

Language in Thought and Action

FIFTH EDITION

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and

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With an Introduction by Robert MacNeil

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CHAPTER 8

How We Know What We Know

The crucial point to be considered in a study of language behavior is the relationship of language and reality, between words and not-words. Except as we understand this relationship, we run the grave risk of straining the delicate connection between words and facts, of permitting our words to go wild, and so of creating for ourselves fabrications of fantasy and delusion.

WENDELL JOHNSON

Bessie, the Cow

THE UNIVERSE IS in a perpetual state of flux. The stars are in constant motion, growing, cooling, exploding. The earth itself is not unchanging; mountains are being worn away, rivers are altering their channels, valleys are deepening. All life is also a process of change, through birth, growth, decay, and death. Even what we used to call "inert matter"—chairs and tables and stones—is not inert, as we now know, for, at the submicroscopic level, they are whirls of electrons and protons. If a table looks today very much as it did yesterday or as it did a hundred years ago, it is not because it has not changed, but because the changes have been too minute for our coarse perceptions.

To modern science, there is no "solid matter." If matter looks "solid" to us, it does so only because its motion is too rapid or too minute to be felt. It is solid only in the sense that a rapidly rotating color chart is "white" or a rapidly spinning top is "standing still." Our senses are extremely limited, so that we constantly have to use instruments such as microscopes, telescopes, speedometers, stethoscopes, and seismographs to detect and record occurrences that our senses are not able to record directly. The way in which we happen to see and feel things is the result of the peculiarities of our nervous system. There are "sights" we cannot see, and, as even children know today with their high-frequency dog whistles, "sounds" that we cannot hear. It is absurd, therefore, to imagine that we ever perceive anything "as it really is."

Inadequate as our senses are, with the help of instruments they tell us a great deal. The discovery of microorganisms with the use of the microscope has given us a measure of control over bacteria; we cannot see, hear, or feel radio waves, but we can create and transform them to useful purpose. Most of our conquest of the external world, in engineering, in chemistry, and in medicine, is due to our use of mechanical contrivances of one kind or another to increase the capacity of our nervous systems. In modern life, our unaided senses are not half enough to get us about in the world. We cannot even obey speed laws or compute our gas and electric bills without mechanical aids to perception.

To return, then, to the relations between words and what they stand for, let us say that there is before us "Bessie," a cow. Bessie is a living organism, constantly changing, constantly ingesting food and air, transforming it, getting rid of it again. Her blood is circulating, her nerves are sending messages. Viewed microscopically, she is a mass of variegated corpuscles, cells, and bacterial organisms; viewed from the point of view of modern physics, she is a perpetual dance of electrons. What she is in her entirety, we can never know; even if we could at any precise moment say what she was, at the next moment she would have changed enough so that our description would no longer be accurate. It is impossible to say

completely what Bessie or anything else really *is*. Bessie is no static "object," but a dynamic *process*.

The Bessie that we experience, however, is something else again. We experience only a small fraction of the total Bessie: the lights and shadows of her exterior, her motions, her general configuration, the noises she makes, and the sensations she presents to our sense of touch. *And because of our previous experience, we observe resemblances in her to certain other animals to which, in the past, we have applied the word "cow."*

The Process of Abstracting

The "object" of our experience, then, is not the "thing in itself," but *an interaction between our nervous systems (with all their imperfections) and something outside them*. Bessie is unique—there is nothing else in the universe exactly like her in all respects. But our nervous systems, automatically *abstracting* or selecting from the Bessie-in-process those features of hers in which she resembles other animals of like shape, functions, and habits, *classify* her as "cow."

