

The Position of Humor in Human Communication

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To discuss the position of humor in the equilibration of human relationship, I shall build up from things that have previously been talked about in this room.

Consider a message of a very simple kind, such as, "The cat is on the mat." That message contains, as has been emphasized here, many other things besides the piece of information which may be defined as the "Yes" or "No" answer to the question which would be created by inverting the same words and adding an interrogation mark. It contains a series of things of which one set would be answers to other informational questions. Not only does it give the answer to: "Is the cat on the mat?", but also to "Where is the cat?", which is a much wider question. The message also contains, as McCulloch has stressed, something in addition to a report about the cat, namely, a mandatory aspect; it urges the recipient of the message to pick the cat up, to kick the cat, feed it, ignore it, put it out, according to taste, purpose, and so forth. The message is a command or stimulus as well as being a report.

There is a further range of implicit communication in this message, two additional categories of implicit content. One category includes the implicit communication between A and B that the word "cat" shall stand for a particular furry, four-footed thing or for a category of furry, four-footed things. People are not necessarily in clear agreement about what their messages mean. The senders have their rules or habits in constructing messages; the recipients have their rules and habits in interpreting them; and there is not always agreement between the rules of the sender and the rules of the recipient. One of the most important uses of messages, and especially of their interchange — the single message doesn't mean much or do much in this respect — is to bring the two persons or the many persons together into an implicit agreement as to what the words are to mean. That is one of the most important social functions of talking. It is not that we want to know where the cat is, but that we terribly want it to be true that both persons are talking the same "language" in the widest sense of the word. If we

discover that we are not communicating in the same way, we become anxious, unhappy, angry; we find ourselves at cross-purposes.

Ongoing interchanges are very useful in building up among a group of persons the conventions of communication. These conventions range from vocabulary and the rules of grammar and syntax to much more abstract conventions of category formation, such as the conventions for structuring the universe and the conventions of epistemology. The conventions of communication include the material of linguistics at the simplest level, but also under this heading comes material which is the field of study of psychiatry and of cultural anthropology. When I, as an anthropologist, say there is something different about those English or those Balinese, I don't only mean that they eat their vegetables in a rather uncooked form or that they go to boarding schools. I do not refer to a set of simple descriptive statements of action or a set of descriptive statements at the vocabulary level. I mean also that their actual conventions of communication are different from those of some other culture¹.

I classify together the simplest conventions of communication and the most abstract cultural and psychiatric premises, and insist that a vast range of premises of this sort are implicit in every message. For example, I believe that the world is "agin" me and I am in communication with some other person, the premise about the world being "agin" me is going to be built into the way in which I structure my messages and interpret his. In a sense, a philosophy of life is describable as a set of rules for constructing messages, and the individual's culture or *Weltanschauung*, call it what you will, is built into his conventions of communication.

There is another set of implicit contents in such a message as: "The cat is on the mat," namely, implicit statements about relationship. We are trying to tell each other that we love each other, that we hate each other, that we are in communication, that we are not in communication, and so on. The implicit statements about the conventions of communication are messages about the

¹Ruesch, J., and Bateson, G.: *Communication. The Social Matrix of Psychiatry*. New York, Norton, 1951 (See: *The Conventions of Communication*, p. 212).

“how” of communication, but these (about relationship) are messages about the fact of communication. “We are communicating” is a statement by two persons.

You meet somebody in the street and he turns and looks into a shop window. You noticed that he saw you coming; you observed that he turned and looked into the shop window. He may be transmitting the very peculiar message: “We are not communicating.” Whether he is or is not communicating is a question which brings us to Epimenides’ paradoxes.

One of the rather curious things about *homo sapiens* is laughter, one of the three common convulsive behaviors of people in daily life, the others being grief and orgasm. I don’t want to say that they do not occur at animal levels, partly because I am not competent to say such a thing, partly because I suspect that there are prefigurations in certain mammals but all three phenomena certainly are not developed among mammals to the extent that they are among *homo sapiens*. Because they are involuntary, or partially so, one tends to think of these phenomena as lower functions, animalish functions, but since the full development of these phenomena is characteristically human, it seems that laughter, sobbing, and orgasm are perhaps not lower functions in a simple neurophysiologic sense but have evolved because of the hypertrophy of the upper levels and the resulting peculiar relationship between the cortical-intellectual processes and those which go on below.

These three phenomena, and also the convulsions of epilepsy and shock therapy, have the characteristic that there is a build-up, a so-called tonic phase, in which something called “tension” — which it certainly is not — builds up for a period; then something happens, and the organism begins quaking, heaving, oscillating, especially about the diaphragm. I leave it to the physiologists to discuss what happens.

These three convulsive phenomena are subject to impairment in mental illness. The inability to weep, the impairment of orgasm, and the impairment of laughter are among the indices of illness that the psychiatrist looks for. If those three things are functioning nicely, the individual probably is not doing so badly. If one of them is hypertrophied, or two or three impaired or absent, then the psychiatrist knows that something is not functioning right.

Of the three types of convulsion, laughter is the one for which there is the clearest ideational content. It is relatively easy to discuss what is a joke, what are the characteristics that make a joke, what is the point of a joke. The sort of analysis that I want to propose assumes that the messages in the first phase of telling the joke are such that while the informational content is, so to speak, on the surface, the other content types in various

forms are implicit in the background. When the point of a joke is reached, suddenly this background material is brought into attention and a paradox, or something like it is touched off. A circuit of contradictory notions is completed.

There is a very simple and not very good joke going around — for some reason, those who discuss humor from the scientific point of view always use rather dull jokes: A man working in an atomic plant knew the guard at the gate slightly, and one day he comes out with a wheel-barrow full of excelsior. When the guard says, “Say, Bill, you can’t take that out,” he says, “It’s only excelsior, they throw the stuff away, anyway.” The guard says, “What do you want it for?” Well, he said he wanted to dig it into his garden because the soil was a bit heavy, and the guard let him go. The next day he comes out again with a wheelbarrow full of excelsior. This goes on day after day, and the gateman is increasingly worried. Finally, he says, “Bill, look, I’m going to have to put you on the suspect list. If you tell me what it is you’re stealing from this place, maybe we can keep it quiet between us, but I’m perfectly sure you’re stealing something.” Bill says, “No, it’s only excelsior. You’ve looked through it every day and dug to the bottom of it. There’s nothing there.” But the guard says, “Bill, I’m not satisfied. I’m going to have to protect myself by putting you on the list if you won’t tell me what this is all about.” Finally, Bill says, “Well maybe we can get together on this. I’ve got a dozen wheelbarrows at home now.”

We have talked a good deal at these Conferences about figure-ground relations. If we name something as a person, a face, or a table, or whatever, by the fact of naming it, we have defined the existence of a universe of not-this, a ground. We have also discussed, although not, I think, as much as we should have, the Russellian paradoxes, especially the class of classes which are not members of themselves. These paradoxes arise when a message about the message is contained in the message. The man who says, “I am lying,” is also implicitly saying, “The statement which I now make is untrue.” Those two statements, the message and the message about the message crisscross each other to complete an oscillating system of notions: if he is lying, then he is telling the truth; but if he is telling the truth, then he is not lying; and so on.

The paradox of the class of classes which are not members of themselves arises similarly from examining the implicit message. The first step toward building the paradox is to say that the man who speaks of elephants is thereby defining the class of non-elephants. The possibility of the class being a member of itself is then introduced via the class of non-elephants, which class is evidently not an elephant and therefore is a member of

itself. The circuit of ideas which is the paradox is closed or completed by treating seriously the background: the non-table, the non-elephant. The ground is a part of the implicit information. It just is. You can't ever really get away from it.

The hypothesis that I am presenting is that the paradoxes are the prototypic paradigm for humor, and that laughter occurs at the moment when a circuit of that kind is completed. This hypothesis could be followed up with an analysis of jokes, but rather than do that, I should like to present to you the notion that these paradoxes are the stuff of human communication. As scientists, we try very hard to keep our levels of abstraction straight; for instance, in these conferences we have gotten into very great trouble when the levels of abstraction became tangled and the theory of types showed itself. In ordinary life, as distinct from scientific talk, we continually accept the implicit paradoxes. If the psychiatric patient says, "I dreamed," and then narrates his dream, he is making a set of statements within a framework not unrelated to that of Epimenides. If an artist paints a picture and says, either implicitly or explicitly, "This picture is a truth, this picture is an attempt to convince you," he is, if I may say so, probably not an artist but a scientist or a propagandist. If he says, "This picture is in an Epimenides frame," he is a "real" artist. Or consider the old difference between Ruskin's true and false grotesque². The true grotesque is, I suggest, created by the man who says frankly, "I am lying," and who goes on to create a thing whose truth is that it is created. The man who says, "This is a horrible dragon," and tries to make his work of art into a factual statement is the one who produces the false grotesque. He is the propagandist.

The setting of the psychotherapeutic interview has a peculiar relationship to reality. Is it real or is it not? The fantastic exchanges that go on within it are paradoxical. The patient who says, "I walked around the grounds this morning and I said, 'I will be honest. I am going to get something straight,' " fairly certainly will not achieve much that day. The likelihood of his making an advance depends much more on his ability to say to himself, "Let me freely imagine what I want to imagine and see what comes up." Indeed, the whole free association technique is an attempt to give that freedom.

But the therapy situation is not unique. It is, perhaps, a specialized version of what, after all, goes on between us all the time. The therapy situation is a place where the freedom to admit paradox has been cultivated as a technique, but on the whole this flexibility exists between two people whenever, God willing, they succeed in giving each other a freedom of discussion. That freedom, the freedom to talk nonsense, the freedom to entertain il-

logical alternatives, the freedom to ignore the theory of types, is probably essential to comfortable human relations.

In sum, I am arguing that there is an important ingredient common to comfortable human relations, humor, and psychotherapeutic change, and that this ingredient is the implicit presence and acceptance of the paradoxes. It appears that the patient (especially the Freudian analysand) makes progress via the mental flux, confusion, or entropy stirred up by paradox, that, passing through this state of inner disorder, he is partly free to achieve a new affective organization of experience or new premises for the codification of his thoughts.

The alternative to the freedoms introduced by paradox is the rigidity of logic. Logic is a very peculiar human invention, more or less timeless. We say, "If A, then B," but in logic, the word, "then" does not mean "at a later time." It means that statement B is synchronously implicit in statement A. But when we speak of causes and say, "If I drop the glass, then it will fall," the words "if . . . then" refer to a sequence in time and are quite different from the "if . . . then" of logic. When logic encounters the theory of types and paradox is generated, its whole exposition breaks down — "Poof!" It is perhaps some terror that mental process may go "poof" which compels many patients and persons at large to cling to logic. But casual systems do not go "poof" in this way. As in an electric buzzer, there is sequential contradiction, and the system merely oscillates.

One of the hypotheses in this group is that mental processes can appropriately be described in terms of causal hypothesis with all due qualification of the word "cause." I would suggest that these processes absolutely cannot be described in terms of timeless logic. The study of mind through the causal approach, however, will lead us into accepting the paradoxes of thinking, which are related to humor, which are related to a freedom to change the system of thought related to humor, and in general are related to mental health and human amenity.

I think that opens enough subjects for discussion, but there is just one other thing I should like to speak of. I want to refer back to some talk which we have had in the past over the words, "unconscious" and "the unconscious." Conventional theories about humor usually refer to repression, release of repression, *Schadenfreude* — the pleasure which we feel in somebody else's pain — and so on. I want to say that the various types of implicit content of messages constitute what I personally would understand by the content of the unconscious. Those are the items which, when we think only of the cat and its location, we are likely not to notice as messages which we have received. It seems to me that the *Schaden-*

²Ruskin, J.: *The Stones of Venice*. London, Smith, 1853, and New York, Dutton, 1907 (Vol. III).

freude theory, which, after all, is classic for this subject, arises because the implicit enjoyment of another's pain is among those things which we prefer not to notice. It is a premise which we leave implicit among those messages which we receive without noticing that we received them. All or most of the cultures of the world have some degree of restriction and taboo upon hostile expressions and hostile actions, and, therefore, in all cultures of the world that type of material is likely to be sidetracked into the implicit and to be unnoticed until a joke is completed. And that is as near as I can get to an explanation of why people make *Schadenfreude* theories about humor.

