on—the differences may even be exaggerated as competition for funds takes place within the ministry, which is dominated by urban interests; and it is doubtful that the reform measures designed to redefine and limit the power of teachers' organizations will in fact inhibit the volatile teachers.

High hopes for the 1968 educational reform are linked to the belief that education is a leading factor in social and economic development. But even under the best of circumstances it is difficult to break the vicious circle of underdevelopment; in addition, one cannot disregard the fact that educational improvements are as much a result as a cause of development. In short, the success of the reform will depend largely upon progress in other parts of the Bolivian social order.

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Robert G. Myers

BRAILLE BOOKS

See Handicapped, education of: books for the blind and physically handicapped.

BRAIN, TRAINING OF THE

To know, to do, and to speak, one must enhance one's competences on the basis of experience and perform. How does the brain effect these accomplishments? This article is devoted to showing what light clinical and experimental derangements of brain function can shed on this problem.

My own basic research in the functioning of the brain took off from a very practical, applied base—the amnestic syndromes in man. These are disturbances in memory processes that result from brain damage. The variety of agnosias, apraxias, and aphasias (losses of ability to recognize objects, to coordinate movements, and to speak) that result from invasion of brain cortex by disease—strokes and tumors—point up the relationship of the physical structure of the brain to its functions. To understand better this relationship, I have surgically and electrically operated upon the cortex of some 1,000 monkeys and studied the effects on problem-solving behavior. The results of these experiments have clarified to a considerable extent the initial questions concerning brain function in learning and remembering—that is, in how memory storage and retrieval take place—although in the course of making these clarifications a whole new set of problems has been unmasked.

When one first attempts to apply these laboratory results in the clinic, it becomes clear that, although a good deal of understanding has been gained, there is little of practical value added that astute clinicians have not already known for the past century. Some precision is given to diagnostic categorization and to localization of syndromes, but for the most part the disease processes which produce these syndromes are untreatable anyhow. So, it is not clear what one gains by this sharpened perspicacity.

The clue to an alternative direction by which the relevance of these studies can be ascertained comes from the problems faced by those who attempt to reeducate (or initially educate) the brain-damaged patient. Therapists in this arena work with so little hard fact to guide them that often black magic, superstition, and well-meaning futility appear to the outsider to be the bases of treatment.

It is but a step from the rehabilitation clinic to the classroom. The organ to be educated is the brain, yet educators today hardly know more about this organ than did their counterparts in the days of phrenology, black magic, and superstition. Education has lost its way because it has severed contact with biological inquiry. Purely behavioral research leads to multiply interpretable answers—behavioral data are normative, that is, situation specific. Education must therefore look at brain research to become solidly grounded in nomothetic fact.

The brain as a coding mechanism. I have taken this and previous opportunities (Pribram 1964; 1969*a*), therefore, to review for educators some of the data my brain research has developed and to suggest, on the basis of these data, new directions which the educational curriculum can profitably take. The data show that the brain serves learning and remembering not so much by storing a great deal of information as by coding and recoding information in order to make it readily accessible when occasion demands. The suggestion is, therefore, that we concentrate on educating this coding capability of students, avoid throwing at pupils large numbers of facts, and steer clear of making dogmatic pronouncements. Jerome Bruner has stated that if we continue the current practice of factual training we will soon raise a generation of concrete idiots. He has not, however, given guidelines to a practical alternative or recognized the opposite danger of producing a flock of ethereal spirits by an overly permissive reliance on letting the student "do his own thing."

Analysis of the systems composing the brain. Parts of the brain are connected through primary pathways with the windows and movers that relate the organism to the surrounding world. Other parts of the brain are in like manner connected with the receptors and effectors of the organism's internal economy. Finally, there are parts of the brain that do not deal directly with the organism's internal or external environments but exert their influence indirectly by operating on the primary neural structures. It is these systems of a higher order about which so much has been learned recently.

A part of the reason for the new surge in knowledge about the brain is that this organ is being viewed from a new vantage (Pribram 1960). Early investigators had severed the spinal cord, the lower, middle, and upper brainstem (the "stalk" between the spinal cord and the cerebrum), the basal ganglia (masses of gray matter in the cerebrum), and the cerebral cortex (the outer gray matter of the cerebrum) from one another and studied them as separate segments (like the segments of a worm) that had developed progressively along with the general development of the higher vertebrates. This segmental approach gave rise to the view that the nervous system was organized into lower, innate, reflex mechanisms controlled by higher, learned complexities of neural organization. There is considerable merit to this view, and it continues to dominate the thinking of many members of the intellectual community who have not caught up with the recent advances made in the neurosciences.

