitting apparatus.
- B. Features characterizing the power of code flexibility.

These frameworks of comparison characterize, in fact, the biophysical and the biosemiotic aspects of the systems under discussion. Although the two are logically interdependent, relative characterizations of each and both of them can be obtained whenever mutually exclusive perspectives are implied.

A1. Channel Capacities for Distal Communication

The first question we might ask is whether distal or proximal modes of communicative linkage are involved. If we decide, as in the case here, that the privileged channel of complex communication is distal, we must presuppose the existence of proximal communication on a lower level.¹⁰ Distal communication, as observable on planet Earth, necessarily implies modulating and demodulating capacities of the following kinds:

- A1a. Visual decoding
- A1b. Auditory decoding
- A1c. Gestural encoding
- A1d. Vocal encoding

⁹I can only hope that I won't suffer the fate of Ernst Haeckel, who was accused of having tried to prove the identity of human and animal development by labeling a photograph of a pig's fetus as that of a human embryo. Otherwise, I'm indebted to Roger Fouts and Gordon Hewes for letting me have access to then unpublished material.

¹⁰"Proximal" is understood here as mechanically or chemically tactile (immediate), somewhat as represented in the works of Hall (1966), Sebeok (1967), and Wilson (1968). In proximal communication, the effectors, characteristically, supply their own mediating agents.

The postulates underlying the whole of A1 include Hockett's DF2 (broadcast transmission and directional reception) and DF3 (rapid fading), whereas A1b and A1d in particular correspond to DF1 (vocal-auditory channel). Since chimps, in addition to their ASL competence, are capable of understanding complex English sentences, it must be assumed that A1d is actually the only channel capacity lacking in chimps but present in men. Kortlandt (1968, 1973), Lenneberg (1962, 1967), and Lieberman, Crelin, and Klatt (1972) offer attractive explanations regarding this fact. Lenneberg (1967) furnishes interesting parallels in humans (and a conclusive corroboration of implications underlying Kortlandt's observations) when he says that: "[due to a congenital deformity,] children may acquire a complete understanding of language without ever having been able to produce intelligible words" (p. 66); "the development of language is quite independent of articulatory skills . . . the perfection of articulation cannot be predicted simply on the basis of general motor development" (pp. 127-128); "since knowledge of a language may be established in the absence of speaking skills, the former must be prior, and, in a sense, simpler than the latter. Speaking appears to require additional capacities, but these are accessory rather than criterial for language development" (pp. 308-309, with an earlier reference to Premack and Schwartz, 1966, p. 305).

Total Feedback Control (DF5)

In all communication, total information is an additive vectorial combination of the information provided by all of the system's relevant components. Wiener has shown that a complete additive system like this cannot be stabilized by a single feedback. Distal communication, as a matter of fact, may employ three stages of feedback:

- A2a. Proprioceptive (or kinesthetic) broadcast control
- A2b. Exteroceptive broadcast control
- A2c. Feedback derived from decoding a response in successful communication

In stickleback courtship, as far as the distal components are concerned, A2b is lacking and the basic A2a is backed up by A2c alone.¹¹ In man and chimp, the basic A2a is necessarily backed up by A2b, whereas A2c in these animals may be required in some situations but totally cut out in others. This particular pattern of feedbacks allows them not only to record the performance or nonperformance of their own tasks, but also to be *en rapport* with the outer world *on a selective basis* in order to *know* what the existing circumstances

¹¹The male stickleback, according to classical reasoning (cf. Hockett), does not see the colors of his own eye and belly (the static sustained signals) that are crucial in stimulating the female.

are. The latter constitutes, according to Wiener (1954), feedback of a higher order necessary to learning, since 'past experience is used not only to regulate specific movements, but also whole policies of behavior . . .' (p. 33); 'It differs from more elementary feedbacks in what Bertrand Russell would call its 'logical type' ' (p. 59; cf. Wiener, 1961, p. 126). In fact, the notion of total feedback in man and chimp is so powerful that it must include Hockett's DF4 (interchangeability),¹² DF6 (specialization),¹³ DF12 (code acquisition through learning),¹⁴ and DF15 (reflexiveness). In other words, the network under discussion can involve reciprocal exchanges intraspecifically with individuals and organized groups of the same or related species; the network, however, can be short-circuited, reducing dialogue to monologue and metalogue. This line of reasoning is entirely consistent with Kortlandt's (1973, p. 14) observation that chimps do a lot of "thinking aloud" without needing any short-term "reward" for their performance in such a situation.