Frank: Gregory Bateson referred very briefly to the figure-ground concept. We could further our thinking by emphasizing the selective awareness and patterned perception of each person, and some of the problems which seem to be involved. For example, we were talking in this room earlier this week³ about the primary discrimination of self and nonself in the child, discussing the fact that primary discrimination is not to an outside objective reality but is always to an idiomatically highly-patterned nonself. Later on, the child may have to learn to modify that objective nonself and accept the social-cultural definitions of the environing world. Some children do not wholly accept these cultural definitions, as we know, and perhaps that is how psychiatric patients develop, from those who have not made the transition from the purely idiomatic to the public world.

The figure-ground concept is further illuminated if the joke is thought of as involving a shift between the figure and ground, where the figure is altered or the ground is reconstituted or a reversal of the figure-ground situation takes place.

Another aspect that may be worth examining is to think of the figure-ground in these terms: that the figure is a cognitive pattern perception, selectively chosen because of learning, constitutional susceptibility, and so on, while the ground is that to which an affective response is made. In all experience, we selectively perceive, define, and impute meanings to the different figures that are largely personal, idiomatic versions of socially and culturally patterned ideas and beliefs. Concurrently, in every situation we respond affectively without being aware of it. If we can use the concept of people growing up with highly conflicting responses, one, a cognitive, meaningful one to the figure, the other an affective response to the ground situation, which is in conflict to the first, we might get a chance to make some kind of an interpretation of what we call "emotional conflicts" and the "unconscious" bias in perception.

Bateson: I think I am responsible for a possible misunderstanding at this point. There is a danger which one has

to be aware of all the time in the psychological sciences, namely, the danger of taking a dichotomy, such as figure-ground, and equating it with every other dichotomy, such as affect-cognition or consciousness-unconsciousness. I set the stage by, using the yes-or-no answer to the question, "Is the cat on the mat?" as in some sense a primarily conscious, figure-ish item, and I defined the other things as background items. But it is important to insist that that was a purely arbitrary selection on my part.

In talking about the character structure of a certain individual or about the thought habits or the communication habits distinguishing a certain culture, it may be important to say which categories of content appear in the forefront of consciousness. There are, certainly, many people who are enormously more conscious of some of the items which I labeled as "implicit" than they are of the concrete information. After the conversation, they don't know whether the cat was on the mat but they do know whether somebody loves or hates them, and so on. I don't think it can be said that affect is necessarily the more unconscious component.

Frank: I didn't want to separate affect and cognition. I merely wanted to point out, in discussing and conceptualizing the picture, that the affective reaction might be looked upon as analogous to the way we adjust to the temperature and barometric pressure in this room without being aware of it, that is, they are part of the ground in which this meeting is taking place.

May I make just one other point? I think you would agree, wouldn't you, Gregory, that the individual is not only communicating to somebody else but at the same time he is trying to reaffirm and re-establish his own idiomatic version of the word?

Bateson: Surely.

Frank: There is, then, the problem of whether the individual is consciously aware of trying to communicate or of his attempt to reassure himself as I suggested at one of our earlier meetings, we should discuss internal speech because that is a highly significant aspect of this problem.

von Bonin: In the joke that was told, all of a sudden the figure-ground relationship switched over into another constellation. The wheelbarrow was background and was not noticed, but I don't think it had any affective tone. I can't see that the background was anything to which we reacted emotionally.

Bateson: I cut down the affective tension of that joke, if I may use the word tension, knowing that I don't mean it, by saying that the man with the wheelbarrow and the gate guard were friends. By making it obvious that they were going to get in cahoots, there was no serious danger in

³Conference on Problems of Infancy and Childhood, sponsored by the Josiah Macy, Jr.] Foundation.

the situation. There would have been more laughter after that joke had I not said that.

von Bonin: I don't think it matters much whether you say that or not. I heard the joke before in a slightly different version, and it evoked the same laughter because one simply does not think of the wheelbarrow and it makes a completely different structure of the whole situation.

As you told that, I thought of another. It is not a good one. We were in the north woods and a man drove into the camp with a huge, sixteen-cylinder Cadillac. The Indian guide said, "Big car." The man said, "Yes, very big car; sixteen-cylinders." The guide said, "Can go fast?" and the man said, "Yes." The guide spit on the ground and said to me, "Every time a cylinder misses he saves a dollar."

Again, the point can be made that what one first has in view is a battery of cylinders as a complete whole, doing certain things. Then, all of a sudden, attention is directed to an individual cylinder. You've never thought of sixteen cylinders as sixteen individuals, so the situation becomes completely restructured. The man on the banana peel is the same sort of thing, although I think Bergson makes the point that the essence of a joke is when the laws of gravity or the laws of the inert universe suddenly apply to something that lives and topple it over.

Young: Couldn't laughter be defined as the sign of sudden agreement? A smile is the sign of agreement. Laughter appears when there is sudden agreement, for a variety of reasons. It may be recognition of a nonmember of the group, for example. It may be reversal of figure and ground, as mentioned. But it is a communication sign; it is the sign of a sudden achievement of communication.

Bateson: I would agree, but I would narrow it to say that laughter is the sign of agreement that X is both equal to Y and not equal to Y. It is agreement in a field in which paradox has been presented.

Quastler: Isn't it true that you have introduced, surprisingly, a new dichotomy between Z and non-Z, with no reference to the Y and non-Y dichotomy? It turns out that X is equal to Z, but it still is equal to Y; the man still has the excelsior.

Bateson: Yes, he's still got the excelsior. The previous figure is not denied; only its relevance is. We know that the figure is the excelsior. Suddenly, we are told, no, it is the wheelbarrow. But it is still the excelsior, too. The original figure survives, and it is that doubling, I think, which promotes laughter.

Pitts: One of the essences of humor consists in the restructuring or reversal of the figure-ground relationship, but, of course, there is a great difficulty in explaining why not all of these cases are jokes. It is one of the most frequent components of our experience that what we did

not attend to, we now attend to, and what was not important becomes important. But, certainly, the vast majority of these transitions are not regarded as humorous by us; thus, there must be something else which is a common characteristic of humor beyond the reconstructing of the figure-ground relationship or the distribution of tension.

Bateson: There is a rather poor joke going round the West Coast about two men playing golf. A couple of women are on the course ahead of them, playing very slowly. The men want to pass, and one fellow says to the other, "You go forward and talk to those gals and ask permission to pass them." He goes forward, returns and says, "Gee, I can't talk to them. One of them is my wife and the other is my mistress. You do it." So the other guy goes forward and he comes back and says, "It's a small world." Now, it is practically impossible to tell that joke without somebody guessing that that particular reversal is going to occur, and it is less of a joke because it has that leak in it.

McCulloch: There is no surprise.

Bateson: The surprise of the point is lost. I have now heard it told twice and I have told it twice, and none of those four tellings has taken place without leakage.

Gerard: There is a joke which exemplifies all the points made so far, except for Walter's question of why the shift is not always humorous, which I think is a critical one. A fellow says to his friend, "Do you know these ice cubes with the hole in them?"; and the reply, "Know them? Hell, I'm married to one." That has the sudden inversion, the carrying of the inanimate to the human, the problem of tensions and expression and suppression.

I told this joke deliberately to raise the question of the difference between ordinary jokes and so-called dirty ones. There is a very real difference in the kinds of things that elicit laughter and the kind of laughter that is elicited depending upon the setting, the group, and so on. The reaction of this group is illustrative. I have told that story twice to small groups this morning and they laughed uproariously, right here in this room. I have now told it publicly, in the presence of a woman, and the guilt feelings almost suppressed any laughter.

Klver: What about the relationship between humor and irony?

Bateson: Do you mean irony in the classical sense, such as occurs in Greek tragedy when the final disaster is implicitly or explicitly predicted in the beginning by a speaker who doesn't know what he is predicting? Or do you mean irony in the sense of saying the opposite of what is meant?

Teuber: One would be the irony of the situation of Oedipus who does not know what everybody else knows, and the other would be the Socratic irony. Socrates insists he

doesn't know what everybody else presumes to know . . .

Pitts: No, he doesn't want to say he does, but the other person doesn't, either.

Teuber: He knows one thing that the other fellow doesn't: he knows that he doesn't know.

Pitts: And the other man supposes he does, and the irony is directly implicit in the fact that the other man doesn't, either.

von Bonin: May we know how the Greeks defined irony? They talked a lot about it.

Pitts: In relation to the tragedy.

von Bonin: Yes.

Mead: Just a moment. Why are we getting so literary?

Pitts: Well, who started it?

Mead: I am just raising it as a question. Why this outcrop of literary-historical erudition here?

Gerard: Maybe we haven't anything constructive to say.

Monnier: Why does laughter not exist in animals? Laughter implies a comparison of the code of one individual with the code adopted by the group. Laughter arises, for instance, when the individual observed does not behave according to the code of the observers. A man walking on a curb is expected to see the edge and to step to the street properly. If he behaves like an automaton, does not see the edge of the curb, and falls, the observer laughs. Bergson pointed out the biological function of laughter, that it tends to protect society against egocentric mechanical behavior of individuals at variance with outer reality.

Mead: I would be willing to accept that laughter can occur when there is a contrast between the code of the collectivity and the individual event or remark, but not that it necessarily requires that something has gone wrong; there is also the laughter when something goes right. Laughter is one of the easiest human responses to evoke by someone saying what everybody is feeling but nobody has expressed it or is quite willing to say it in that way. It isn't that the remark is wrong to make, but that there is a discrepancy between what is correct to express and what everybody feels. The discrepancy is the thing that produces the laughter. People laugh when the cork is pulled from the bottle.

Young: Children's laughter.

Wiesner: People often laugh when they are upset or nervous. The situation in itself is not humorous, but when the relationship between the external and internal world is not quite right, laughter is one way of bridging the gap.

Mead: So there is again a discrepancy.

Wiesner: The discrepancy seems to be a common thing.

Young: Humor is only one of the situations that evoke laughter. That is what we want to say.

Bateson: Yes, and the situations should be subject to formal analysis. We should be able to say how we would construct a cybernetic machine of some kind which would show this characteristic which would be thrown into some sort of oscillating condition by certain types of contradiction.

Wiesner: It would laugh whenever the input and the coding did not match properly.

Bowman: There can be a very simple network of two tubes in such form that if one conducts, it cuts off the other. A circuit of that type may have two stable states. If it is put in any state, it will asymptotically approach one of the two stable states and stay there. On the other hand, with the same components in slightly different values of the circuit constants, it can oscillate.

Bateson: I am always prepared to say that an electric buzzer is laughing.

Bowman: It has no stable state.

Bigelow: I don't understand what we are trying to do here. Are we trying to construct a definition which will be adequate for all types of humor?

Mead: No; we are not studying humor.

Gerard: We seem to be trying to equate humor and laughter.

McCulloch: We are trying to study the role of humor in communication.

von Bonin: I am guilty of this digression, for I wanted to speak about figure-ground and used a joke as an example because it seemed to me to illustrate the point more clearly than the cat on the mat. Throwing in another joke got the discussion off on a tangent. May I bring it back by bringing up another point. In language, there are not only the actual words which are announced but there are also the overtones in the language.

In studies being done in Chicago, the experimenters are putting forward that there is a difference between laryngeal and oral speech. It has been shown that you can frequently understand the emotional state of a person even when you don't understand a word he says. We have had, for instance, a man talking in Hungarian, which none of us understands, but we have gotten a faint idea of what he said.

Bigelow: What could you tell?

von Bonin: Whether he related a story, whether he was trying to express his displeasure, whether he approved heartily — that sort of thing.

Mead: That won't stand up cross-culturally.

von Bonin: I don't think it will at all. For instance, you can't ask a question in Chinese by raising your voice at the end of the sentence because the last syllable would mean something entirely different.

Mead: What does stand up cross-culturally is that in every society that has been analyzed so far there seems to be a tendency to symbolize certain states by certain sounds. The sounds are not constant but they have enough physiological congruence so they may recur.

Wiesner: May not there be physiological changes in the mechanisms of speech which can be universally recognized and deciphered? For example, when an individual is angry, his muscles tighten so the format structure is very different, thus changing his tone.

von Bonin: That is the problem the Chicago group studied, whether his voice can be meaningful without an understanding of the words.

Pitts: That is, do all people in all cultures raise their voices when they are angry.

Bigelow: Does the aspect of information content involving emotion remain across cultures?

Mead: No.

Bigelow: Can you enumerate cultures in which these overtones do not contain, essentially, emotion but some other information?

