

COMMUNICATION EVOLVING: FROM PREHISTORIC TO
'POSTHISTORIC' SIGNALING SYSTEMS*

Roger W. Wescott
Drew University

Back in the days when 'swingers' were pop music fans rather than heroes of the sexual revolution, they used to salute each other in various rhyming couplets, one of which was

Greetings to you, gate!
Now, let's communicate.

I found -- and still find -- this salutation attractive, because it calls attention to the fact that we cannot take communication for granted, even in an age of mass media, when all of us have supposedly become inhabitants of Marshall McLuhan's 'global village'. For it is a paradox of our era that, as the means of communication proliferate, its goals seem to recede. We talk more but listen less and reach one another hardly at all. We suffer increasingly from the condition that psychotherapists call 'contactless sociability' -- a relationship which is perhaps typified by that peculiar 20th century institution, the cocktail party, characterized as it is by much mixing but little meeting of minds. Yet, lest we should jump to the premature conclusion that our communicative malady is, like atomic war, an exclusive aberration of our own century, we might note that it troubled our great-grandparents' generation as well. Even in the supposedly comfortable years of Good Queen Victoria, the British novelist George Eliot lamented that 'we are all islands, shouting lies at one another across seas of misunderstanding'.

Most of our communication seems to be, at best, semi-communication: we feel out of touch. We can hardly remedy this situation, however, until we have more than a merely emotive notion of what communication is. As Voltaire insisted, we must define our terms. But, in attempting to define communication, we can hardly escape what T. S. Eliot called 'the intolerable wrestle with words and meanings'. Since the literal meaning of definition is 'putting an end to' -- in effect, sharply circumscribing -- whatever it is that needs defining, my own inclination is to avoid

*Presented at the Harvard Club of New York, 3 December 1976.

it. By this I mean not that I prefer the unexamined life but rather that I think all-or-none definitions Procrustean. Instead, I prefer relativistic descriptions that permit boundaries which are blurred in fact to remain blurred in theory as well. So, in the spirit of George Orwell's Animal Farm, I shall declare that, while all interactions are communicative, some interactions are more communicative than others. I shall not follow most of my colleagues in the field of communication theory in ruling out of court such assertions as, for example, that the sun communicates light and heat to the earth. I shall only qualify it by maintaining that such communication is minimal in terms of evolutionary potential. In the gradient terms which I prefer, I shall say, generally speaking, that all communication oscillates between poles of maximality and minimality, rarely reaching either.

As regards purpose, I should call interaction more communicative when it is voluntary or intentional (as in the case of animal signaling systems) than when it is accidental or automatic (as in the case of inorganic processes). As regards reciprocity, I should call interaction more communicative when it is mutual or pluralistic (as in a dialog) than when it is one-sided or unidirectional (as in a lecture, no matter how eloquently delivered). As regards benefit, I should call interaction more communicative when it is constructive or beneficent (as in a love relation) than when it is destructive or reductive (as in a hostile encounter, however clear its message may be). As regards distance traversed, I should call interaction more communicative when it is distal or interval-spanning (as in the audio-visual systems of birds and primates) than when it is proximal or confined (as in the tactile relations between amoebae or the gustatory relations between slime-molds, which must literally touch or taste one another in order to be aware of one another's existence). And, as regards specificity, I should call interaction more communicative when it is referential or informative (as in the case of verbal language) than when it is vague or ambiguous (as in the case of 'body language', particularly the unconventionalized intention movements of most animals).

Another way to approach the problem of defining communication is historically, by way of etymology. As long as we take care to avoid the pitfall known as 'the genetic fallacy' -- gratuitously assuming that early meanings are eternal meanings -- we can profit from this approach. And it reveals that the noun communication is cognate both with the Latin-derived nouns community and communion and with the French-derived words common and communiqué. Word history as an approach to the understanding of communication is further validated by the fact that it yields much the same results as does animal behavior study. For students of animal behavior

have long adopted an operational definition of communication as community-formation. Generally speaking, the more complex and highly integrated animal communities are, the subtler and more effective their communication is presumed to be. And the closer the behavioral coordination between individuals within a community, the more complete their communion may be said to be.