When we say, then, that "Bessie is a cow," we are only noting the process-Bessie's resemblances to other "cows" and *ignoring differences*. What is more, we are leaping a huge chasm: from the dynamic process-Bessie, a whirl of electrochemico-neural eventfulness, to a relatively static "idea," "concept," or *word*, "cow". The reader is referred to the diagram entitled "The Abstraction Ladder" on page 85.¹

As the diagram illustrates, the "object" we see is an abstraction of the lowest level, but it is still an abstraction, since it leaves out characteristics of the process that is the real Bessie. The word "Bessie" (cow₁) is the lowest *verbal* level of abstraction, leaving out further characteristics—the differences between Bessie yesterday and Bessie today, between Bessie today and Bessie tomorrow—and selecting only the similarities. The word "cow" selects only the similarities between Bessie (cow₁), Daisy (cow₂), Rosie (cow₃), and so on, and therefore leaves out still more about Bessie. The word "livestock" selects or abstracts only the features that Bessie has in common with pigs, chickens, goats, and sheep. The term "farm asset" abstracts only the features Bessie has in common with barns, fences, livestock, furniture, generating plants, and tractors, and is therefore on a very high level of abstraction.

Our concern here with the process of abstracting may seem strange, since the study of language is all too often restricted to matters of pronunci-

¹ The "Abstraction Ladder" is based on the "Structural Differential," a diagram originated by Alfred Korzybski to explain the process of abstracting. For a further explanation both of the diagram and of the process it illustrates, see his *Science and Sanity: An Introduction to Non-Aristotelian Systems and General Semantics* (1933), especially Chapter 25.

ABSTRACTION LADDER

Start reading from the bottom up

8. "wealth"

8. The word "wealth" is at an extremely high level of abstraction, omitting *almost* all reference to the characteristics of Bessie.

7. "asset"

7. When Bessie is referred to as an "asset," still more of her characteristics are left out.

6. "farm assets"

6. When Bessie is included among "farm assets," reference is made only to what she has in common with all other salable items on the farm.

5. "livestock"

5. When Bessie is referred to as "livestock," only those characteristics she has in common with pigs, chickens, goats, etc., are referred to.

4. "cow"

4. The word "cow" stands for the characteristics we have abstracted as common to cow₁, cow₂, cow₃ . . . cow_n. Characteristics peculiar to specific cows are left out.

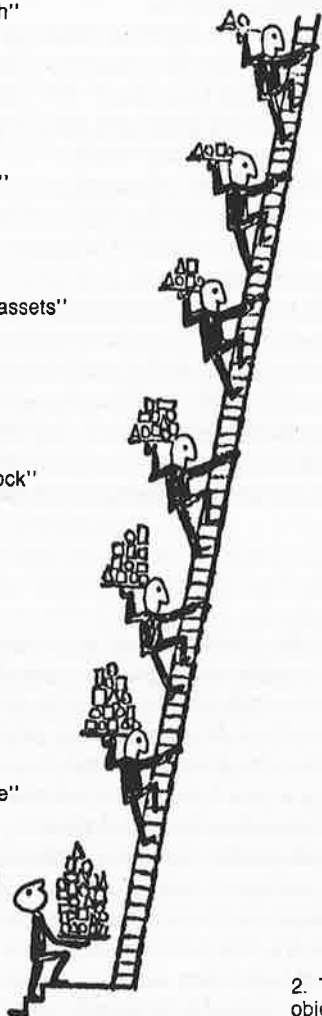
3. "Bessie"

3. The word "Bessie" (cow₁) is the *name* we give to the object of perception of level 2. The name is *not* the object; it merely *stands for* the object and omits reference to many of the characteristics of the object.

2.

2. The cow we perceive is not the word, but the object of experience, that which our nervous system abstracts (selects) from the totality that constitutes the process-cow. Many of the characteristics of the process-cow are left out.

1. The cow ultimately consists of atoms, electrons, etc., according to present-day scientific inference. Characteristics (represented by circles) are infinite at this level and ever-changing. This is the *process level*.



ation, spelling, vocabulary, grammar, and such. The methods by which composition and oratory are taught in many school systems seem to be largely responsible for this widespread notion that the way to study words is to concentrate one's attention exclusively on words.

But as we know from everyday experience, learning language is not simply a matter of learning words; it is a matter of correctly relating our words to the things and happenings for which they stand. We learn the language of baseball by playing or watching the game *and studying what goes on*. It is not enough for children to learn to say "cookie" or "dog"; they must be able to use these words in their proper relationship to nonverbal cookies and nonverbal dogs before we can grant that they are learning the language. As Wendell Johnson has said, "The study of language begins properly with a study of what language is about."