Wiesner: In other words, do people always talk faster when they get excited?

Mead: As far as is known at present, there are no universals of that order. The universal is that every culture, if the language is properly analyzed, includes what Trager and Smith are coding as superscripts; that is, every language has a recognizable intonational pattern. Similarly, every culture has a code of emotional expression but the code differs from one society to another.

Bigelow: But is it emotion in every case?

Mead: The best example I can give are the shouting signals of the Arapesh, in which they use words. The words may be, "Somebody is coming," but nobody hears the words. Some words are shouted that nobody can understand, that communicate only a degree of affect by their loudness and their frequency. The people hearing the shouts sit down and figure out what is meant entirely in terms of their knowledge of the probabilities of the situation, which are quite reasonable. They translate a message which has the form of information but which never gets across. They sit there and say, "Now, that came from there. Who do you think would be there now? Who would be shouting that loud and that often? And if it were he who is shouting, what does it mean? Does it mean that his mother-in-law who has been quite sick has died?" They work up a whole series of probabilities and then they set out to the funeral.

Bigelow: In such a case as that, then certainly the over-

tones contain something else besides the usual emotion; they contain a lot of information separate from emotion.

Bateson: The tone languages and the use of drum signals should be mentioned. There are languages in which words have significance on a flat tone or a rising tone or a falling tone. In Chinese and in many of the African languages, this occurs. The pitch or pitch structure of a word discriminates that word from others which would otherwise be homonyms.

This problem of homonymy arises in reverse in African drum signals⁴. The Bantu spoken languages have significant pitch, but in sending messages by drum, only the pitch can be transmitted. This would lead to serious homonymy except that it is avoided by transmitting whole phrases instead of single words. Thus the word "girl" is conventionally replaced in drum messages by the phrase: "The girl will never go to the linginda fishing net." (The use of this type of net is a traditionally masculine occupation.) The long tonal sequence provided by the whole phrase precludes homonymy.

For the purposes of this discussion, the important thing is to treat the word "language" as including all of this. We should drop the idea that language is made up of words and that words are toneless sequences of letters on paper, although even on paper there are possibilities for poetic overtones. We are dealing here with language in a very general sense, which would include posture, gesture, and intonation.

Klver: First, I should like to remind you that Yerkes once pointed out that the chimpanzee resents being laughed at by man or other animals. Second, I wonder whether what has been said here should not be related to more general considerations. The factor of discontinuity which has been emphasized in this discussion is, of course, characteristic of many psychological phenomena. For example, all our dealings with inanimate and animate objects, with humans and animals, involve processes of "typification." One may doubt whether personality "types" exist, but one cannot doubt that processes of "typification" constantly occur in our response to environmental objects and events. The great psychological and sociological significance of such "typifications" was recognized long ago by philosophers, such as Simmel⁵.

It seems to be the fate of many "typifications" to suffer sudden breaks or reversals. You encounter a man on a beach and after talking to him for a while you learn that he is, let us say, a priest or a colonel. As a result, the whole field may suddenly become restructured and reorganized. Or let us consider our reactions to objects of the visual environment. We are in optical contact with an object, and we may go to the trouble of performing

⁴Carrington, J. F.: *The Talking Drums of Africa*. London, Carey, Kingsgate, 1949.

⁵Simmel, G.: *Soziologie. Untersuchungen fiber die Formen der Vergesellschaftung*. Leipzig, Duncker & Humblot, 1908.

numerous and diverse motor reactions to stay in optical contact. However, it happens again and again that the contact is broken since the appropriate movements either cannot be performed or cannot be performed quickly enough. Thus, optically induced behavior constantly involves discontinuities and breaks resulting in loss of contact or coherence between ourselves and the object.

More generally speaking, life seems to be a sequence of jokes, the humor of which we often fail to recognize.

Ashby: Perhaps this repeats what has just been said, but the language is sufficiently different to suggest that there may be some more general principle behind both. I want to consider the question of an observer getting information from some physical system, either an inanimate system or another human being. Every physical system lives in a physical universe. The system is surrounded or supported by a great number of variables that are in some effective contact with it. The observer can profitably study only systems in which these surrounding variables are constant. If the surrounding variables are held constant, the constancy is sufficient to isolate the system, and the observer can get useful information out of it. But because the surrounding variables are constant does not in any way prejudice what values they are constant at. Thus, when the observer is studying the system, this is one of the first things he must find out. In ordinary language, he must find out what the person takes for granted.

The number of surrounding variables is usually uncountable. If one started to write down what we are taking for granted this morning, for instance, that we are talking in 1952 A.D. and not in 1952 B.C., the list would get sillier and sillier but it would have no end. Consequently, all the information that is coming out of here this morning is related to these values, even though they can't be given explicitly.

What may happen is that the observer, taking for granted that a surrounding variable has the value of, say, zero, may go on collecting information about the system until suddenly some astonishing event shows him that the variable must really have been at one all the time. He suddenly has to re-interpret all his past information on a new basis. That is the critical moment, when he realizes that the variable which he had assumed to have one value evidently must have some other value.

Wiesner: This is the situation you have when somebody talks at you in a foreign language and you don't realize it for a moment; then you suddenly switch. If you go to England and expect an accent that you have to adjust to, and a man talks French to you or German, it sometimes takes many words before you realize it and make the translation and get information.

Bateson: The social scientist is not only in the sort of position that Ashby has suggested for his observer but,

worse, he is investigating a dynamic system more or less in the dark with a flexible stick, his own personality, the characteristics of whose flexibility he does not fully know. There is, therefore, a set of unknowns in the observer, which are also subject to investigation. Every statement we make about the observed derives from premises about the self. I say this glass of water is there because I can touch it with my hands and feel it there with my eyes shut. In order to make this statement, "It is there," I have to know where my arm is, and, on the premise that my arm is out in that direction, I conclude that the glass is there. But the premise about myself is built into my conclusion. The whole gamut of projection phenomena follows.

There are premises about one's self, in terms of which one understands something else. But the events in interaction between oneself and the something else may lead to a revision of premises about one's self. Then, suddenly, one sees the other thing in a new light. It is this sort of thing that leads to the paradoxes and to a good deal of humor, I would suspect.

Ashby: A paradox might start in this way. You begin by thinking that parameter alpha is at zero, but, after you have gone on for a time, you suddenly realize it must be at one, and you start to re-explore on the assumption it is one. If the system has something rather peculiar in it, it might force you back to the deduction that alpha is zero. Obviously, if you go on without any further change, you are caught because you will go on changing in opinion backwards and forwards. What it means is that, simply from the physical point of view, the two, observer and system, have gotten into a cycle. There is nothing strange in the physical aspect, although it may be disturbing to the observer.

Bateson: And if those are two human beings, when that point is reached, laughter is likely to occur.

Ashby: Very likely.

Teuber: Wasn't it Gregory's point that it is quite desirable for the benefit of the process of communication to let jokes, or riddles of a certain sort, point up the schematism that is shot through all of our communicative processes and without which we could not communicate?

Bateson: A schematism which we cannot communicate by itself.

Teuber: Yes. There have to be schemata; we cannot talk or communicate, even in nonverbal forms, without some schematism. At the same time, I want to point out, and this, I think, was also Klver's point, that the schemata are quite limited. We have constantly to pick and choose, shift or be pushed from one to another. Whether the sudden transitions are frightening or exhilarating probably depends on very many things that have not been enumer-

ated. But I think it is no accident that jokes and riddles tend to appear together in child development. When the child begins to make jokes, he usually will ask riddles for the first time in his life. Similarly, the so-called primitive riddle seems to lie somewhere between the pun and the prototype of a lyrical metaphor. These riddles exist in all sorts of languages and cultures, although I would not know whether they are really universal.

Mead: No, these riddles are not universal. Some people do not have them.

Teuber: Still, those that do exist are surprisingly similar in structure. For example, "bird without feathers flies to a tree without leaves." The answer: "fire consumes a log." Such a primitive riddle seems to play at making a definition.

Pitts: Is not the definition of a good riddle that its answer is a good joke?

Teuber: Certainly, or a poem. All these forms of expression have this in common: they point simultaneously at the value and at the limitations of all schemata. They force us to realize that the communication process is what it is — it cannot do without the schemata. They make communication, for a moment, about communication.

Young: Laughter is the recognition of the achievement of that communication.

Mead: But Walter made the point that all such occasions do not provoke laughter, for instance, Dr. Ashby's picture of the scientist who has worked for years and then he discovers he has made a mistake in attributing a certain value to a variable. The response there might well be convulsive sobbing instead of laughter. I think if we keep laughter in the context originally suggested, of a tension release that is related to other tension releases, we shall do much better. In such a context, laughter has the function of a safety valve.

Remond: That brings up the point of the emotional status of the individual at the times when humor has a possibility of occurring. For instance, A can say a particular phrase to B, and in a certain emotional state, it will not be humorous; at another time, because of what has been said before or what he has lived through before, B will laugh uproariously. There is, therefore, a very important difference between the reaction of a human being and a machine. Man adapts to the moment and a machine should be, at all times identical to itself, not changed by emotions built up for a variety of reasons not absolutely relevant to the joke being made.

Some people laugh very easily. They see something to laugh at immediately in everything. Some people, who are extremely cold or who are sad for some reason, will not laugh at anything. But sometimes laughter depends

on things other than the emotional state. For instance, the meaning of some phrase can be well understood but the phrase does not carry the humorous message it should. I am thinking about the fractured French jokes on napkins. Since I am French, I was interested in them. My emotional state at the time I saw them was quite adequate. I was at parties; I had been laughing already; I had been drinking, and I was set to laugh easily. But the fact that those jokes were not made for French people and that I had to make an effort to understand them put me in an intellectual attitude rather than a humorous one. I had to be led to understand that in America such and such a phrase was pronounced with such and such an inflection or such and such an accent so that it could refer to such and such a situation. But I wasn't happy with it; it wasn't funny.

Wiesner: Well, I, as an American, don't find them very funny, either.

Remond: Sometimes I can see that some are funny, but I have to analyze their positive meaning to understand them and I don't feel them really, which is quite different.

Bateson: The diaphragm is not really involved.

Gerard: And that factor vitiates a great deal of the discussion that has gone on this morning. There is something quite unique and explosive when the diaphragm gets out of control, but most of the discussion has not dealt with that semiphysiological aspect of it. Laughter may become as uncontrollable as the other two elements you mentioned, or as a fourth one that I think is probably related, the yawn.

McCulloch: Domarus worked up a set of jokes ranging from those which will make a man laugh under almost any circumstances to those which are so dull and boring that you just don't see how anybody could laugh at them. He told these deliberately and systematically to people in various degrees of fatigue, and found that the ease of provoking laughter was dependent in large measure on fatigue. Dusser de Barenne and I were among his guinea pigs. He would never forewarn us, of course. He would simply be around while we worked. We were really horrified that, at the end of seventy-odd hours of work without more than a few minutes snatched in sleep, he could tell us that one and one made two and we would burst into laughter. We became furious with ourselves at the ease with which laughter was evoked when we were tired. The physiological state of the organism is crucial, but just how, I don't know.

Mead: The most laughter I have ever gotten was when I gave the last lecture to a group of social workers who had had a week's conference. They laughed at anything. It didn't make the slightest difference. They laughed virtu-

ally before I opened my mouth. But there was something in what I said that gave them permission to laugh, just as when a joke was told to you. All the cue you needed at that state of fatigue was, "It's all right to laugh." A comparable situation is when one has been repressing yawns with a terrific effort. The minute the chairman says, "Let's have some coffee," the yawn will burst out in that same way.

Fremont-Smith: There is another element in Warren's situation, that he had been trying for seventy-odd hours to focus his attention on a problem. He really wanted relief from that. The "one and one makes two" provided a situation for a withdrawal of attention and a moment's relief and relaxation.

One point that seems to me important is suddenness of shift; I don't know whether there is such a thing as a slow development of a sense of humor. I suspect that what happens is that a series of sudden steps must be involved rather than a gradation.

Another thing I should like to bring up is, shall we put a little more attention on the humorless person and on the person who is at a given moment humorless? It has seemed to me that the humorless person is the person who lacks perspective or lacks the capacity to see something in several different perspectives. Isn't that the figure-ground situation again? The humorless persons sees things only in a very narrow frame of reference, and therefore he cannot shift.

Teuber: For that reason, if we are working on a difficult experiment, we ordinarily don't appreciate any sudden increase in difficulty as humorous.