But, even if we make the optimistic assumption that we know what communication is, we must still cope with the fact that, in a universe in which all things change, it is unlikely that communication can realistically be treated as a constant. So we must do our best to chart the course of communication through time, inferring what we can of its past and projecting what we dare of its future. In short, we must treat its evolution, realizing that the term evolution itself, being a 'buzz-word', involves pitfalls of its own. For, though evolution denotes little more than change, it connotes change which is naturalistic, gradual, and progressive. Yet, even in the case of the morphological development of species, which is the easiest kind of evolution to trace, all three of these connotative aspects of organic evolution are uncertain. We know that the recent development of our domestic animals has been due to artificial rather than to natural selection, and we cannot be sure that the appearance of such recent organic groups as flowering plants or mammals was not due to interference by preternatural or extraterrestrial agencies.

Gradualism, moreover, is not only under fire from catastrophists but is an intrinsically ambiguous concept, since what is gradual when viewed from the year-by-year perspective of history is sudden when viewed from the eon-by-eon perspective of geology. Furthermore, even uniformitarian geologists concede that the pace of organic evolution is discontinuous, proceeding more rapidly at some times than at others. In these terms, evolution may be envisioned as a step pyramid whose sides look smooth only when viewed from a distance: close up, they are seen to rise in a series of spurts. Victorian naturalists referred to these spurts as saltations. In the realm of human communication, language, speech, and writing are all manifestations of such comparatively salutory developments. Since the two World Wars, finally, not even progress can be taken for granted. In the realm of cultural evolution, the very same Industrial Revolution which seems progressive to most scientists and technologists seems retrogressive to many ethicists and environmentalists.

Although the term prehistory is well known, its reciprocal, posthistory, may require explanation. Posthistory was introduced by the historian and futurist Roderick Seidenberg as a cover term for both the emerging social order and the study of that order. By 'emerging social order', he means a stage of cultural development

(referred to by Daniel Bell as post-industrialism and by Marshall McLuhan as post-literacy) which has the same relation to civilization that civilization has to pre-urban culture of the hunting or horticultural type. In this stage, which has already been entered by the Western World, cities will cease to be fountainheads of cultural innovation; the majority of the population will no longer be engaged in the production of food or manufactured goods; and the printed word will be displaced as a source of authoritative information by the 'audialized' mass media.

Since language is the most distinctively human system of communication, it has long been a source of puzzlement to laymen that linguistic scientists show so little interest in the subject of linguistic evolution. In this matter, I share the reaction of the laity and cannot help suspecting that my fellow linguists, who claim to be motivated by a hard-headed disdain for speculative scholarship, are actually motivated more by fear of having to venture into archeology, paleontology, and other social and biological sciences which most of them have managed to avoid by confining themselves to 'pure' phonology or grammar.

Without becoming either too technical or too polemical, however, I think it fair to say that nearly all those scholars who have entered the difficult field of glossogonics, or the study of language origins, agree that language is a specialized outgrowth of the generalized audio-visual communication system of the simian primates, or Old World apes and monkeys. All simians have auditory and visual capacities almost indistinguishable from our own, though our brains differ from theirs both in size and in the organization of sensory pathways. Human paleontologists generally distinguish three major stages in the anatomical evolution of the genus Homo: (1) a pithecanthropian stage, about 500,000 to 100,000 years ago, when brains were only about two-thirds as large as today; (2) a neandertalian stage, about 100,000 to 50,000 years ago, when brains reached contemporary size but were larger in the cerebellar, or motor, area, than in the neocortical, or information-processing, area; and (3) a sapient stage, from about 50,000 years ago till the present, when contemporary physiques became the rule and made contemporary achievements theoretically possible. The behaviors that accompanied these three hominine types are generally thought to include these: (1) among the pithecanthropians, mastery of fire and the construction of pit-traps for big game; (2) among the neandertalians, ritual burial of the dead and the erection of religious shrines; and (3) among early sapients, mining of mineral dyes and graphic representation of men and game animals.

When it comes to reconstruction of the communicative behavior of these early human beings, however, consensus wanes; and I shall have to speak for myself alone. But I think it reasonable to infer that (1) our pithecanthropian ancestors became skilled in the employment of gestural and vocal mimicry, first as a hunting lure and later for ludic or esthetic pleasure; that (2) our neandertalian ancestors became linguistically proficient in the manual-visual mode but remained glossolalic in the vocal-auditory mode, in which they would have sounded to us like the 'tongue speakers' in a pentecostal religious gathering; and that (3) our sapient ancestors transferred their linguistic skills from the visual to the auditory channel and became, for the first time, speakers rather than signers.