Once we begin to concern ourselves with what language is about, we are at once thrown into a consideration of how the human nervous system works. When we call Beau (the Boston terrier), Pedro (the chihuahua), Snuffles (the English bulldog), and Shane (the Irish wolfhound)—creatures that differ greatly in size, shape, appearance, and behavior—by the same name, "dog," our nervous system has obviously gone to work *abstracting* what is common to them all, ignoring for the time being the differences among them.

Why We Must Abstract

This process of abstracting, of leaving characteristics out, is an indispensable convenience. To illustrate by still another example, suppose that we live in an isolated village of four families, each owning a house. A's house is referred to as *maga*; B's house is *biyo*; C's is *kata*, and D's is *pelel*. This is quite satisfactory for ordinary purposes of communication in the village, unless a discussion arises about building a new house—a spare one, let us say. We cannot refer to the projected house by any one of the four words we have for the existing houses, since each of these has too specific a meaning. We must find a *general* term, at a higher level of abstraction, that means "something that has certain characteristics in common with *maga*, *biyo*, *kata*, and *pelel*, and yet is not A's, B's, C's, or D's. Since this is much too complicated to say each time, an *abbreviation* must be invented. So we choose the noise, *house*. Out of such needs do our words come—they are a form of shorthand. The invention of a new abstraction is a great step forward, since it *makes discussion possible*—as, in this case, not only the discussion of a fifth house, but of all future houses we may build or see in our travels or dream about.

A producer of educational films once remarked to me that it is impossible to make a shot of "work." You can shoot Joe hoeing potatoes, Susan polishing her car, Bill spraying paint on a barn, but never just "work."



Words defining words

"Work," too, is a shorthand term, standing, at a higher level of abstraction, for a characteristic that a multitude of activities, from dishwashing to navigation to running an advertising agency to governing a nation, have in common. The special meaning that "work" has in physics is also clearly derived from abstracting the common characteristics of many different kinds of work. ("A transference of energy from one body to another, resulting in the motion or displacement of the body acted upon, in the direction of the acting force and against resistance." Funk and Wagnalls, *Standard College Dictionary*.)

The indispensability of this process of abstracting can again be illustrated by what we do when we "calculate." The word "calculate" originates from the Latin word *calculus*, meaning "pebble," and derives its present meaning from such ancient practices as putting a pebble into a box for each sheep as it left the fold, so that one could tell, by checking the sheep returning at night against the pebbles, whether any had been lost. Primitive as this example of calculation is, it will serve to show why mathematics works. Each pebble is, in this example, an abstraction representing the "oneness" of each sheep—its numerical value. And because we are abstracting from extensional events on clearly understood and uniform principles, the numerical facts about the pebbles are also, barring unforeseen circumstances, numerical facts about the sheep. Our x 's and y 's and other mathematical symbols are abstractions made from numerical abstractions, and are therefore abstractions of still higher level. And they are useful in predicting occurrences and in getting work done because, since they are abstractions properly and uniformly made from starting points in the extensional world, the relations revealed by the symbols will be, again barring unforeseen circumstances, relations existing in the extensional world.

On Definitions

Definitions, contrary to popular opinion, tell us nothing about things. They only describe people's linguistic habits; that is, they tell us what

words people use under what conditions. Definitions should be understood as *statements about language*.

House. This word, at the next higher level of abstraction, can be substituted for the more cumbersome expression, "Something that has characteristics in common with Bill's bungalow, Jordan's cottage, Mrs. Smith's guest home, Dr. Jones's mansion . . ."

Red. A feature that rubies, roses, ripe tomatoes, robins' breasts, uncooked beef, and lipsticks have in common is abstracted, and this word expresses that abstraction.

Kangaroo. Where the biologist would say "herbivorous mammal, a marsupial of the family Macropodidae," ordinary people say "kangaroo."