McCulloch: If a man already has investigated those possibilities and you bring up one of them, he isn't likely to laugh.

Pitts: I should like to say several things, of which a number are meant as a summary. First, I should say that we are probably agreed that, in some sense of the term, a restructuring of the situation is necessary to a joke, and we should probably also agree that a certain suddenness is required if it is to produce an effect. The restructuring will explain Dr. Fremont-Smith's case of the man who is humorless because of his incapacity for restructuring his point of view, and the suddenness will presumably explain Tony's case of the joke whose point cannot be perceived without a considerable intellectual application, that is to say, not except by a relatively slow process.

In addition, I still maintain, in agreement with Dr. Klver, that some additional quantum is required to make something into a joke. I would like to deviate from that, however, for one further point, namely this, that one must, although this is not the kind of thing I customarily say, not suppose that a joke, every time it is said or every time it is heard by a given person, is necessarily

the same joke. The joke must be considered in the context of the person who hears it, and his past. The fifth time you hear a joke, you rarely laugh. Naturally, the reconstructing of the situation in your case is in that case absent because, well, you can predict the future course of the joke, and so, when you begin hearing it, you have the whole situation in mind and that simply persists without any restructuring, all the way to the end.

With respect to the additional quantum, there is only one suggestion as far as I can see, namely, Gregory Bateson's, that there is a kind of self-reference of the type seen in the logical or pre-Socratic paradoxes which is superimposed on the restructuring of the situation to produce the humorous element. However, that is something I can't easily understand and, consequently, I should like to ask him how he would apply this additional element in the case of the joke he gave. I don't think there is any process of self-reference in the story about the man with the wheelbarrow and the excelsior.

Bateson: When the story is told, the hearer is invited to identify himself either with the gate guard or with the man with the excelsior. "If you were in that situation" is the premise which is introduced. That is one part of the problem of self-reference. The other part is related, I think, to a peculiarity of human communication, which I think was implicit in what you said, Dr. Monnier, that when two human beings are talking or communicating in any form, there is a mutual awareness of the fact that they are communicating. It is not clear that similar mutual awareness is always present among animals. In the courtship of sticklebacks, for example, there is an exchange of signals in quite a complex sequence. The male has to do A and in reply (as we say) to A, the female does X; and X sets free the next step in the male's behavior which is B; which sets off the next step in the female's behavior which is Y; and so on: A-X, B-Y, C-Z; ending with a completion of the driving of the female into a nest which the male has built, where she lays her eggs and he looks after them. A, B, X, and Y are various sorts of perceptible behavior, exhibitionism, as we might say: raising the spines, exposing the colored belly, etc. But it is fairly doubtful in such sequences how much each communicates or is adjusting his communication to the circumstance of whether it is or is not perceived by the recipient. The male will, I think, start doing his belly dance in parts of the aquarium where the female can't see him.

When human beings try to communicate with each other, we raise our voices, for example, according to the distance that the recipient is from us. We modify our speech in all sorts of ways and include in our speech all sorts of messages about how the speech is to be interpreted. At the end of the message, we say, "Over," in

some form or other. We punctuate. We stop and ask at a given moment, "Have you got me so far?" We watch the faces of the people we are talking to, to see whether the message is getting through, and what they do with their faces is a very important contribution to the communication because it tells us about the success of the communication. The faces give us a message about communication at this higher level of abstraction. In human communication, the essence of it, almost, is the fact of a mutual awareness of the other person's perception. Often, it gets distorted; often, we don't behave rationally in terms of this awareness. We may repeat and repeat when we know very well that the other person got the message. But that mutual awareness seems to me to be very important in human communication.

Young: Why do you say "awareness" rather than "repeated exchange of signs"?

Bateson: Because I want to stress again the implicit content. Many of the implicit messages are about that awareness.

Pitts: But what about all this as peculiar to a joke?

Bateson: The involvement of self in a joke is the thing I was getting to. You can't stand to hear a joke more than three or four times. By the fifth time, you don't laugh. However, a very large number of people will laugh at a joke the twentieth time they tell it.

Gerard: Well, that was a shift. Tell it or hear it?

Pitts: There was a shift.

Torre: That is the point now.

Bateson: The teller of the joke is able to be self-involved in the joke because he can hear it as if it were new. Granted he hears through his Eustachian tubes and not as a simple recipient, but he can identify with the hearer of the joke as a creature who has never heard it before and therefore he can laugh.

Fremont-Smith: Two elements come in there. One is the business of contagion; very often, somebody who has not heard the joke or has not understood it at all will laugh if the group laughs. But the man hearing a joke for the fifth time does not laugh because the element of surprise or suddenness is absent.

Mead: But the significant thing still is the conditions under which laughter will or will not be evoked as they relate to the question of identification that Walter brought up. Humor is a playful change of identification, which is safe. One of the things you communicate to an audience, when you keep them laughing, is, "It is safe to think like this, it is safe to think like me, it is safe for a minute to say it like that. Nobody will keep you there. You can get back. You can move around. It is play. It is free."

Fremont-Smith: And something you wanted to do before.

Mead: As to grief, if one takes Erich Lindemann's studies of grief⁶, there is, again, identification involved. His studies, which are the best that I know of, are cases where the total identification with the person who was lost was such that it was unbearable. Tension was built up to an unbearable point and was released in a different type of diaphragmic breakdown. Identification is required before there is grief or laughter, but in one case it may be something that is terribly dangerous.

Once, I was presiding at a conference of dreadfully solemn people on family life. It was just before Mother's Day, and everyone was tired. Our P.T.A. delegate had announced she was going home to take up her duties as a mother, and I wanted to give the audience a sense of not being worried if people went out early on this last morning so I said, as chairman, "Our principal mother has already gone because she wanted to be home on Mother's Day, and we will all understand that this is the day before Mother's Day and anybody who leaves is going home to be a mother." And then I thought, well, I have to deal with the men, and I said, "Or going home to help their wives be mothers." The audience roared with delight. If I had said it knowingly, they would not have laughed because they would have been frightened. You can't have chairmen, you know, at a conference on family life who make dirty jokes.

Fremont-Smith: The audience laughed at you. There probably was in that situation a recognition that you had slipped without meaning to, and they were enjoying your discomfiture.

Mead: No, the essence of it is, surely, a safe recognition of the communication of sex, which is one of the funniest things. I think the element of relaxation when it is safe is the pertinent thing. The release of tension when unsafety has built up, ties in with what happens in grief and, in a sense, in orgasm, because orgasm is a problem of safety, too, of trust.

Pitts: I will accept that as an explanation rather than identification. Many of the most amusing things people say are not said with the intention of being funny.

Bigelow: Isn't there some element of personal discovery?

Young: Or group discovery.

Mead: If it isn't too painful.

Gerard: To follow up a point that Frank made about the contagion of laughter, you probably all have heard these "laughing" records. If I hear one by myself, I am quite able not to laugh; but in a group, when laughing starts, I

⁶Cobb, S., and Lindemann, E.: Neuropsychiatric observations. *Management of the Cocoonut Grove Burns at the Massachusetts General Hospital*. Philadelphia, Lippincott, 1943 (p. 14-34).

cannot avoid an uncontrollable laughing response. This is a case, then, of laughter itself provoking laughter, without any symbolic or conscious or logical or other meaning.

Mead: Yawning, too, provokes yawning.

Fremont-Smith: Laughter has memory meaning, and therefore symbolic meaning, I would think.

Gerard: I don't know that it has to have any memory meaning.

Fremont-Smith: Would someone who has never laughed go off that way? I think it almost inevitable that hearing laughter and seeing other people laugh would evoke memories of laughing situations, unconscious memories.

Gerard: It would be interesting to try it out on somebody who has never laughed, if such a person could be found.

Fremont-Smith: There is contagious coughing at a concert or in a whooping cough ward; if one person starts to whoop, they will all whoop; and if somebody has tears come to his eyes and you watch him, tears are very likely to spring to your eyes.

Young: Have we sufficiently recognized the place of laughter in communication signs? The difference between man and the stickleback is that we have specific signs to indicate communication in general; a series of those, which are very complicated, start on the face. I wonder if there is any significance in the proximity of the face area, the mouth area, and the laryngeal areas of speech in the cortex. Is it an accident that the smallest communication signs appear in the face and are part, almost, of the speech mechanism itself? From the face, a whole series of communication signs for use in expressing more emphatic and sudden achievements of communication spread down. The diaphragm has been mentioned, but convulsions of the entire organism may be used to indicate sudden and important intercommunication, as, for example, in dancing.

Klver: In connection with Dr. Young's remarks, it is a very interesting point that many animals communicate with the face of man instead of some other part of the human anatomy. It may be worth while to study this form of communication and also to get some information on animals which do not communicate with the face. As far as our own reactions to the human face, it is somewhat surprising that we speak so often of sweet, sour, and bitter faces. There seems to be a strong tendency in man to communicate in terms of gustatory qualities.

von Bonin: I think most emotions are contagious, whether they appear in the face or not. If somebody cries, many will start crying. You may not and I may not, but very many people will.

Gerard: At least you won't go around giggling, chuckling, or laughing.

von Bonin: The question as to how we participate in and how we perceive the emotional state of another being is a large problem which I don't believe anybody has tackled very clearly.

Bateson: When I was talking of mutual awareness of perception, I was leading up to empathy.

von Bonin: Mutual awareness of perception?

Bateson: Yes, in human communication.

Pitts: It does not generate laughter.

Wiesner: One does not laugh hard where there is not the possibility of feedback. If you are listening to the radio by yourself or reading a book, you will chuckle, whereas the same stimulus, in a group, may evoke enormous laughter.

Mead: A complete sequence can be proposed from the smile to the socialized dance or to copulation, but then grief cannot be handled in it. Grief, in a sense, would have to be regarded as a failure in social interaction. The sobbing that goes with grief is not dependent on the presence of another person, and yet it has the same convulsive aspects.

In the conference on "Problems of Consciousness" held last week, one of the problems raised was the protective function of breaks in tension.

Pitts: Does anyone know what the word "tension" is a metaphor for? I think that is the most promising avenue of approach, but this is the difficulty that strikes me first.

Mead: It is an idea that has arisen in the course of studies on epilepsy. If all convulsive states could be regarded as having protective functions in breaking rising tension, then they could be differentiated in terms of how much need of protection one has. Laughter protects in a real communication system with other people. Grief protects against a moving out of communication, against such an identification with the dead that one is no longer in communication at all. They both are protective and they both are comments on communication, but one of them occurs in a real intercommunication system and one occurs outside it.

Monnier: I have the impression that the physiological basis of these two expressions, laughter and grief, is different. Both these expressions have different physiological inductors. There are cases in which paroxysmal laughter leads to loss of tone, patients who, when laughing at a joke, lose their tone and fall prone. This is called catalepsy and may be the result of a generalized emotion or tension. In grief, as we know from primitive societies, a generalized emotion may end in rhythmic vocal expression and not in a collapse of tone. In both cases, relaxation of tension is obtained.

Mead: But either control or loss of control is possible. Grief can be controlled; Mourning can be patterned so

that it is highly stylized and has a rhythmic quality which is reassuring, or it can be of the type that moves more and more towards loss of control. One can be helpless with sobbing or helpless with laughter. There are two possibilities in the same system, really, either to achieve oscillatory steadiness or to move toward the point where people throw themselves on the ground and no longer have any control at all.

Fremont-Smith: The small child so frequently goes back and forth between laughter to crying.

McCulloch: Well, isn't it true that with most people, if they get to laughing very hard, are apt to end up weeping, too? I don't think the two mechanisms are completely independent.

Fremont-Smith: I think it is interesting, after what Dr. Monnier said, to touch on narcolepsy. There are patients who have a lesion in the hypothalamic area and are constantly dropping off to sleep. They are relieved of this sleep tendency by the benzedrine group of drugs but they cannot go to the movies frequently because the comics throw them into unconsciousness.

Pitts: Do you know anything of the effect of grief on such patients?

Fremont-Smith: No.

McCulloch: I had to go over the literature about four years ago. At that time, there was no recorded case in which grief precipitated sleep, at least none I could find. On the other hand, I myself have seen cases, and there are several instances in the literature, in which anger precipitated it.

Fremont-Smith: And conflict. I have seen emotional conflicts in the narcoleptic precipitate the sleep state in exactly the same way as any other psychosomatic phenomenon was precipitated.