Once language was spoken, I further opine that there were stages in the collective development of speech. During the Upper Paleolithic Period, from about 50,000 to 20,000 years ago, phonemicity, or distinctiveness of speech-sounds, was probably confined to consonants, and grammaticality was confined to the dichotomy of noun subjects and verb predicates. During the Mesolithic Period, from about 20,000 to 10,000 years ago, phonemicity probably extended to vowels, and modifiers and particles became distinct from 'head words'. And, during the Neolithic Period, about 10,000 to 5,000 years ago, a situation in which phonemic inventories were relatively large but lexical inventories relatively small was reversed, giving way to the phonemic economy and lexical plethora of our own times.

Another subject on which linguists puzzle laymen is that of the definition of language. Whereas laymen generally expect linguists to define language in an intricate and detailed manner, most linguists, on the contrary, decline to give any definition at all, apparently feeling that the gulf between human language and sub-human prelanguage is so huge and so obvious that laborious distinctions between the two types of communication would be otiose. Yet every recent discovery in the field of animal communication studies, from that of the map-drawing ability of honey-bee workers to that of the vocal improvisations of song-thrushes, makes it clear that the gulf is far narrower than we had thought -- so narrow, in fact, that (as we shall see) chimpanzees may be able to leap it in a single generation.

When pressed, linguists often fall back on a traditional definition of language as 'vocal symbolism', where symbolism is in turn defined as 'a system of arbitrary signs'. But this definition is worse than none, since it is now clear that the manual gesture systems of the deaf, such as American Sign Language, can translate or express virtually everything spoken and that the iconic, or onomatopoeic, aspects of speech are not arbitrary but universal in principle and clearly

imitative of non-linguistic reality. At this point the non-linguist is tempted, with some justification I think, to declare that, if (as Clemenceau insisted) war is too important to be left to generals, language is likewise too important to be left to linguists.

I have drawn up a list of twenty distinctive traits of language which follows, on Table 1. Since space-limitations preclude detailed discussion of each of these, I shall confine myself to the three overarching categories within which the twenty fall: complexity, flexibility, and precision. The most commonly cited example of linguistic complexity is productivity, or the tendency to facilitate communicative innovation; of flexibility, displacement, or reference to what is not immediately perceptible; and of precision, referentiality, or specificity of denotation. What is remarkable about these three salient linguistic traits, however, is not their uniqueness to our species but the fact that each of them also characterizes the signaling behavior of some other species. (In these cases, the three non-human species are song-thrushes, honey-bees, and pine siskins, respectively, the last of which can vocally distinguish, in their alarm calls, between predatory birds and predatory mammals.) My conclusion is not that language cannot be defined but rather that its boundaries are more often gradient than discrete and that the distinction between prelanguage and language must consequently be viewed more as a difference of degree than as a difference of kind.

As we move from the inferred prehistory to the documented history of language, one of the first things we note about it, beyond the fact that language is pre-eminently reflexive and enables us to talk about talking in an all but infinite regress, is that people are dissatisfied with it. Cynical observers from Plutarch to Talleyrand have commented that, particularly in public situations, the goal of language too often seems to be the concealment of thought. While animals can elude and mislead others, only man, it appears, can explicitly misinform his fellows, in some cases so filling their heads with false verbal maps as to make them wholly incapable of navigating in their social environments.

The prevalence of prevarication and the unquestionable cognitive damage that such linguistic deception does, especially to children, inevitably leads to the question of mental privacy and its desirability. The right to privacy is part of the heritage of civil liberty; and most civil libertarians are troubled by the threat to privacy posed by the electronic gadgetry of our emerging posthistoric age, from computerized data-banks through infra-red visual scanners to hidden microphones.

Table 1

DISTINCTIVE TRAITS OF LANGUAGE (Speech, Signing, and Writing)

<u>Trait</u>	<u>Explication</u>	<u>Exponent</u>
I. complexity		
1. grammaticality	fixed sequence	Jespersen
2. stratification	'phoneme' vs. morpheme	Hockett
3. dichotomy	subject vs. predicate	Buehler
4. deuterism	talking about talking	Bateson
5. multicanalicity	speech vs. writing	Sebeck
6. multimodality	statement vs. command	Greenberg
7. productivity	ease of innovation	Russell
8. pantopicality	unlimited reference	Greenberg
9. lengthlessness	unlimited discourse	Greenberg
10. propositionality	equative assertion	Piaget
II. flexibility		
11. displacement	reference to the imperceptible	Hockett
12. prevarication	verbal deception	Humboldt
13. soliloquism	talking to oneself	Bronowski
14. cenemicity	absence of denotation	Hjelmslev
III. precision		
15. synonymy	rephraseability	Wescott
16. referentiality	specificity of denotation	Lancaster
17. digitality	'phonemic' discreteness	Gleason
18. negation	verbal denial	Burke
19. interrogation	verbal questioning	Bronowski
20. temporality	aspect or tense	Hewes