Code Capacity

The idea of "code capacity" is meaningful only to the extent that we can oppose it to "code acquisition." If this general requirement is not met, code ontogenesis *and* phylogenesis are dependent on physiological maturation alone without the "addition," along the way, of any learned "software" components. The optimal code is part of the system's hardware. In distal communication, however, extragenetically determined and congenital code aspects remain quite distinct. Moreover, the kind of code capacity we wish to investigate must be homeomorphic to human language capacity. This is to say that the code capacity we're looking for can operate only when conditions on A2 are optimal and conditions on A1 optimal or minimal.¹⁵

Three gradations of code flexibility are criterial in mapping natural code capacity in man and chimp:

- B1. Capacity for predication
- B2. Capacity for isolation
- B3. Multiple codability

Predication implies that every "Sentence" in rule-governed coding behavior will have the pattern "Subject + Predicate." The notion of "Sen-

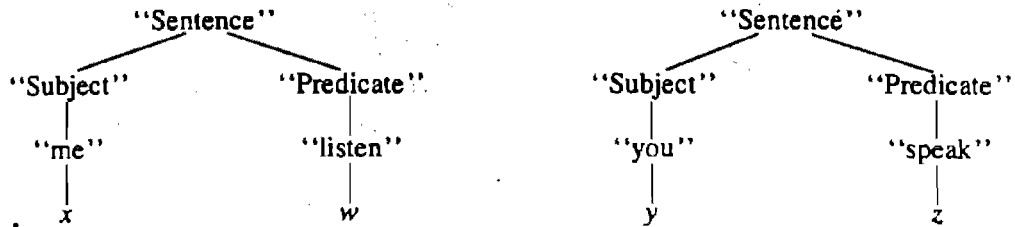
¹²Either adult participant can act out the signals appropriate to the other. This feature and the whole of A2 are prerequisites to B3.

¹³To the extent that this concept is not totally meaningless.

¹⁴This feature predetermines the meaningfulness of the parameters underlying feature framework B, whose capacitive margin will tell what sort of code or codes the system is able to handle.

¹⁵Minimal conditions on A1 are needed in order to stimulate human code acquisition (and maturation based on experience) in the presence of congenital channel deficiencies.

tence," however, can be meaningful only in relation to other "sentences" generated by the same code. The minimal requirement would be that "Subject" and "Predicate" be sets consisting of at least two "Concepts," and that "Concepts" be correlated to single surface labels. In this way, it would be possible to generate four different sentences and 12 narrative patterns that are not repetitions. Two sentences with no overlapping, such as



would be a representative sample from which to construct the optimal grammar. The model involves syntactic blending of the simplest kind (Bolinger, 1961), as well as narrative competence (Wittmann, 1975). The requirements for Hockett's DF9 (discreteness) and DF7 (semanticity) are equally met, which implies also a minimum of arbitrariness (DF8) and double articulation in the wider sense (DF13). B1 seems thus to be a very fundamental aspect of code capacity and should have appeared early in its development (cf. Bidwell, 1968).

The minimal units functioning in syntactic blending are formatives (as defined by Bolinger, 1948). The formatives in the sample sentences xw and yz are, as total gestalts, logocenematic, i.e., cenemes of word size. Isolation (B2) renders formatives cenematically and plerematically complex.¹⁶ Isolation allows recursive definitions of formats in response to communicative needs conflicting with the tendency to reduce to a minimum mental and physical activity. The implied DF11 (productivity) leads to distinctions such as lexical/grammatical, generic-specific, and ultimately to DF10 (displacement).¹⁷

Multiple codability (B3 corresponding to Hockett's DF16), although to some extent inherent in optimal A2, constitutes capacity of a higher order than B1 and B2 together, whether cross-modal transfer of learning or code-

¹⁶Formatives are built out of recurrent partials that Hall (1959, pp. 106-110) calls "isolates" (phonemes in speech, kinemes in gesture, and so on). B2 now includes Martinet's double articulation in the narrow sense (DF13) and supposes arbitrariness of a higher order (DF8).

¹⁷Healy, 1973, doubts whether chimps could ever learn a phonemic language (i.e., truly talk). She is apparently unaware that ASL does have "structure" below the level of the formative, and she doesn't account for the chimp's ability to understand spoken English. Without that sort of underlying economy, the mind of the chimp would never have been able to generate such things as "dirty monkey."

switching on the same mode is involved. Bicodality in chimps has definitely been observed by Kortlandt (1967) and Fouts, Chown, and Goodin (1973) (and by Carpenter, 1969, p. 51, for lower primates).¹⁸ Bicodality is equally involved when code surrogates (converting evanescent messages to frozen messages) develop under laboratory conditions (the cases of chimps Sarah and Lana). The general principle underlying bicodality might be called "economy of alternate policies of behavior." Eventually, bicodality in the individual and variable rules in the group (as defined by Labov, 1972),¹⁹ will affect the extragenetic transmission of code structure and lead to code change and code diversity.²⁰ Thus, even the covariability of linguistic with social structure turns out to be a phenomenon common to the life of man and chimp.²¹

INTONATION IN GLOTTOGENESIS

As can be seen, the communicative capacities of man and chimp do meet Lenneberg's requirement of homeomorphism. Comparative evidence may therefore be helpful in glottogenic debating.