Quastler: What happens to the narcoleptic if you make him laugh just by tickling him, without any humor being involved at all?

Fremont-Smith: I think they lose their tone and may go right into sleep.

Quastler: It is the laughing that causes it?

Fremont-Smith: Yes.

von Bonin: *Lachschlag*, in German.

Bateson: Tickling for some reason hasn't been mentioned, or the relation between laughing and the scratch reflex. I wish somebody who knows about such things would speak about them.

Bateson: We use tickling metaphorically; we laugh when "tickled."

Klver: So does the chimpanzee.

McCulloch: And the orangutan.

Monnier: The common feature of the two conditions which produce the tickling sensation and laughter is the repetitive action of very slight, or even subliminal, stimuli. This gives rise to a spreading process, which activates consciousness. We spoke, in the meeting on consciousness⁷, of the ascending activating reticular system, which has been identified by Moruzzi and Magoun and which induces the arousal reaction. The mechanisms which increase consciousness, pain or laughter produced by a tickling sensation, have something in common. They are put in action by repetitive stimuli and they induce a generalized excitatory state. If the increase in tension becomes too great, it may suddenly be cut by a protective mechanism which produces, in one case, loss of consciousness or tone and, in other cases, rhythmic vocal expression. But these various forms of expression are always the result of repetitive stimuli, ending in a widespread (irradiated) paroxysmal excitation.

McCulloch: There are two varieties of tickling. We use one word for two entirely different things, I am sure. There is tickling in the sense in which a fly tickles you or a straw up your nose tickles you, and there is the tickling produced by a rather strong stimulus of a fluctuating kind, which results in laughter. That kind of tickling can rarely be done to oneself. The kind with the straw up one's nose certainly can. They differ in the self-reference component in them. The one that produces laughter loses its effect in many postencephalitic patients, while the other does not. Postencephalitic patients do not laugh, and almost all of them show also a remarkable reduction in sexual activity. Those who have lost laughter have lost sex, for the most part. It is the common mechanism involved.

von Bonin: Does the straw ever evoke laughter in anyone?

Pitts: It is rather more like itching than tickling.

Mead: You have a problem here, Warren, if you equate repetitive tickling with various varieties of sexual foreplay that act as sexual stimulant, for that can be something self-administered or other-person administered.

McCulloch: That's right, it can be; there is only the question of whether it must be brushed off or whether it switches over to sexual excitement. But the kind of tickling that evokes laughter is lost in the postencephalitic whose sexuality is also down.

Bowman: The straw can cause a sneeze. Is that an allied effect?

Mead: Quite.

Bateson: Do you think one could discriminate between

⁷ Monnier, M.: Experimental work on sleep and other variations in consciousness. *Problems of Consciousness*. Abramson, H. A., Editor. Third Conf. New York, Josiah Macy, Jr. Foundation, 1952 (p. 107).

these two sorts of tickling in a dog?

McCulloch: Yes, very decidedly, and in the cat it is even easier.

von Bonin: You can tickle the ear of a cat.

McCulloch: Yes, and the ear starts to snap, to get rid of the tickle, and then the paw comes up.

Bateson: That is one type. How about the other?

McCulloch: The other type is produced usually by stimulation in the small of the back of a rhythmical kind. The cat will start arching and its tail goes up. The dog is ticklish in the same region, and it is in this region that man is also most ticklish.

Pitts: It seems to be wholly pleasant, though, in the case of the cat or dog, whereas we don't usually enjoy being tickled.

Teuber: Oh, it can end by the cat biting. The transition can be sudden.

Mead: There are cases where tickling is a definite form of foreplay and other contexts where tickling is regarded as unpleasant. Take the tickling that occurs among adolescents, for instance, where it is very common. This is an age that goes in for a great deal of tickling. If it cannot be allowed to go to a sexual conclusion and it is unpleasant, it becomes a rejected activity, but in an approved situation of very rough forms of courtship of certain sorts, tickling goes right into a developing sexual sequence.

Klver: We have discussed a number of situations in which a sudden break, reversal, or discontinuity leads to a restructuring or reorganizing of the whole field. Such situations occur on all levels of behavior, ranging from the perceptual to the emotional. It seems impossible to discuss all these situations profitably in a general way without recourse to a scientific analysis of particular situations. Only such an analysis can specify the properties of a given structure as well as the conditions in the external and internal environment related to this structure and governing the transition from one structure to another. Let us suppose such an analysis of a concrete situation, for example, of a certain phenomenon in the field of laughter, has been successful in specifying the numerous psychological, physiological, and other factors involved and let us suppose the results of such a scientific analysis are handed to Dr. Bateson. The question I wish to raise is whether at this point there are any problems left unsolved? And if so, what are these problems?

Bateson: Yes. I opened the discussion with the focus on laughter and humor, but the thing that I would be interested in from such a study would be to use the occurrence of laughter as an indicator, a sort of litmus paper. This would be helpful in studying the implicit content of communication. It is an extraordinarily hard thing to study, actually, because we do not know what is in the mind

of the communicator or what is aroused in the mind of the recipient. It seems to me very, very important for sociocultural investigation and for psychologic and physiologic investigation to begin from some fairly sharp criterion for what is in the message. Dr. Mead told a story about herself as a president. Von Bonin said that it was a *Schadenfreude* joke. He heard an overtone which Dr. Mead, so far as consciousness is concerned, is prepared to deny, perhaps correctly. She, after all, was present at the meeting and von Bonin wasn't. But it is awfully hard to test any statement of that kind. One uses one's sensitivity and one's imperfect knowledge of his own communicative habits. One predicts. The question is, if one had a satisfactory working hypothesis, or some idea of the types of paradigm which lead to something like laughter — could the occurrence of laughter be used as an indicator for what there was implicit in the communication? That is the question in which I would be interested, not so much in the significance of the laughter as in using its occurrence as an indicator.

McCulloch: May I say that we have two questions still before us. It is fairly clear that one item of value in jests leading to laughter is that the joke sets up some kind of a relation in which it is safe to play. The second thing that is fairly clear is that there is always some re-shuffling or restating of the problem, which in itself may be valuable in the transfer of information. But it is by no means clear that these are the only functions that humor may have in communication. There is the double role of the jest, one, the reorganization within the person, and the other, the reorganization between people, and I don't believe this has been sufficiently disclosed. Can we have Bateson say once more what he thinks is communicated besides what formally appears in the jest? Is it the relation of people to one another? Is it the relation of people to themselves in the situation?

Bateson: In human exchange, in general, we deal with material which cannot be overtly communicated: the premises of how we understand life, how we construct our understandings, and so forth. These are very, very difficult matters for people to talk about with precision, but if these premises are out of kilter between two people, the individuals grow anxious or unhappy. Humor seems to me to be important in that it gives the persons an indirect clue to what sort of view of life they share or might share.

As to the way in which humor does that: Consider some swallows that are migrating, we will say, from London to New York and suppose that we are scientists who face the problem of finding out how the swallows know the route. We invite the swallows to communicate to us how their conceptual world is made up: what sense data they use and how these data are fitted together to enable

them to find their way. If we watch the swallows and we find, for example, that they travel on a great circle without error, it is true we know something about the swallows now that we did not know before, but we are left pretty much in the dark on the question of how they do it. The only way in which we can have the swallows communicate to us how they know is either by their making errors and correcting them or by our performing experiments which will put them in error and then observing which errors they can correct and which they cannot.

It seems to me that a very important element is added in human communication when B is able to observe what corrections A makes in his (A's) course. One of the questions which the young psychiatrist asks is, "Is it a bad thing to say such-and-such to a patient in such-and-such a situation?" to which the only answer is, if it be a bad thing and the patient react unfavorably to that "bad" thing, and if it be later possible to communicate to the patient that that was the thing to which he reacted unfavorably, then all may be well. In fact, if the therapist is able to correct his course and thereby communicate to the patient some hint of how matters appear to the therapist, the original error may become a very important and useful thing in the communication. A great deal of communication occurs not directly but by the commission of error and its later correction.

It seems to me that the nature of a jest is somehow related to this point, that when the joke breaks open and the implicit levels have been touched, have met each other, and oscillation has occurred, the laughter verifies an agreement that this is "unimportant," it is "play," and yet, within the very situation which is defined by the laughter as play, there is a juxtaposition of contrasting polarities, which contrast may be compared to the commission and correction of an error. The laughter lets those who laugh know that there is a common subsumption of how they see the universe. Do I answer the question that you asked?

McCulloch: Exactly.

Fremont-Smith: I wonder if we don't have to go back to the earliest development of laughter or smiling in the infant to get some idea of all the meaning of the shared experience? One of the early ways of communication between the mother and the baby is the mother's smile to the baby, which a little later is responded to by a smile on the part of the baby. The mother's smile is one of the basic means of reassurance to the small child. It seems to me that when two people are talking and one of them smiles at the other, the smile contains the element of reassurance. The person is saying, "I like you, I like what you are saying, I understand you," so that it is a sign of the effectiveness of their communication; it is a reassurance. A smile is associated with physiological changes,

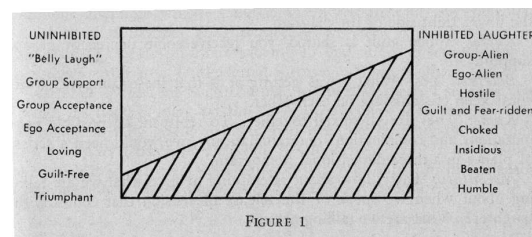
such as dilatation of the skin vessels, which are opposed to those found in an anxiety reaction. Anxiety is almost always associated with the absence of a smile and with a fall in skin temperature.

Bateson: I think we are clear on the reassuring aspects of laughter, the in-group statements, the affirmation of group membership which is implied when both individuals laugh or smile; and we are clear enough that laughter, especially thoracic rather than belly laughter, is a conventional sign which people use to each other, quite apart from whether it is the "real thing." Such laughter becomes almost a part of the vocabulary and is almost as voluntary as the use of words, not quite but nearly so. The problem, which I want to push toward, is that of involuntary laughter and its antecedents, rather than the problem of the function of laughter between two persons in melting the ice.

McCulloch: The latter says, "I got you," and "I got you at the level of premises."

Bateson: At the level of premises, and it is indicated that the premises are right because there is a crisscross of them. We define a point not by drawing a line but by making two lines cross.

Kubie: Laughter is in itself a language, and, like all languages, it can say many things. In the rectangle of Figure 1 are represented two poles of meaningfulness. At one is the unchecked or uninhibited belly laugh, and at the other the inhibited laughter. The major difference between the two poles is that at the one extreme there is a general sense of group-support and group-acceptance; whereas at the other end, the laughter is group-alien. Group-supported as opposed to "group-alien" refers to the relationship that is communicated between the person who starts the laughter and the group to which he is talking, or the group that is represented, or that he represents. It may be a group that is present in the flesh or a group that is there only in his thinking and in his own words or actions.



In the unchecked belly laugh, there may be a loving element. Therefore, it is guiltless and is not held in check by guilt feelings; whereas, in the inhibited laughter, as we all know, it is difficult sometimes to tell whether a person is laughing or is grimacing with hostility. It carries an implication of masked hatred, with an enormous

guilt factor which stifles the laughter even as one laughs. Finally, there is an element of triumph in the unchecked belly laugh. The person is unafraid, free of all apprehension of defeat and of the fear that inhibits the ordinary tense laughter, with which, I am afraid, we are far more familiar.

One other point: I drew this line slanting in this way purposely to indicate diagrammatically that these never occur in pure culture but that there are always varying admixtures of the two components. It must also be added that these differences can exist on conscious and/or unconscious levels of psychological function. We can be triumphant and loving on a conscious level, yet full of hate and guilt on an unconscious level, or vice versa. This makes the phenomena of laughter as complex as are all other mental acts. Finally, in any consideration of the problems of laughter, as in all emotional problems, we must include a consideration of the role of trigger mechanisms. Laughter is *par excellance* released by such mechanisms. In this respect, it is closer to a phobic mechanism than is usually realized. This trigger element, which I plan to discuss in connection with the role of feedback mechanisms in emotional processes, is one of the basic elements in laughter which has been overlooked.

Bateson: With shared guilt as a very important element, down in the lower right side of the diagram.

Kubie: When guilt is shared, you receive some degree of group support.

Bateson: Yes. What I was getting at is that these components of yours keep crisscrossing on each other.