On the other hand, the literal meaning of privacy is, as its derivation makes clear, privation. The right to privacy is ultimately the right to deprive others of information about us. The best we can say about privacy in this light is that, in a frequently malicious world, privacy is a regrettably necessary defense against hostile curiosity. In a world of total or predominant benignity, privacy might well -- and with justice -- come to be viewed as a kind of social or intellectual avarice and stigmatized accordingly.

If the current Aquarian trend toward psychic development continues and leads to clairvoyant success in mind-reading, the whole question of privacy will reemerge in an even more urgent form. We will then have to ask not only whether we want to have our minds read but also whether we wish to read the minds of others: for some, the second of these prospects might prove even more alarming than the first.

Yet another evidence of the close similarity between human and non-human communication systems is the extensive overlap between our signalings and those of our near kinsmen, the great apes. They pat one another's shoulders reassuringly, make begging gestures with extended palms, stare threateningly, pound their chests or nearby objects in defiance, and scream in alarm -- all with the same apparent intentions and effects as among ourselves. Till recently, it seemed that the only sharp difference between them and us lay in our linguistic elaboration of their non-linguistic communications. Recently, however, even this communicative Rubicon has apparently been crossed by chimpanzees. During the past decade, American psychologists have succeeded in teaching them not just verbal signals but verbal systems in the manual-visual channel. Foremost among these systems is American Sign Language, first taught to a chimp named Washoe by Allen and Beatrice Gardner. Next came a plastic token system, akin to sign-painting, first taught to a chimp named Sarah by David Premack. And finally there is the computer console key-pressing method, equivalent to typewriting, taught to a chimp named Lana by Duane Rumbaugh. During the coming decade, it is anticipated not only that we will teach visual language to other apes, such as gorillas and orang-utans, but also, and more excitingly, that gesturally 'talking' chimpanzees will teach visual language to their offspring.

Language, however, is merely the tip of the communicative iceberg. Its vast prelinguistic undergirding stretches back at least three billion years -- more than half the age of Earth itself. Since the creation of the new interdisciplinary science of molecular biology by James Watson and Francis Crick in the 1950's, it has become clear that all organisms -- on our planet, at least -- replicate by means of the same genetic code. Moreover, this code not only constitutes a genuine

communication system, telling each new generation, in effect, how to perpetuate the structural 'tradition' of its antecedents, but resembles language to a degree that no linguist would have dared to expect or predict. The type of linguistic system which it most resembles is writing -- so much so, in fact, that some communication theorists question the propriety of treating that resemblance as though it were a mere figure of speech. The extent of the correspondence between genetic codon-formation and spelling is revealed in Table 2.

When we reach the level of the total individual organism interacting with its surroundings, we must consider the senses, those anatomical structures and/or physiological processes by means of which animals gather the information on which their survival depends. In discussing man and his primate relatives, it is useful to speak of 'the five senses' -- of sight, hearing, smell, taste, and touch -- as though these were all that a well-equipped simian needs in order to thrive. In fact, however, a human being who had only five senses would be, quite literally, a handicapped person. For, without the sense of balance located in our inner ears, we could not walk. And, without the proprioceptive sense located in our musculature, which tells us the relative positions of our limbs, we could not even lift our hands to our mouths to feed ourselves. Moreover, without a sense of temperature (actually two senses, since the sensations of heat and cold are transmitted along different neural pathways), children might painlessly burn or freeze to death and never reach adulthood at all.

In sum, human beings need at least nine fully functioning senses just to be normal. And it may be, as some neurophysiologists think, that, to be sensually well endowed, we need more than that. What follows, on Table 3, is my inventory of animal senses, with an indication in each case of the animal group in which that sense seems most highly developed. (When I showed this list to the late Scottish-American biologist Ivan Sanderson, he commended it but remarked that he thought it misleadingly brief!)