Now it will be observed that while the definitions of "house" and "red" given here point *down* the abstraction ladder (see the charts) to *lower* levels of abstraction, the definition of "kangaroo" remains at the same level. That is to say, in the case of "house," we could if necessary go and *look* at Bill's bungalow, Jordan's cottage, Mrs. Smith's guest home, and Dr. Jones's mansion, and figure out for ourselves what features they seem to have in common; in this way, we might begin to understand under what conditions to use the word "house." But all we know about "kangaroo" from the above is that where some people say one thing, other people say another. That is, when we stay at the *same* level of abstraction in giving a definition, we do not give any information, unless, of course, the listener or reader is already sufficiently familiar with the defining words to work down the abstraction ladder. Dictionaries, in order to save space, have to assume in many cases such familiarity with the language on the part of the reader. But where the assumption is unwarranted, definitions at the same level of abstraction are worse than useless. Looking up "indifference" in some pocket dictionaries, we find it defined as "apathy": we look up "apathy" and find it defined as "indifference."

Even more useless, however, are the definitions that go *up* the abstraction ladder to *higher* levels of abstraction—the kind most of us tend to make automatically. Try the following experiment on an unsuspecting friend:

"What is meant by the word *red*?"

"It's a color."

"What's a color?"

"Why, it's a quality things have."

"What's a *quality*?"

"Say, what are you trying to do, anyway?"

You have pushed him into the clouds. If, on the other hand, we habitually go *down* the abstraction ladder to *lower* levels of abstraction when we

are asked the meaning of a word, we are less likely to get lost in verbal mazes; we will tend to "have our feet on the ground" and know what we are talking about. This habit displays itself in an answer such as this:

"What is meant by the word *red*?"

"Well, the next time you see some cars stopped at an intersection, look at the traffic light facing them. Also, you might go to the fire department and see how their trucks are painted."

Thus, some of the most helpful definitions are those that include examples with which readers or listeners may be familiar. A writer provides details—verbal images, examples, illustrations—so readers can understand more thoroughly, so readers will have more opportunities to link their own experiences to what they read.

"Let's Define Our Terms"

An extremely widespread instance of an unrealistic (and ultimately superstitious) attitude toward definitions is found in the common academic prescription, "Let's define our terms so that we shall all know what we are talking about." As we have already seen in Chapter 4, the fact that a golfer, for example, cannot define golfing terms is no indication that he cannot understand and use them. Conversely, the fact that we can define a large number of words is no guarantee that we know what objects or operations they stand for in concrete situations. Having defined a word, people often believe that some kind of understanding has been established, ignoring the fact that the words in the definition often conceal even more serious confusions and ambiguities than the word defined. If we happen to discover this fact and try to remedy matters by defining the defining words, and then, finding ourselves still confused, we go on to define the words in the definitions of the defining words, we quickly find ourselves in a hopeless snarl. The only way to avoid this snarl is to keep definitions to a minimum and to point to extensional levels wherever necessary; in writing and speaking, this means giving specific examples of what we are talking about.

Operational Definitions

Another way to keep extensional levels in mind, when definitions are called for, is to use what physicist P. W. Bridgman called "operational definitions." As he says:

To find the length of an object, we have to perform certain physical operations. The concept of length is therefore fixed when the operations by which

length is measured are fixed. . . . In general, we mean by any concept nothing more than a set of operations; the concept is synonymous with the corresponding set of operations.²

The operational definition, then, as Anatol Rapoport explains, is one that tells you "*what to do and what to observe* in order to bring the thing defined or its effects within the range of one's experience." He gives the following simple example of how to define "weight": go to a railroad station or drugstore, look for a scale, stand on it, put in a penny, read the number at which the pointer comes to rest. *That* is your weight. But suppose different scales give different readings? Then your weight can be said to be within the range of, say, 140 to 145 pounds. With more accurate scales you might get closer readings, such as 142 pounds plus-or-minus one. *But there is no "property" called weight that exists apart from the operations of measuring it.* As Rapoport says, "If the only way we can be aware of the amount of weight is by means of the scale, then the very definition of weight has to be in terms of the scale."³

Such, then, is the scientific, or "operational" point of view toward definition—one that attempts rigidly to exclude non-extensional, non-sense statements. We can extend this idea from science to the problems of everyday life and thought. Just as there is no such thing as "length" apart from the operations by which length is measured, there is likewise no "democracy" apart from the sum total of democratic *practices*, such as universal franchise, freedom of speech, equality before the law, and so on. Similarly, there is no such thing as "brotherhood" apart from brotherly behavior, nor "charity" apart from charitable actions.