Lenneberg himself, on the basis of congenital anarthria observed in human subjects, comes to the conclusion (1967, p. 305) that speaking skills evidently are accessory rather than criterial for language development. Why, then, shouldn't the absence of speaking skills in chimps be interpreted by Hewes as meaning that human speaking skills must constitute, in a model of glottogenesis, a relatively recent addition to the overall code capacity as compared to the preexisting gestural skills?

As a last step, we may now attempt to determine how "suprasegmentals," intonation in the wider sense, insert into a model of "optimal" distal communication. Do primates, for instance, make use of suprasegmental modalities?

On examination, there can be no doubt that what we call "primate vocalizations" (as, for example, in Altmann, 1968) are the suprasegmentals

¹⁸Carpenter (1969, p. 51): "It's a reasonable hypothesis, therefore, that vocal responses are less plastic for learning and more fixed than their sensory perception and associated neurological processes. The latter can be learned for use in across species communicative behavior, and in interactions between individuals of different species as exemplified by these infant howler and spider monkeys."

¹⁹Indeed, the operation of variable rules can be extrapolated from the protocols of the Gardner and Fouts.

²⁰As noted by Kortlandt (1967) for chimps and by Stokoe (1969) for human deaf-mutes.

²¹Although this discussion can only be an information presentation of a formal model for communicative capacity, it should be clear that B3 attempts to define inherent code variability whether intra- or interlingual in scope. Synonymizing, syntactic transforming, translating, and so on are all aspects of a general capacity for recoding messages relating to one social reality into structurally equivalent messages relating to another social reality.

we're looking for in primates (a fact not fully appreciated by Hewes). The apparent dissociation of segmental and suprasegmental modes observed for chimps in the wild is part of an intricate system of predator control (cf. Kortlandt, 1973). When such constraints are removed, as is the case in ASL-using chimps, normal communicative behavior exhibits a conjoint use of segmental and suprasegmental signs (even when the inhibition on the use of vocal segmentals persists). In optimally developed distal communication, suprasegmentals are thus suprasegmental to both gestural-visual and vocal-auditory coding.

Bolinger has shown that: 1) there is no valid reason to compartmentalize suprasegmentals, as signata, into cognitive and emotive; and 2) suprasegmentals, as signantia, are *voice-gestures*. Intonation thus constitutes an area of apparent transition, the compactness of which is more stable than we have expected so far. We might do well to amend our model of A1 so as to integrate voice-gesture as the essential pivot to cross-modal transfer of dominance from body-gesture to mouth-gesture, with congenital consequences on the encoding rather than the decoding side. Reformulated, the model looks like this:

- A1a. Visual-auditory decoding
- A1b. Body-gestural encoding
- A1c. Voice-gestural encoding
- A1d. Mouth-gestural encoding

The integration of visual and auditory modes of decoding into a single multimodal all-purpose decoding capacity (as operant in simultaneous listening and lipreading) underlies the acquisition of complex "gestural" encoding skills. "Gestural" encoding integrates, on various levels (A1b, A1c, A1d), skills of correlating "manners" and "places" of articulation, although control of these factors is more elusive on the level of voice-gesture. In other words, voice-gestural encoding is more complex than either body-gestural or mouth-gestural encoding.

The latter conclusion is crucial to our understanding of the evolution of optimally operant distal communication systems. If we want to explain the lack of A1d ability in chimps, we must assume either that the evolutionary design of the chimp's communicative capacity allows for the existence of congenital predispositions to congenital predispositions or that optimal designs may be altered through the addition of congenital inhibitions (in Kortlandt's sense).²² Although the latter alternative seems to be more attrac-

²²It might be worthwhile to mention that the chimp Viki actually overcame congenital inhibition in simulating human speech sounds in four isolated words. This would suggest that the lack of a supralaryngeal vocal tract in chimps (as posited by Lieberman) does not necessarily impede the removal of congenital inhibition to mouth gesturing.

tive from an angle of structural simplicity, both perspectives would have to admit that the communicative capacities of man and chimp are superficially different representations of one abstract structure of evolutionary design.²³

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²³This work was supported in part by the Quebec Department of Education.

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