Yet external communication between organisms is no more crucial than internal communication within organisms. A healthy human being needs efficient message-transmission within his body, both neural, for rapid response to stimuli, and hormonal, for the maintenance of biochemical equilibrium. In addition, he needs at least minimal communication between the various 'subpersonalities' of his psyche, lest he succumb to the schizoid malady of multiple personality, as a result of which an individual may find himself unable to coordinate or even to remain aware of his various 'selves.'

Table 2

GRAPHIC METAPHORS FOR GENICITY

I. The Genetic Code

1. 'letter': any one of 4 possible nitrogenous bases in a nucleotide
2. 'word': any one of 64 possible codons, or nucleotide triplets, in a nucleic acid chain
3. 'sentence': a nucleic acid strand containing a specified sequence of codons (whose minimum number is apparently 8)
4. 'punctuation': either of the 2 nucleotide triplets UAA (nicknamed 'amber') and UAG (nicknamed 'ochre')

II. Genetic Processes

1. 'spelling': forming triplet words
2. 'transcription': conversion of DNA code into mRNA code
3. 'reading': ribosomal movement along mRNA chains
4. 'recognition': self-attachment of activated tRNA to mRNA
5. 'translation': formation of completed polypeptide chains

III. Mutagenic Processes

1. 'spelling error': change of nitrogenous base in a codon
2. 'reading error': change of nitrogenous base in an anti-codon

IV. Genetic Inventories

1. 'vocabulary' (also called 'dictionary'): all 64 codons
2. 'grammar': rules (not yet completely known) stipulating which amino acid sequence is required to produce each particular polypeptide chain

Table 3

THE ANIMAL SENSORIUM

<u>Type</u>	<u>Stimulus</u>	<u>Sense</u>	<u>Receptor</u>	<u>Animal</u>
Chemical	taste	gustatory	cell membrane	slime-mold
	odor	olfactory	antennae	moth
	humidity	hygrotic	dorsal hairs	beetle
	oxygen	oxesthetic	unknown	lung-fish
	anoxia	anoxesthetic	unknown	lung-fish
Physical	solidity	tactile	leg-hairs	bee
	gravity	bithic	statocyst	scallop
	pressure	barotic	lateral line	fish
	proprioception	proprioceptive	musculature	(most)
	vibration	palmotic	feet	spider
	sound	auditory	ear	bat
Electro- Magnetic	light	visual	eye	hawk
	radar	radionic	unknown	man
	x-ray	radiatory	unknown	rat
	electricity	electresic	mormyoplast	ray
	heat	thermotic	subocular pit	viper
	cold	cryotic	beak	mallee fowl
	magnetism	magnetic	unknown	mud-snail
'Mental'	space	directional	unknown	water-fowl
	time	chronometric	unknown	(most)
	orgone	orgonotic	skin	man
	pain	algesic	diencephalon	placental
	pleasure	hedonic	diencephalon	placental
	(any)	clairvoyant	unknown	man
	thought	telepathic	unknown	man

If, on the microcosmic side, many scholars neglect internal communication, it is equally true that, on the macrocosmic side, they neglect communication between individuals of different species. Much interspecific communication, however, is not only common but crucial. Such communication, literally interpreted as community-formation (and community maintenance), is referred to by students of animal behavior as symbiosis -- a Greek word which means cohabitation. A dozen types of symbiosis are listed in Table 4.

Some zoologists refuse to apply the term symbiosis to such destructive interactions as predation on the grounds that symbiosis implies mutual benefit, or at least absence of harm. But this view, I think, rests upon the implicit premise that only individuals communicate or interact. Even from the standpoint of population biology, it should be clear that groups also communicate and interact. And the very predation that must seem entirely harmful with regard to the individual prey animal may have a beneficially 'pruning' effect on the group, since it is usually the sickly or senescent animals that are taken by predators, the young and healthy being left to mature and breed a stronger generation.

One theory about the origin of eucaryotes, or the complex cells found in protozoans and all higher plants and animals, is that it was symbiotic. More specifically, the complex cells of amoebae and sponges differ from the simple pro-caryotic cells of bacteria and blue algae in containing organelles, or microbial inclusions, called chromosomes and mitochondria, which perform reproductive and energizing functions for them. An increasing number of microbiologists now believe that organelles were originally independent organisms, which did not become biologically successful until they fused with procaryotes to form those compact miniature communities called eucaryotes.