The operational point of view does much to keep our words meaningful. When people say things like "Let's have no more of *progressive* methods in our schools," "Let's get back to *sound business principles* in running our county government," "Let's try to do the *Christian* thing," "Let's restore *family values*," we are entitled to ask, "What do you mean—extensionally speaking?" To ask this question often—of ourselves as well as of others—is to do our bit toward reducing the vast amount of non-sense that is written, spoken, and shouted in this incredibly garrulous world.

The best examples in everyday life of operational definitions are to be found in cookbooks, which describe the *operations* by means of which the entity defined may be extensionally experienced. Thus: "*Steak Diane*. Slice tenderloin beef very thin and give it a few whacks with a meat mallet to flatten it even more; sprinkle with salt and pepper to taste. Have your pan very hot . . ." (*The Sunset Cook Book*). Writers and speakers would do well to study cookbooks occasionally to increase the clarity and verifiability of their utterances.

² *The Logic of Modern Physics* (1927), p. 5.

³ *Operational Philosophy* (1953), p. 25.

Chasing Oneself in Verbal Circles

In other words, the kind of "thinking" we must be extremely wary of is that which *never* leaves the higher verbal levels of abstraction, the kind that never points *down* the abstraction ladder to lower levels of abstraction and from there to the extensional world:

"What do you mean by *democracy*?"

"Democracy means the preservation of human rights."

"What do you mean by *rights*?"

"By rights I mean those privileges God grants to all of us—I mean man's inherent privileges."

"Such as?"

"Liberty, for example."

"What do you mean by *liberty*?"

"Religious and political freedom."

"And what does that mean?"

"Religious and political freedom is what we enjoy under a democracy."

Of course it is possible to talk meaningfully about democracy, as Jefferson and Lincoln have done, as Frederick Jackson Turner does in *The Frontier in American History*, as Karl R. Popper does in *The Open Society and Its Enemies*, as Robert Dahl does in *Pluralist Democracy in the United States; Conflict and Consent*—to name only a few examples that come to mind. Speakers who never leave the higher levels of abstraction, however, may fail to notice when they are saying something and when they are not.

This is by no means to say, however, that we must never make extensionally meaningless noises. When we use directive language, when we talk about the future, when we utter ritual language or engage in social conversation, and when we express our feelings, we often make utterances that have no extensional verifiability. It must not be overlooked that our highest ratiocinative and imaginative powers are derived from the fact that symbols *are* independent of things symbolized, so that we are free not only to go quickly from low to extremely high levels of abstraction (from "canned peas" to "groceries" to "commodities" to "national wealth") and to manipulate symbols even when the things they stand for cannot be so manipulated ("If all the freight cars in the country were hooked up to each other in one long line . . ."), but we are also free to manufacture symbols at will, even if they stand only for abstractions made from other abstractions and not anything in the extensional world. Mathematicians, for example, often play with symbols and ideas that have no extensional content just to find out what can be done with them; this is called "pure mathematics." And pure mathematics is far from being a useless pastime, because mathematical systems that are elaborated with no extensional application in mind often prove later to be applicable in useful and unforeseen ways.

Mathematicians, however, when they are dealing with extensionally meaningless symbols, usually know what they are doing. *We*, likewise, must know what we are doing.

Nevertheless, all of us (including mathematicians), when we speak the language of everyday life, often make meaningless noises without knowing that we are doing so. We have already seen what confusion this can lead to. The fundamental purpose of the abstraction ladder, as shown both in this chapter and the next, is to make us aware of the process of abstracting.