Kubie: They are all mixed together. To represent all possible permutations and combinations diagrammatically, we would need a series of planes in a three dimensional nomogram⁸.

McCulloch: Larry, how about attempting to state what we are talking about when we speak of the release of tension that comes with laughter? What are we talking about?

Kubie: That is Chapter IV of the manuscript I have brought with me⁹.

McCulloch: How do we go at it?

Kubie: I hesitate to leap into the middle of an exposition which requires step-by-step logical elaboration, but in essence, my thesis is that the peculiar attribute of emotions in psychological affairs is that they impose an automatic value-judgment on experience, which does one of two things: this creates an impulse, conscious or un-

conscious, either to repeat that experience in the future or else to avoid it in the future. Emotions give experience either a plus or a negative sign. I believe that one can group all emotional states in these two categories. Sometimes their influence is relative and the same experience evokes both plus and minus reaction, for special reasons; but, basically, the emotion always falls on one side or the other. By and large, anger and elation are the emotional qualities which tend to be repeated, whereas fear and depression are the emotional qualities that we avoid if we can.

The relationship of an affect to a drive of any kind can, therefore, best be understood in these terms. To put this succinctly, my thesis about tension is that the word is a figure of speech by which we characterize that state which arises within us whenever there is some compelling inner necessity towards some action against which at the same time there are countervailing forces. These countervailing forces can be external or internal or both. They can be conscious or unconscious or both. But where there are no countervailing forces, the mere existence of an impulse towards something does not give rise to that inner experience which we characterize with the particular word "tension." The countervailing force may be nothing more important than the unavoidable delay which is inherent in the transport of chemicals in any multicellular organism. Tension, like all psychic phenomena, is inconceivable without delay. In human life, one sees this in its simplest form in the infant, where a delay of only a few seconds is enough to evoke random discharge which is the infantile precursor of the controlled tensions of adult life. Thus, tension, as we know it in adult life, implies an aggregate of forces moving in one direction opposed by an aggregate of internal and external forces moving in another.

Bateson: When we say that a man is tense, we mean, I suppose, that while his hand is lying on the table, or wherever it is, there is more muscular activity going on in it than need be; that not only is there the necessary tension in the flexor to support the hand in the position in which it is, but also some antagonistic contribution in the extensor. The metaphor of tension is a psychological metaphor but often it is worked out or exemplified by extensor-flexor opposition in the body.

McCulloch: In other words, it is a rise in tension in the muscle that we are talking about when we say a man is getting tense?

Bateson: Or it is from that rise of tension that we derive the psychological metaphor. I don't want to suggest that

⁸*nomogram*: A diagram representing a relationship between three or more variables by means of a number of straight or curved scales, so arranged that the value of one variable corresponding to given values of the others can be found by a simple geometrical construction (e.g. by means of one or more straight lines drawn to intersect the scales at the appropriate values). Also called *alignment chart*.

⁹Dr. Kubie refers to Chapter IV of a manuscript on which he draws more extensively in the next section.

language precedes the physiology or vice versa. I don't know about that.

Young: Is it physiological? Is the physiology correct? I think not. The balance, if you are speaking of a balance between antagonists, will not be at different levels, as far as I know.

Gerard: I think what Gregory says is certainly valid in many cases. I don't think it is universal.

Young: I don't think it is the basis of what we mean by tension. It is a false clue, if I may say so.

Bateson: That is the question I was asking. Would it be false or true?

Young: I would suspect it.

Bateson: There are people whose psychological tension is expressed with a general limpness.

McCulloch: People complain of a headache when they report tension, and tension of the scalp muscles can be recorded. It appears in many EEG tracings.

Young: But that is different from his thesis altogether. Certainly, there would be other somatic manifestations accompanying so-called tension.

Gerard: He is equating tension and tonus¹⁰. What is it specifically that you are objecting to, John? I don't quite understand.

Young: I think the danger is that we should use this relatively low-level metaphor for more than a metaphor. The tension you are speaking of is surely at an altogether different level.

Bateson: We don't know how much the levels echo each other.

Gerard: What I understand Gregory is asking is whether there is a sufficient correlation between this internal state or emotional state that is called tension and a manifest physiological state in terms of muscle tension so that there could be an etiological¹¹ relationship between them. Now, you feel that is entirely wrong?

Young: I should doubt it.

Gerard: Why do you react so strongly? I would have doubts about it but, on the whole, I would be inclined to be hospitable to thinking along those lines.

Kubie: I wonder whether one of the reasons why this concept seems so difficult (and I have heard it batted around a hundred times) is because of the implicit assumption that some kind of undifferentiated emotional state can form in us which cannot itself properly be called an emotional state. It might be called a pre-emotional state, or a larval emotional state, or a precursor state out of which emotional feelings and actions and expressions

can be precipitated in various directions. Although in itself it is undifferentiated, out of it can come tears, laughter, anger, elation, depression, fear, and even sleep or an obsessional-compulsive furor. It is this diffuse, undifferentiated state for which we seek a name. It is not the same as alertness, yet it is quite different from a state of sleep or apathy. We must use some figurative word to characterize it. The particular example which Gregory Bateson used is, in some ways, the simplest, because there the tension is expressed in muscular terms and is related to a close balance between aggression and its withholding. Yet, one can also find its expression in speech, or in specific somatic language, such as that of the gastrointestinal tract, among people who, on the somato-muscular side, are quite relaxed. The particular somatic vehicle which is used varies from individual to individual. Nobody has ever found a satisfactory definition of it, but nobody can think in this field without accepting the existence of this phenomenon because subjectively we are aware that there is something which we have to characterize by some such word as tension. Call it "X" if you prefer, as long as we all know that we are thinking and talking about a state which arises in human beings and which can, under appropriate internal and external circumstances, be channeled into any of various directions. Tension is not a bad word with which to characterize it figuratively, and its use crops up again and again precisely because it gives us a sense of knowing what we are communicating about with one another.

Hutchinson: I want to add two points: first, it seems to me that the very fact that some people, as Gregory said, show a sort of limpness suggests that this psychological tension can be modified or reversed by a learning process. If so, this leaves the whole thing wide open, so that objections are probably irrelevant until they are further analyzed.

My second point is that, etymologically or semantically, there are probably two things involved: the obvious observation made in many cultures that there is increased tension of the fingers, and, something which continually crops up even in the most respectable writing on comparative behavior, a consideration of the discharge as a release of something like potential energy, so that one particular kind of potential energy, and its release, occurring, in our example, in the musculature of the fingers, occupies a considerable semantic area in discussions of this kind.

Bateson: Would we get on better if, instead of saying we must conceptualize this state that Kubie has just offered us, we said that the important thing might be to build a classification of the resolutions of such states? Later, we

¹⁰tonus: The condition or state of muscular tone; the proper elasticity of the organs; tonicity.

¹¹etiologist: One who studies etiology or the science of causes.

could ask about the states themselves.

Young: That is rather my objection. From a physiological point of view, I would say it is dangerous to simplify, as Kubie suggests, by postulating a central reservoir of tension. I would say that was a dangerous approach for the cerebral physiologist and that, however hard it may be, we must dissect these individual manifestations that we classify as tension and identify their cerebral components.

Kubie: I am not assuming the existence of a single central mechanism. I am saying only that clinically an extraordinary transmutability among various kinds of tension states is observed. This suggests that there is something which precedes any of the various differentiated forms of emotional experience, acting almost as a common root out of which all can evolve. This inescapable clinical fact has to be included among the phenomena that we are trying to understand and explain.

McCulloch: May I put it somewhat differently? Suppose a man is tense; in that man is there any place where one could look and find a particular change?

Kubie: I shall counter the question with a question. Let us picture three youngsters. One has an intense eating compulsion. The second has a handwashing compulsion. The third has a counting compulsion. As we have said, if the subject does not fight against his own inner drive and if there is no external person or force which acts against it, the drive will be expressed freely and insatiably. The one will eat voraciously, even until he vomits and after. The other will wash his hands until soap and towels and water are exhausted or until the skin peels from his hands, leaving open sores. The third child will count until there is nothing around to count. As long as one of the individuals is carried on the flood tide of his drive, neither another's observations of him nor his own self-observation will lead to a state of "tension," whatever that may be. On the other hand, if anyone tries to stop him, or if he tries to stop himself, a state arises in him at once for which the observer, whether he be uneducated or the most highly trained and sophisticated psychologist, will automatically turn to the word "tension." For this state, we have no other name at present. In this state of "tension," many different things can happen. The person can have an attack of what the layman calls "hysterics," and laugh and cry. He can become overwhelmingly depressed and morose. He can go into a state of panic or rage or elation. He can get bowel upsets. He can vomit. Or he may even, paradoxically enough, go to sleep. I am not trying to explain tension. I am trying, rather, to characterize it in all of its complexity, to save ourselves

from the seductive tendency to oversimplify nature in the interests of our theories.

Young: How do you identify the state before it has reached the extremes you mention?

von Bonin: Being a biologist, I can't talk in abstractions, so take the example of a man who hears a shoe thrown down by somebody who is undressing above. He expects, of course, the next shoe to be dropped too, but the sound never comes. What happens, as I see it, is that he forecasts in his mind the noise of the second shoe falling down. I would look in the cerebral cortex for some configuration which makes that forecast effective, and I would expect that the noise that actually follows destroys the configuration that is forecasted and lets the nerve cells resume their normal rhythm.

Young: I would accept that.

von Bonin: Whether the thing forecast is a happening in the outside world or something the individual programs for himself, as the boy who washes his hands or wants to count, when something that the brain has made up its mind should happen, either within or without, does not come about, then that release of the neuronal pattern which would come about if the program were carried out is inhibited.

Gerard: Gerhardt, I like that. But why do you call it a biological or physiological explanation?

von Bonin: The two shoes will fit.

Fremont-Smith: From the biological aspect, it is very concrete. You said "when the brain had made up its mind."

Frank: May I remind you that Howard Liddell has said that he can distinguish in his experimental animals between an acute alarm reaction and what he has called the state of watchfulness? He has various criteria, both physiological and motor for doing so. In the experimental animal, the expectancy that something is going to happen produces a sort of subacute¹² emotional state, if it can be called that.

McCulloch: The expectancy is definitely revealed by motor manifestations.

Frank: But some physiological variables were also recorded.

Monnier: It is hardly necessary to recall what happens to the electrical activity of the brain when a subject suddenly awakens and become alert or excited. There is a real spectrum of changes paralleling the transition from deep sleep to alertness or an excitatory state, or from deep narcosis¹³ to wakefulness. The chief changes are accompanied by electrical activities of increased fre-

¹²subacute: Between acute and chronic.

¹³narcosis: A state of drowsiness, stupor, or insensibility; dagthe ability to produce such a state (obs.); the production of such a state, esp. by means of a drug.

quency and lower voltage, the so-called desynchronization of electrical patterns. At the same time, the cortex becomes more reactive to afferent stimuli. All organs, including the cortex, which can be considered as a terminal organ, simultaneously show a change in reactivity and functional readiness. This shift may be due to a greater generalization of afferent¹⁴ stimuli, or to a greater reactivity of the sensory, cortical, and motor organs to the same stimuli. On the contrary, in deep sleep there is a decrease in reactivity on all levels: cortex, muscles, sensory organs. This is particularly obvious of increased tension, manic excitement or anxiety. In these cases electrical fast activities of low voltage are found in increased proportion in the precentral and postcentral region of the cortex, as a symptom of greater reactivity of the cortex to afferent stimuli.

von Bonin: The precentral gyrus receives radiations which come from cerebellum, as I understand. Is that correct?

Monnier: Yes, the whole area, precentral and central, becomes a place for afferent stimulation, not only from the primary sensory afferents but also from other parts of the brain.

von Bonin: Oh, yes, surely.

McCulloch: Even photic stimulation comes through to precentral areas, is that right?

Monnier: That's right.

von Bonin: The afferent activity can be picked up precentrally even after the cerebellum has been destroyed.

Bigelow: I understood the question as to what trace can be found of the existence of tension to be one raised in objection to the use of concept of "tension," at least to its use as if it were something centralized or local. It seems to me that this is a very weak objection because there are certainly changes which occur in the neurological system, which we know must occur because of exterior evidence, of which we cannot find any direct trace by anatomical means. For example, if a man is multiplying a sum in his head, I challenge anyone to find out from external changes whether he is multiplying, and yet it can be determined that he is multiplying by the answers he gives to questions. There should be no objection to Kubie's using the word tension as he pleases. His observation that tension, in his sense, is something that is probably widely spread over a number of different locations, of concepts or type situations, is not negated simply by the fact that Kubie can't put his finger on exactly what physiological or neurological change occurs when tension exists.