All social relations are of necessity communicative relations, from which it follows that social evolution is a crucial ingredient in the development of communication. The evolution of intraspecific sociality has proceeded along two parallel but separate tracks, the first, or micro-evolutionary, path being that of family development and the second, or macro-evolutionary, path being that of community development. This dual development is illustrated in Table 5.

In speaking of man and the other creatures with whom he shares this planet, we have thus far used the term 'human' as though its meaning were unambiguous. From a zoological standpoint, however, it is highly ambiguous, since it may refer either to humanity as a taxonomic group (anthropoid, mammalian, vertebrate, and so on) or to humanity as a typological quality, roughly synonymous with humaneness. In terms of

Table 4
A TYPOLOGY OF SYMBIOSES

<u>Type</u>	<u>Description</u>	<u>Example</u>
1. predation	unilateral, lethal	cats on mice
2. parasitism	unilateral, debilitating	fleas on dogs
3. slavery	unilateral, exploitive	other ants by Polyergines
4. inquilinism	unilateral, harmless	muskrats in beaver lodges
5. hitching	" "	remoras on sharks
6. mimesis	" "	mockingbirds mimicking other birds
7. donning	" "	sea-anemones by hermit crabs
8. domestication	unilateral, fostering	horses by men
9. commensalism	bilateral, optional	plovers with crocodiles
10. partying	" "	baboons with antelopes
11. teaming	" "	badgers with coyotes (to hunt rabbits)
12. mutualism	bilateral, obligatory	termites and their intestinal flagellates

Table 5

A DIODIC ('TWO-TRACK') MODEL OF SOCIAL EVOLUTION

<u>Type</u>	<u>Micro-Evolution (Family Development)</u>	<u>Macro-Evolution (Community Development)</u>
Sub-Social	1 collocation	collocation
	2	aggregation
	3 conjugation	
	4 sexuality	
	a] isogamy	
	b] heterogamy	
	5	agglutination
		a] homocytism
	b] heterocytism	
	colonialism	
	congregation	
	coordination	
Social	9 familiarity	society
	a] courtship	
	b] parentalism	
	c] fraternalism	
	d] filialism	
Meta-Social	10 genetrarchy	tradition
	a] matriarchy	
	b] patriarchy	
	11 marriage	culture
	secondary kinship	
	corporate lineality	
multinucleation		
	12	civilization

this distinction, no animal but man can be taxonomically human, although many can be typologically as human as our species, if not more so. A general survey of the higher animal taxa -- vertebrates, arthropods, and cephalopod molluscs -- shows that complex communicative behavior is encountered only in species that are relatively big, brainy, mobile, versatile, and gregarious. All such species exhibit some degree of typological humanity. And my optimistic presentiment is that, if our species were to become extinct through some (probably self-inflicted) disaster, another species would eventually assume our role, domesticating 'lesser breeds,' manipulating the planetary surface, and reaching out toward other celestial bodies.

In making this supposition, I am well aware that I am adopting a controversial view of the relation between man and beast, a relation concerning which attitudes have see-sawed through the centuries. Prior to the era of the Old Testament prophets, the universal attitude was one which I would call Totemic, drawing the term from ethnology, where the word totemism is used to describe a wide-spread pre-literate belief that human beings have animal ancestors who deserve veneration. This attitude seems initially to have been just as prevalent among urban as among non-urban peoples, as witness the immense animal pantheons of the ancient Egyptians and Hindus. In developing their Torah, however, the early Hebrews also developed the idea not only that theriolatry was evil but that God had fixed a gulf between man and beast. The early Christians accepted this separation and further stipulated that it was the soul which necessitated it, since men had souls but beasts did not. Judeo-Christian segregationism was not intellectually challenged in the Western world till the mid-nineteenth century, when Alfred Russel Wallace and Charles Darwin argued that men were descended from apes, apes from monkeys, and so on back to ultimate unicellular ancestors in the pre-Cambrian era. This Neo-Totemic outlook became the new orthodoxy of the Western intelligentsia until it was challenged in turn by a Neo-Biblical reaction, which came from (of all sources) cultural anthropology. Around the turn of the century, anthropologists like Edward Tylor and Bronislaw Malinowski maintained that man and beast were indeed as separate as the writers of Holy Writ had held but that the great wall between them was culture -- meaning language and ideology -- rather than the soul. Finally, after World War II, a 'Neo-Neo-Totemic' reaction took place, reemphasizing man's kinship with animals not so much on genetic or paleontological grounds as on behavioral and ecological grounds. As may be obvious by now, I lean heavily in the totemistic direction. But my chief reason for this leaning is not the historical fact that the scientific pendulum happens currently to be swinging toward a man-beast continuum but rather the

experiential fact that, at a non-verbal level, I find and always have found communication with other animals, especially mammals (wild as well as tame), to be an easy, natural, and congenial activity.