The Distrust of Abstractions

We may, using our abstraction ladder, allocate statements as well as words to differing levels of abstraction. "Mrs. Levin makes good potato pancakes" may be regarded as a statement at a fairly low level of abstraction, although, to be sure, it leaves out many elements, such as (1) the meaning of "goodness" in potato pancakes, and (2) the infrequent occasions when her pancakes fail to turn out well. "Mrs. Levin is a good cook" is a statement at a higher level of abstraction, covering Mrs. Levin's skill not only with potato pancakes, but also with roasts, pickles, noodles, strudels, and so on, nevertheless omitting *specific* mention of what she can accomplish. "Chicagoans are good cooks" is a statement at a still higher level of abstraction; it can be made (if at all) only from observation of the cooking of a statistically significant number of Chicagoans. "The culinary art has reached a high state in America" would be a still more highly abstract statement and, if made at all, would have to be based not only on observation of the Mrs. Levins of Chicago, New York, San Francisco, Denver, Albuquerque, and Atlanta, but also on observation of the quality of meals served in hotels and restaurants, the quality of training in high school and college departments of home economics, the quality of writings on culinary art in American books and magazines, and many other relevant factors.

Unfortunately, though understandably, there is a tendency in our times to speak with contempt of "mere abstractions." The ability to climb to higher and higher levels of abstraction is a distinctively human trait without which none of our philosophical or scientific insights would be possible. In order to have a science of chemistry, one *has* to be able to think of " H_2O ," leaving out of consideration for the time being the wetness of water, the hardness of ice, the pearliness of dew, and the other extensional characteristics of H_2O at the objective level. In order to have a study called "ethics," one has to be able to think of what elements in ethical behavior have in common under different conditions and in different civilizations; one has to abstract that which is common to the behavior of the ethical carpenter, the ethical politician, the ethical businessman, and the ethical soldier—and that which is common to the laws of conduct of the Buddhist, the Orthodox Jew, the Confucian, the Christian. Thinking that is most

abstract can also be that which is most generally useful. The famous injunction of Jesus, "And as ye would that men should do to you, do ye also to them likewise," is, from this point of view, a brilliant generalization of more particular directives—a generalization at so high a level of abstraction that it appears to be applicable to all people in all cultures.

But high-level abstractions acquire a bad reputation because they are so often used, consciously or unconsciously, to confuse and befuddle people. Depriving blacks of their votes in violation of the Constitution of the United States was at one time spoken of as "preserving states' rights." The consequences of such free, and often irresponsible, use of high-level abstractions in public controversy and special pleading is that a significant portion of the population has grown cynical about *all* abstractions.

But, as the abstraction ladder has shown, *all we know are abstractions*. What you know about the chair you are sitting in is an abstraction from the totality of the chair. When you eat white bread you cannot tell by the taste whether or not it has been "enriched by vitamin B" as it says on the wrapper; you simply have to trust that the process (from which the words "vitamin B" are abstracted) was performed. What you know about your spouse—even a spouse of thirty years—is again an abstraction. Distrusting all abstractions simply does not make sense.

The test of abstractions then is not whether they are "high-level" or "low-level" abstractions, but *whether they are referable to lower levels*. If one makes a statement about "culinary arts in America," one should be able to refer the statement down the abstraction ladder to particulars of American restaurants, American domestic science, American techniques of food preservation, down to Mrs. Levin in her kitchen. If one makes a statement about "civil rights in Wisconsin," one should know something about national, state, and local statutes; one should also know something about the behavior of police officers, magistrates, judges, academic authorities, hotel managers, and the general public in Wisconsin, all of whose acts and whose decisions affect that minimum of decent treatment in the courts, in politics, and in society that we call "civil rights." A preacher, a professor, a journalist, or a politician whose high-level abstractions can systematically and surely be referred to lower-level abstractions is not only talking but saying something.

"Dead-Level Abstracting"

The late professor Wendell Johnson of the University of Iowa, in *People in Quandaries*, discusses a linguistic phenomenon that he calls "dead-level abstracting." Some people, it appears, remain more or less permanently stuck at certain levels of the abstraction ladder, some on the lower levels, some on the very high levels. There are those, for example, who go in for "persistent low-level abstracting":

Probably all of us know certain people who seem able to talk on and on without ever drawing any very general conclusions. For example, there is the back-fence chatter that is made up of he said and then I said and then she said and I said and then he said, far into the afternoon, ending with, "Well, that's *just* what I told him!" Letters describing vacation trips frequently illustrate this sort of language, detailing places seen, times of arrival and departure, the foods eaten and the prices paid, whether the beds were hard or soft, etc.