McCulloch: I am not sure Kubie can't, sooner or later.

Bigelow: I am not sure, either, but I say this is a very

weak way of objecting to the use of the word tension.

von Bonin: Does anybody object? I thought we had made neurologists of the physiologists. I thought we took it for granted there is such a thing as a brain.

Teuber: It was not Kubie but Bateson who started the argument about physiology. Gregory was the one who suggested that "tension," in Kubie's sense, might be correlated with some measurable tonus, either postural or central. Such correlations have been looked for in many places but, as Dr. Young said, just about every correlation that has been claimed to exist has turned out to be unreliable. We certainly can't expect any simple one-to-one correlations, no matter whether we use the electromyogram, the galvanic skin response, or even the EEG. The EEG, though, may be a special case. If worked with on the head end of the animal, one seems to get fairly good correlations not with tension but, at least, with relaxation.

It has always bothered me that the most reliable thing an EEG can show is that the brain is not doing anything significant at the time of recording. At such times, the EEG shows characteristic regular activity; but as soon as the brain is doing something (usually it is very difficult to say what), this regular activity disappears. For that reason, I have never been too sure that searching for correlations between mental states and EEG signs would lead very far. But you were challenging people to show some electrophysiologic correlates of multiplication, perhaps with tongue in cheek, and I want to pick that up.

A young lady, Lila Ghent, has investigated the effects of various types of tasks on the slow-wave activity shown by the EEG of patients who have had electroshock. During the rather long periods after the electroshock when the EEG showed slow waves, these patients were asked to perform various tasks, for instance, tapping with a stylus on a drum. Such rhythmic tapping abolished the slow-wave activity for a short time; if they went on tapping, the slow waves reappeared. The picture was somewhat different with patients who were asked to perform more complex tasks. If they were told to go through a reaction time experiment, the slow-wave activity was abolished for quite a long time. Another effective way of abolishing the abnormal slow-wave activity was to ask them to count back from one hundred by sevens. This serial subtraction very markedly reduced their slow-wave activity.

Bigelow: Can you distinguish by that method, say, subtraction from multiplication?

Teuber: I should suppose not. However, it wasn't tried. There is no reason to believe that division or multiplication would have effects different from addition or subtraction. There was something rather odd though: the

¹⁴afferent: Bringing or conducting inwards or towards. Chiefly in Phys. as afferent nerves, vessels.

most effective way of getting rid of the slow waves was when the patients made errors. When a patient made a mistake in counting, his slow waves disappeared for a particularly long time.

Bigelow: Mental processes may be determined by terminal performance only, perhaps.

Teuber: Surely.

Gerard: What happens to the Cheshire cat's smile when the cat disappears, in other words.

Young: The danger is, surely, if terminal effects which are similar are referred to one postulated central source, which then turns out not to be one.

Bigelow: It depends upon whether the oneness is critical. Is it in this case? It hasn't been demonstrated yet, so far as I can see. I grant it is a possibility, but it hasn't been shown.

Young: That is what we are asking Dr. Kubie.

Gerard: The only person who has made even a presumptive attempt so far to give this any kind of an organic mechanism has been Monnier, who tried to tie these things up to changes in the measurable behavior of neurons, at least through their distant signals of the EEG changes. Nobody else tried to do it so nobody else should be criticized. That is why I did not think your objection, Dr. Young, to what Gregory said was valid. You were reacting to the kind of dangerous verbal analyzing that Evelyn Hutchinson was warning against, the idea of the building up of potential energy. It is hard to avoid this idea. Adrian told me he could not do so. The reason why one gets a little bit apprehensive about it is that we are perfectly sure that the kind of thing a neurophysiologist means when speaking of inhibition and so on — well, we are sure he does not mean "inhibition" in the psychological sense but perhaps we are not even sure of that! But Gregory's original question, it seemed to me, did not imply a positive answer, merely being an attempt to get at the origin of the use of the figure. I think it was entirely legitimate from that point of view.

McCulloch: Well, may I put the question in a slightly different way? Is the word "tension" simply one name for a host of different affairs or have they some common factor in the sense that in all of them there is some part of the nervous system or of the body which is in a given state or exhibiting a general pattern of activity? I think, for example, we use the word "memory" altogether too loosely. We use it often for processes which are inherently or essentially dissimilar, and I am not sure we may not be doing the same with the word "tension."

Bigelow: Isn't it essential, if a word is to be useful, that it cover a class of phenomena which may, in some sense,

be different but have some common property? Isn't the answer to the question this: that if "tension" is to be a useful word, it must cover some properties which are in some way different but have a common aspect?

Gerard: I was going to say another word on the physiological side. It seems to me that if we substitute the physiological term "irradiation," which is not too well-defined in terms of its mechanisms but is objectively quite measurable, and then think of irradiation as increasing in quantity as an excitation state builds up in neuron pools, it will help. Then when we want to ask, "What do we mean by excitation state?", we shall have to go back to the concentration of energy-rich phosphates in the membrane or the number of potassium ions that have crossed it or something like that, in other words, to perfectly real things whether or not we know just which they are.

We are not too far away from this general concept of tension, and that is why I feel there is a good deal of validity in the kind of tie-up Gregory is trying to make. We recognize an increase in tension, subjectively in ourselves and objectively in others, in terms of increasing neuronal irradiation, whether it is increased contraction of antagonist flexors and extensors or whether it is tapping the table with the fingers or whether it is shifting around restlessly in a chair or whether it is performing a ritualistic act or whether it is merely counting mentally a series of numbers. There is greater activity of some sort, greater neurological discharge, spreading over a wider and wider group of neurons, it seems to me. Do any of you physiologists take exception to that in biological terms, and do any of the psychological people feel that that is too far away from what we really do mean by "tension?"

Klver: From a psychological point of view, it is worth mentioning that tension, whatever it is, and the perception of tension are two different things. The fact that one is able to perceive tension in the face of a person does not necessarily imply that the observed person is in a state of tension. Nor does it imply that the observer is tense. Either the observer or the observed person or both of them may or may not be in a state of tension. Under pathological conditions, there may be an inability to perceive tension, sadness, cheerfulness, etc.; that is, there may be an agnosia¹⁵ for physiognomic¹⁶ characteristics. A patient may be able to recognize his wife and see that her eyes are blue and that her mouth is red, but he may no longer be able to recognize tension or sadness in her face. The visibility of emotions is undoubtedly as important a problem as the visibility of colors.

Pitts: I should doubt whether a satisfactory correlation can be made between the psychological concept of ten-

¹⁵agnosia: Freud's term (*Zur Auffassung der Aphasien*, 1891) for loss of perception.

¹⁶physiognomic: Relating to the person's face, physical form, or appearance

sion and the mere number of excited neurons. Consider the case of a boy with a handwashing compulsion. We sit him in a chair and we don't allow him to wash his hands. Presumably, his inner tension increases as he sits there. Then we set him free and he promptly goes and washes his hands. As soon as he washes his hands, allegedly his inner tension declines very sharply, but a large number of neurons, namely, those involved in washing his hands, now accelerate, so he may have a greater number of neurons discharging *per se* than he had when the state of tension was at its height.

Gerard: Excuse me, but you imply total number, which I did not. Irradiation is not just a volume-conductor type of thing. It is usually along a defined path.

Pitts: It is usually along a definite line of activity in which the person engages and is accompanied by a reduction of tension.

Gerard: That can no longer be called irradiation.

Pitts: Then irradiation excludes channelization.

Young: Would it be fair to say that your attempt to use the concept of irradiation and to give it a quantitative meaning is the best one can do with physiological terms, but that you would not regard it as a completely satisfactory statement of the cerebral process involved?

Gerard: Of course not.

Young: You are putting up a preliminary model.

Pitts: Then you must mean by irradiation something more than the mere engagement of a large number of neurons in the process.

Kubie: Something akin to the old Pavlovian concept of a diffuse overflowing irradiation of some kind of activating or inhibiting process.

Young: To my mind, there is a danger there.

Gerard: No, I don't like that either, Larry.

Monnier: The word irradiation is misleading because it has been used in many different senses. The process responsible for such changes has something to do with an increased propagation of impulses; the Germans call that *Ausbreitung*.

Gerard: Yes, a spread.

Monnier: But it is probably in this meaning that you use the word irradiation loosely.

Gerard: I was avoiding bringing this down to the individual neuron because I think that does impinge on the next level. This is not simply total number of neurons, but number and pattern. If that is your point, Walter, I agree with you.

Pitts: The spread is perhaps all-important.

Kubie: I have two complications in mind. One concerns the basic feedback function of emotional processes. I am thinking of a patient who is an exceptionally effective, competent, and able person, who thinks problems through extremely well, reaches decisions, and then acts on them. At present, he is juggling ten different balls in the air at once and doing it well. But the moment of reaching and implementing a decision precipitates in this patient an obsessional furor of doubt. Consequently, after a decision is made and after appropriate action is taken, when he reaches the very point at which he should be able to relax, heave a sigh, take a drink, and be comfortably free from tension, a storm erupts. This storm is a reaction to the fact of having made a decision and acted upon it, which arouses fear and guilt and an obsessional furor of extraordinary severity. Doubts go round and round in his mind like squirrels in a cage, with an enormous piling up of something that can be described only with this same figurative word. I describe this clinical phenomenon as another example of the complexity of the manifestations of the feedback systems in the emotional sphere.

The second complication centers around the fact that there are such things as chronic emotional states. Up to the present, our discussion has dealt only with acute emotions, as though emotions were always sharp processes. What about those individuals who seem to have a fixed center of emotional gravity to which they always return, no matter what forces swing them temporarily away from it? They function as though some persistent emotional set or emotional potential formed the center of gravity of their emotional lives. Sometimes, this is a pleasant and comfortable center which they do not want to disturb. The chronic hypomanic¹⁷ is an example. (Unfortunately, however, in the end this usually catches up with them; but that is another story.) Sometimes, the emotional center is a chronic rage state, a disguised temper tantrum. I have known patients who lived out their entire lives in disguised temper tantrums, masking these in a thousand different ways. Sometimes, it is chronic depression, which may arise in very early years and last throughout life. I know two eighty-year-old patients who face today the problems with which they were dealing when they were four years old. Indeed, they have lived with their reactions to these problems as their fundamental emotional base or potential throughout their lives. Clinically, this is an inescapable, basic, and puzzling fact.

How can we put this in terms which are descriptively accurate? The first requirement for such a term is that it shall be an adequate representation of observable phenomena in nature. The second is that the term should

¹⁷*hypomania*: A minor form of mania, often part of the manic-depressive cycle, characterized by elation and a feeling of well-being together with quickness of thought.

at the same time lead one's mind to explore possible explanations while avoiding figures of speech which beg all essential questions. For me, a term such as "chronic emotional potential" or "chronic emotional set" meets these requirements perhaps a little better than "tension." Yet it does not help us to escape the word tension, because, although in these particular cases there is a chronic emotional set with a specific quality, there are also other clinical states in which the emotional set is undifferentiated, with no qualitatively differentiated feeling tone, but out of which the more highly differentiated emotional states can precipitate. Thus, there would seem to be two contrasting clinical manifestations: the differentiated and the undifferentiated chronic emotional tensions.

Young: But these particular words are very valuable, aren't they, because they give us a picture? One could imagine that they would equally well describe chronic states of activity of parts of the nervous system. You could really cover everything you said without using the word "emotion."

Kubie: Only by paraphrasing it with some neologism; and in the end that is no gain.

Young: One could visualize a condition of parts of the brain being responsible for these states throughout life, by virtue of the particular activity of one or another aspect of cerebral physiology.

Kubie: Isn't there a danger that that may also beg the question, although it is possible, of course, that an undifferentiated tension or potential existed first, subsequently and for special reasons acquiring specific coloring.

Young: We do know that local lesions may produce, in both man and animal, syndromes of that sort. A lesion in the midbrain of the cat produces the syndrome of obstinate progression, as it has been called, in which the cat just walks and walks and walks. That could be described in terms of an emotional state.