During the past two decades, linguistically oriented anthropologists like Henry Lee Smith and Edward Hall have been increasingly successful in persuading their scholarly colleagues to view culture itself as consisting primarily of communicative behaviors. Predictably, perhaps, I accept their view. Somewhat less predictably, however, I see the chief difference between human cultural tradition and the pre-cultural traditions of other animals as consisting of a far greater communion, on our part, with deceased ancestors. Putting the matter another way, I would say that, to a great extent, culture is communication with the dead. It is so, moreover, in several senses. Of these, the most obvious is probably the fact that many peoples believe not only in the survival of the souls of the dead but also in their own ability to communicate with those discarnate spirits, especially if the spirits are those of kinsmen. They contend that, if they pray deservedly, their ancestors respond appropriately. Yet even for those who, like most moderns, lack such beliefs, culture remains communication with the dead in the sense that each of us partakes of a social heritage the overwhelming majority of which comes from persons no longer alive. Our language, for example, comes from 17th century England, our religion from ancient Palestine, our diet (in large part) from Pre-Columbian America, and so on. Alfred Korzybski, I think, acknowledged this when he defined man as 'a time-binding class of life' and dedicated his Manhood of Humanity 'To the Quick and the Dead'. To this dedication I myself would add the unborn, since, if we commune with our forebears, it follows that our descendants will commune with theirs. My definition of culture, then, should be correspondingly broadened to read 'communication with the unliving' -- with those whose lives lie in the future as well as those whose lives lie in the past.

To continue in what may seem a somewhat uncanny vein, I would further maintain that culture is, in large part, hypnosis. By this I mean what most cultural anthropologists mean when they call attention to the tendency of each individual culture, rarely detected by those partaking of it, to direct their attention toward some concerns and away from others. Each society imposes a kind of tunnel vision on its members which makes its view of reality unavoidably different from that of its neighbors, even when their physical environments are indistinguishable. Where, for example, we may perceive anomalous aerial lights as extra terrestrial space-craft, non-Westerners are more likely to perceive them as ancestral materializations. To

this conventional wisdom of ethnography, I would, however, add the observation that culture has a universal as well as a particular signification: each of us lives not only in this or that parochial culture but also in human culture-at-large. And, whereas it is now comparatively easy to be a jet-set Marco Polo and fly to an exotic outpost of humanity, such as that of Bali, none of us can, even by rocketing to the moon, fly out of humanity and leave its peculiar perceptions behind us. Nor can we, as yet, ask some articulate dolphin to tell us what is eccentric, from the viewpoint of a non-hominid intelligence, about our species. The best we can now do is entertain the very reasonable suspicion that we suffer from constricted awareness and hope that some day we may acquire the means of awakening to a larger reality.

The image of waking and of its implied reciprocal, sleep, can hardly fail to lead us to the subject of dreams. That dreams are an appropriate subtopic in a discussion of communication was nowhere more persuasively argued, I think, than in the Talmud, where we read that 'an uninterrupted dream is like an unopened letter'. Nearly all of us have had unforgettable dreams, and nearly everyone who has had such dreams would agree that they cry out for elucidation. The question is, what do dreams mean? And who is qualified to tell us? There is not even agreement on whether the source of our dreams is internal or external. A majority of ancients and of contemporary preliterates favor the view that our dreams are sent to us -- usually from supernatural sources -- whereas most modern analysts, as direct or indirect heirs of Sigmund Freud, favor the contrary view that dreams well up from our own forgotten personal experiences. It may seem something of a paradox, therefore, that the most recent discovery in dream research supports the archaic rather than the regnant contemporary view. Working at Maimonides Hospital in New York, Montague Ullman and Stanley Krippner report that, once it has been established (by the electronic monitoring of both brain-waves and eye-movements) that sleeping subjects are dreaming, it proves relatively easy for waking collaborators in another room, even persons supposedly devoid of psychic gifts, to 'beam' images to the sleepers and thereby quite literally to program their dreams.