A similar inability to get to higher levels of abstraction characterizes certain types of mental patients who suffer, as Johnson says, "a general blocking of the abstracting process." They go on indefinitely, reciting insignificant facts, never able to pull them together to frame a generalization that would give a meaning to the facts.

Other speakers remain stuck at higher levels of abstraction, with little or no contact with lower levels. Such language remains permanently in the clouds. As Johnson says:

It is characterized especially by vagueness, ambiguity, even utter meaninglessness. Simply by saving various circulars, brochures, free copies of "new thought" magazines, etc. . . . it is possible to accumulate in a short time quite a sizable file of illustrative material. Much more, of course, is to be found on library shelves, on newsstands, and in radio programs. Everyday conversation, classroom lectures, political speeches, commencement addresses, and various kinds of group forums and round-table discussions provide a further abundant source of *words cut loose from their moorings*. [Italics supplied.]

(I once heard of a course in esthetics given at a large midwestern university in which an entire semester was devoted to Art and Beauty and the principles underlying them, and during which the professor, even when asked by students, persistently declined to name specific paintings, symphonies, sculptures, or objects of beauty to which his principles might apply. "We are interested," he would say, "in principles, not in particulars.")

There are psychiatric implications to dead-level abstracting on higher levels, too, because when maps proliferate wildly without any reference to a territory, the result can only be delusion. But whether at higher or lower levels, dead-level abstracting is, as Johnson says, always dull:

The low-level speaker frustrates you because he leaves you with no directions as to what to do with the basketful of information he has given you. The high-level speaker frustrates you because he simply doesn't tell you what he is talking about. . . . Being thus frustrated, and being further blocked because the rules of courtesy (or of attendance at class lectures) require that one remain quietly seated until the speaker has finished, there is little for one to do but daydream, doodle, or simply fall asleep.

It is obvious, then, that interesting speech and writing, as well as clear thinking and psychological well-being, require the constant interplay of higher-level and lower-level abstractions, and the constant interplay of the verbal levels with the nonverbal ("object") levels. In science, this interplay goes on constantly, hypotheses being checked against observations, predictions against extensional results. (Scientific writing, however, as exemplified in technical journals, offers some appalling examples of almost dead-level abstracting, which is the reason so much of it is hard to read. Nevertheless, the interplay between verbal and nonverbal experimental levels does continue, or else we would not have science.)

The work of good novelists and poets also represents this constant interplay between higher and lower levels of abstraction. A "significant" novelist or poet is one whose message has a high level of general usefulness in providing insight into life, but he gives his generalizations an impact and persuasiveness through an ability to observe and describe actual social situations and states of mind. A memorable literary character, such as Sinclair Lewis's George F. Babbitt, has descriptive validity (at a low level of abstraction) as the picture of an individual, as well as a general validity as a picture of a "typical" American businessman of his time.

The great political leader is also one in whom there is interplay between higher and lower levels of abstraction. The ward heeler knows politics only at lower levels of abstraction: what promises or what acts will cause what people to vote as desired; his loyalties are not to principles (high-level abstractions) but to persons (for example, political bosses) and immediate advantages (low-level abstractions). The so-called impractical political theorist knows the high-level abstractions ("democracy," "civil rights," "social justice") but is not well enough acquainted with facts at lower levels of abstraction to get elected county registrar of deeds. But the political leaders to whom states and nations remain permanently grateful are those who are able, somehow or other, to achieve simultaneously higher-level aims ("freedom," "national unity," "justice") and lower-level aims ("better prices for potato farmers," "higher wages for textile workers," "judicial reform," "soil conservation").

The interesting writer, the informative speaker, the accurate thinker, and the sane individual operate on all levels of the abstraction ladder, moving quickly and gracefully and in orderly fashion from higher to lower, from lower to higher, with minds as lithe and deft and beautiful as monkeys in a tree.