Gerard: This is going back a little bit but I think it may be useful in pointing up to our friends who deal with the more difficult levels of the brain that we too sometimes run up against difficult and seemingly insoluble problems of analysis at a level where we would not expect it. I could not help but think, as we discussed the building up of tension, of a strict physiological analogy, one which points up the irradiation problem.

Nerve paths descend on each side of the brain stem from the respiratory centers in the medulla to the upper spinal cord, from which come the two phrenic nerves that innervate the diaphragm. If a cut is made halfway across the neuraxis on, say, the left side, the corresponding half of the diaphragm stops. The right side goes on working perfectly well. If the right phrenic nerve is then cut, so that the right half of the diaphragm cannot re-

spond, the left half starts again. This is perfectly simple to understand. Because the animal has lost its aeration, it becomes progressively asphyxiated, there is a change in the carbon dioxide and oxygen situation in the brain nourishment, the cells become more irritable, and messages coming down the brain stem, not quite able to break across at the ordinary level of excitability, now do break across from right to left, across the midline, and set off the left phrenic. The only trouble with this simple explanation is that it is not true. As shown by Arturo Rosenblueth, if the right phrenic is blocked (by a current, which stops nerve messages as fully as a cut but can be turned off again and the experiment repeated), the very next respiration comes through on the left. Thus, the switchover is not due to an accumulation of carbon dioxide, or to any other slowly built-up change.

Here, then, is a case of a building of tension until it escapes, if I may use that word, and a case of sudden irradiation. It would be very nice and very simple to interpret this in a perfectly mechanistic way, in terms of a change of threshold of neurons and of the gradual accumulation of summated impulses until they can escape, neuron by neuron. It just happens not to work. If anybody has yet come up with an explanation of this that is physiologically acceptable, I have not heard of it. It is a mystifying, very real phenomenon that any student can repeat at will.

Bigelow: Are there no local cross fibers there of any sort?

Gerard: No. There are many of these intriguing neurophysiological paradoxes. For example, after denervating the lower cord, changes in the reflexes of the fore limbs are still produced by cutting away some of the denervated lower cord.

McCulloch: The interesting thing about it is that this happens in certain animals but not in all. The dog and the rabbit work one way and the cat the other, or vice versa, which means that there must be either an anatomical or physiological substrate which is different in the two kinds of animals.

Bigelow: Is there anything else that characterizes the two animals?

von Bonin: The cat has much larger cells than the dog or rabbit.

McCulloch: There is a possibility, of course, that we are dealing with some "pup" coming back up the nerve when the main impulse goes down, that there is a backfiring, for when we have actual collaterals, it is quite a different story. "Pup" is laboratory slang for back impulses over the motor nerve. If there are axonal collaterals, then, in the case in which there is a return volley of this kind from the muscle, far more impulses in the axonal collaterals would be expected than otherwise.

Gerard: Oh, obviously, it is explicable sooner or later. It isn't gremlins.

McCulloch: That's right, but there must be a new way to attack it.

Gerard: There must be another way of patterning it besides the simple interaction of neurons and axons.

McCulloch: I don't think so.

Fremont-Smith: Would we gain anything by going back to a state of "un-tension," examining it, and then moving on to consider the state of so-called tension? I should like to start off by saying I don't believe there is any state of absolute "un-tension" other than death; in other words, the organism is constantly reacting to its internal and external environment. The closest it comes to an absence of tension, presumably, is in deep narcosis. From that level, there is a progression through varying states of activity.

McCulloch: May I bring us back for a moment? The crucial thing that we are talking about here is tension in the sense in which it is somehow a trouble in communication between people, directing our attention to our own carcass or our own brain, making us heed our own effort instead of heeding what the other man is saying.

Kubie: Because it is relevant, I want to remind you of the work of Barach¹⁸. It bears directly on this matter of tension, even though his observations were made during studies of a quite different problem. He was evaluating a method of producing complete respiratory rest by placing patients entirely within a chamber in which alternate increases and decreases of the pressure of the air cause sufficient diffusion of O and CO₂ between pulmonary alveoli and the blood stream to maintain respiratory exchange without any actual motion in the diaphragm or chest wall. For some reason, not all patients can stop breathing in this chamber, an interesting fact which has not yet been explained. What is more important, a large number of those who can stop breathing soon enter into a curious state, as close an approximation to a completely relaxed hypnoidal state as has ever been achieved without hypnosis or drugs. It is even more complete, I think, than are those hypnagogic reveries which Margolin and I used to induce by having patients listen to their own respiratory sounds brought back to their ears through throat microphones and an amplifier¹⁹.

Those of Barach's patients who achieve this nearly complete respiratory rest and who go into the hypnoidal

state also have certain chemical changes (8). In this state, patients lie motionless for long hours, without any sense of the passage of time, without restlessness or movement. Afterwards, they report that little, if anything, was going on in their thinking processes, although they were not asleep.

Klver: Do these patients, instead of reporting that little or nothing has happened, ever say that a given period of time appeared infinitely long, like an eternity?

Kubie: I do not know. They have not been fully explored psychologically as yet. This phenomenon calls our attention to the relationship of the central respiratory nuclei to the level of activity in the nervous system as a whole, and also to the influence of the ascending reticular substance, which has been studied by Magoun²⁰. These investigations give us clues as to certain processes in the central nervous system which may influence levels of tension or of activation.

McCulloch: Do you happen to know what the electroencephalograms of patients in this state look like, and do you know whether they are more or less responsive to information at the time?

Kubie: There have been technical difficulties about getting good electroencephalograms under these circumstances. It has not been done as yet.

McCulloch: Using earphones or signal boxes to communicate with these patients is their reception better at such times, with the tension down, than it is at a time when they are attending to something?

Kubie: They can communicate with you, but I don't know the exact answer to that.

Fremont-Smith: Larry, doesn't it take some time for people to go into this hypnoidal state?

Kubie: Some go very promptly, some very slowly.

McCulloch: If they have a familiarity with the situation, do they go in much more rapidly?

Kubie: Yes, usually.

Fremont-Smith: I was in it once, and it is a surprising thing to discover that one doesn't have to breathe; but nobody told me that I went into a hypnoidal state and I wasn't aware of it if I did.

Remond: There may be a state of tension in an individual even when unconscious, deeply unconscious, in coma. If, while taking the electroencephalogram of a comatose

¹⁸Barach, A. L.: Continuous immobilization of the lungs by residence in the equalizing pressure chamber in the treatment of pulmonary tuberculosis. *Dis. of Chest* 12, 3 (1946).

Barach, A. L., Eastlake, C., Jr., and Beck, G. J.: Clinical results and physiological effects of immobilizing lung chamber therapy in chronic pulmonary T.B. *Dis. of Chest* 20, 148 (1951).

¹⁹Kubie, L. S., and Margolin, S.: A physiological method for the induction of states of partial sleep and securing free associations and early memories in such states. *Transactions of the American Neurological Association*, Richmond, Va., Byrd, 1942.

Kubie, L. S., and Margolin, S.: An acoustic respirograph. A method for the study of respiration through the graphic recording of the breath sounds. *J. Clin. Investigation* 22, 221 (1943).

²⁰Magoun, H. W.: An ascending reticular activating system in the brain stem. (cf. Bibliog.) *Arch. Neurol. & Psychiat.* 67, 145 (1952).

person, some sort of sensory stimulus is produced, a noise, for example, a K complex can be recorded, just as in sleep, a change in the encephalogram which is quite recognizable. If the stimulus is repeated after a certain time, the response will be less marked. If repeated a third time, it will be barely apparent. But if, at the time when the reaction has become unnoticeable, the stimulus is altered, if, instead of making a noise, there is a sudden, important change in the lighting of the room, then once again there is a strong response in the electroencephalogram, which will vanish with repetition of the stimulus. When stimuli have been given with less and less response, and if new kinds of stimuli are no longer efficient even at their first introduction, the name of the patient pronounced very softly may "awaken" him. But that patient is absolutely "unconscious," and he will not remember at all what happened. Nevertheless, he has some sort of attention, he is able to be attentive unconsciously, and he loses that state of attention when getting accustomed to the stimulus.

Wiesner: If a particular stimulus is repeated at a later time, will there be a response?

Remond: Yes, if there is a wait of a long enough time, say, half an hour, to let the patient lose his adaptation to stimulation.

Pitts: I wonder if anyone would be interested in a somewhat frivolous, dynamic analogy to the concept of a state of tension? It seems to me that the proper correspondence to make is not between tension and potential energy but between tension and the second derivative of the mean rate of change of potential energy.

When tension reaches a critical degree, apparently the state of the organism begins changing in a rather violent way; the actions of the individual change rapidly, but in what way is not determinate from the value of the tension. Suppose we consider the simple case of a marble in a cup, a perfect analogy with the most general dynamic instances. Naturally, if we consider small deviations from the position of equilibrium at the bottom, the rapidity with which the marble will return to its equilibrium position depends, in essence, upon the curvature of the cup; the more curved the cup is, the smaller the deviations produced by any given disturbing force will be, and the more rapidly the marble will return to equilibrium. But what very often happens with dynamic systems is that their character depends upon some sort of external parameter. We might suppose there was an external force, for example, which went through a series of fixed values, and this external parameter, as it varied, would change the curvature of the cup, so that, say, when the external force, A , was equal to zero, the cup might possibly be extremely highly curved. As A vanishes, it varies between zero and one; the curvature of the cup de-

creases gradually until finally, when it reaches one, it is flat. And, say, when A is greater than one, it even inverts.

As soon as it reaches this point, of course, the situation is quite different from any deviation from equilibrium. As soon as A reaches the value of one, or possibly slightly beyond it, then a slight push, of course, is going to send the state of the dynamic system off to a different position of equilibrium, or, in any case, to some completely different form of behavior. Exactly what will happen is not determined simply by knowing the value of A when it approaches one. There are several possibilities. But if you know the initial position and you know that the disturbing forces are not too great, as long as A has values between zero and one, there will be an equilibrium position which can be fixed in advance. It can be said that if the particle is not there, it will at least be there very soon, or it will oscillate a small degree about this position, and so forth. But assume, roughly, that, as soon as the curvature of the pocket in which it is becomes zero, it inverts, then, of course, this system behaves in quite a different way.

I suggest that the kind of dynamic variable which tension, in this sense we are using it, is really analogous to is not the value of a potential energy but of something like this curvature. This is a perfectly general sort of situation. Consider the case of rotating liquid masses, for example, rotating stars, and assume the velocity of rotation and the mean angular momentum would constantly increase. Up to a certain point, there is a gradually increasing deviation from the spherical shape. But as soon as it reaches a certain point, the rotating liquid mass becomes unstable, and, thereafter, small deviations in its shape cause it to break up — or to have a furrow which increases in size, and one can no longer say, from merely knowing its angular velocity, what its subsequent history will be. As long as the velocity of rotation is smaller than the critical amount, then, if one knew nothing else about that sphere of liquid except that it was rotating with that angular velocity, it could be said it would have a certain shape and would stay very nearly about that shape.

The critical parameter there would be what corresponds to the curvature of the cup in the example of the marble, namely, those coefficients of the second derivatives of potential energy that determine the stability in characteristic grooves. I should say the tension in this case is really something like the reciprocal of the absolute magnitude of the real part of the largest characteristic groove; that is, it is a number which measures the tendency of the system to return to equilibrium after a small disturbance, and when the tension becomes too large, it corresponds essentially to an inversion, to the case where there is instability because the curvature turns out negative. I would say that tension is essentially a measure

of the rate of return to an equilibrium after small disturbances rather than potential energy itself. If this analogy is exact, potential energy is a bead sliding on wire. The potential energy, of course, is proportional to the height of the wire from the ground. But what matters in the case of tension, so to speak, is the curvature of the wire rather than its absolute height from the ground.

Bigelow: Walter, you don't really mean that the rapidity with which the system returns to equilibrium is a function of the curve, do you? It is not a function of the coefficient of the second derivative, but a function of the decrement, of the dissipation factor.

Pitts: In part, naturally; if it is moved to a small degree

and the system is conservative, of course it will keep oscillating indefinitely.

McCulloch: May we hear from Larry Kubie and then we will stop.

Kubie: I want to explain why I brought up the example of the extremely efficient person who becomes upset precisely at the point at which, if he was strictly analogous to any simple physical system, he ought to achieve equilibrium. At this very point, the unconscious symbolic values of his decisive behavior throw into action a new set of forces which disturb the equilibrium all over again. That is the kind of event which makes life difficult for the psychologist.