What this reminds one of is recent work by the former Federal Government polygrapher, or lie-detector expert, Cleve Backster, who claims to have firm quantifiable evidence of emotional communication between plants and animals, including human beings. He found, initially by accident, that when he threatened or harmed experimental animals in his laboratory, those plants to which he had attached polygraphic connections registered the same electrical jumps which characterize fear or shock in human subjects!

At this point imagination and memory conspire to offer all but limitless horizons. Outdoorsmen have always spoken of 'communing with nature,' however unclear it has been whether the expression was to be taken literally or figuratively. And some mystics, such as the German poet Friedrich von Hardenberg (whose penname was Novalis), have claimed that their communion was not only with the animal and vegetable worlds but with the mineral world as well. For that matter, a majority of the peoples known to ethnography further believe that there are invisible beings, ranging from minor local spirits to star-wielding cosmic deities, with whom human beings can and do communicate by ritual, prayer, or mediumistic intervention. In such terms, most of us are 'contactees' -- and not merely the handful of post-War cultists who claim to have visited remote planets aboard 'flying saucers'.

But what of the posthistoric era which so many futurists now see us entering? What communicative innovations are imminent in our time? With some confidence, we can say that videophony is on its way to becoming a household device. Videophones, or 'picture phones', already in use in Pittsburgh on a city-wide experimental basis, permit users to watch small television pictures of their interlocutors (if both ends of the video are switched on) while talking with them by telephone. The two-dimensional type of videophone, which operates like a home TV set, is unlikely to be revolutionary in its effect, since it simply extends a current trend in the domestic use of telecommunication. However, three-dimensional videophony, which is now in operation, though at currently prohibitive expense, in Bell Laboratories, is radically different both in mechanism and in predictable effect. It employs laser holography to project solid-looking images of objects, including people, whose eeriness is only increased by the fact that one can pass one's hand through them! Those equipped with 3D videophones could hold apparently ordinary armchair-to-armchair conversations with overseas friends -- who would simultaneously perceive their interlocutors as sitting with them overseas. For all those white-collar workers whose jobs now consist primarily of talking and writing, rather than farming or manufacture, this technological advance has potentially explosive import. For it means that the office work-force of the future need not leave home in order to be at work, face to face with employers and co-workers. Commuters' rush-hour could become a thing of the past, like the 'dark satanic mills' in which the women and children of the early Industrial Revolution were imprisoned in the daylight hours.

Beyond videophony, speculation replaces extrapolation. It seems probable that our Apollo moon landings will be followed by various forms of extraterrestrial settlement, ranging from orbiting space stations through lunar bases to asteroid

colonies so constructed as to convert the asteroids themselves into gigantic natural space-craft for explorations of the Jovian planets and their satellites. If we accept Albert Einstein's view that the speed of light is a cosmic velocity ceiling, then Frank Drake's 'project Ozma' and all comparable schemes for radio communication with other stellar and galactic systems must necessarily restrict themselves to message exchanges requiring decades or longer. But, if Gerald Feinberg is right in his hypothecation of tachyons, or particles that move at speeds exceeding that of light, then virtually instantaneous signaling between galaxies would be, initially, possible and, eventually, inevitable.

The gap between signaling and transportation, which laser videophony has already begun to narrow, may eventually be closed if Arthur Clarke's line of thought can be put into operation. Taking his lead from the fact that organic reproduction is now known to consist primarily of information transfer, he looks to a time when computer scanning of microscopic structure will become sufficiently accurate and detailed that we can transmit objects to any destination to which we can transmit messages. If Clarke's vision can then be conjoined with Feinberg's, we may eventually be able to realize man's ancient dream of instantaneous teleportation of anyone or anything to any place.

Before fantasy and reality become wholly indistinguishable, however, let me conclude this mind-stretching exercise with a quotation from Ulysses by Alfred, Lord Tennyson:

...all experience is an arch wherethrough
 Gleams that untraveled world whose margin fades
 Forever and forever when I move.
 How dull it is to pause, to make an end,
 To rust unburnished, not to shine in use!
 As though to breathe were life! Life piled on life
 Were all too little, and of one to me
 Little remains; but every hour is saved
 From that eternal silence, something more,
 A bringer of new things; and vile it were
 For some three suns to store and hoard myself,
 And this grey spirit yearning in desire
 To follow knowledge like a sinking star,
 Beyond the utmost bound of human thought.