Between 1945 and 1970 new technology made it possible to abandon the simple severance approach to the central neural structures and replace it with more subtle analyses. These analyses have suggested that the brain's organization is more akin to an onion than to an asparagus, that an octopus (Wilson 1957) or a sea slug (Kandel & Spencer 1968) might provide a more appropriate model than a worm. Especially important to this change in view have been analyses of the nervous system from inside out. By approaching the brainstem in this fashion, scientists have probed the functions of the reticular formation; by delving into the brain proper in this manner, scientists have brought to light the functions of the limbic formations of the forebrain.

The reticular core of the brainstem. The reticular formation and its ramifications have been shown to determine neurological and therefore psychological states. Placed within the core of the brainstem, which regulates the organism's internal economy, the reticular formation also receives branching connections from the systems which relay signals from exteroceptors (the sense organs that receive external stimuli) and at the same time exerts an influence on motor systems. This pervasive interrelatedness with the rest of the neural axis is the hallmark of the reticular formation: in a nonspecific manner, it activates or inhibits what goes on elsewhere, thus setting the level within which subsequent neuronal organization must develop. The reticular formation, because of its internal structure and its connectivity, is well suited for this purpose (Magoun 1963*b*; Pribram 1961). Mostly made up of a feltwork of short, fine fibers, this structure provides an opportunity for slow, long-lasting, nonpropagating, steady-state electrical potentials to develop. These potentials are especially sensitive to their biochemical surround, so that neurotransmitter secretory substances, which elsewhere in the nervous system merely boost a nerve impulse across a synapse, here play a major role in determining overall function. Sleep and arousal (Magoun 1963*a*), as well as the more selective vigilances of attention (Haider et al. 1964), are regulated by the neuroelectric and neurochemical configurations developed in the reticular formation of the brainstem.

Thus, the functions of the reticular formation cannot productively be examined in terms of oppositions like higher versus lower, the learned versus the innate, or the complex versus the reflex. Rather, the reticular core deals with differences between state (slow potential) variables and transient (nerve impulse) variables in the nervous system—that is, differences between dispositions to perceive and to behave on the one hand and the specifics of stimulus and response mechanisms on the other.

The limbic formations of the forebrain. The delineation of the functions of the limbic structures which lie at the junction between the basal ganglia and the cerebral cortex of the forebrain has in a similar fashion turned the focus of many neuroscientists away from the earlier dichotomies. The earlier belief that the limbic structures of nonhuman primates and of man are exclusively primitive by comparative anatomical criteria and exclusively visceral in their connectivity has gradually been superseded. Recent evidence shows that a variety of performances and acquisitions of behavior (simple and complex) suffer when the limbic brain is damaged (Pribram 1960; 1961). Trying to force the new data into a mold devised to fit old data has temporarily, however, resulted in inadequate and conflicting formulations.

A more comprehensive view of the functions of the limbic forebrain is derived when a fresh look is given the data (Pribram 1969*b*). The connections of the nervous structures of the limbic forebrain are primarily with each other. Signals are conveyed among the structures composing the limbic formations—back and forth, in small and large loops. Secondarily, the limbic structures connect through two major portals with the reticular core of the brainstem. An anterior portal (in the vicinity of the septal and hypothalamic regions) and a posterior portal (in the vicinity of the gray substances around the aqueduct of Sylvius and the mesencephalic reticular formation) have been identified. Electrical excitations of structures around the rear portal produce pain, and animals can be trained to turn off such stimulations (N. Miller 1961). Conversely, animals seek electrical excitations of structures around the forward portal, and such excitations are therefore assumed to be pleasurable (Olds 1955). Changes in amount and in other stimulus parameters also influence the result obtained (Valenstein 1965). Further, just as the reticular system extends forward from the mesencephalic location (at the upper end the brainstem—where it was first discovered where it is most easily dissected out), so the p tals of the limbic formations spread through brainstem core to overlap to some extent in middle reaches (Pribram 1960).

The connections of the limbic formations with the parts of the brain which regulate organism's relations with the world around. These connections are in most instances made collateral branches much as in the case of reticular system, and for this reason the limb and reticular formations have sometimes be classed together as the nonspecific systems of brain.

The cybernetics of brain function. I belie these data show that the limbic forebrain ideally situated to provide for and monitor the brain's equilibrium (Pribram 1967*d*; 1970*b*; Pri bram & Melges 1969). These limbic structure make up the cybernetic brain—the "homeosta as conceived by Ashby (1960)—by which the brai steers its course much as the gyroscope is the mechanism by which a ship is guided. The cour is mapped elsewhere in the brain; the limb circuit informs only that a given direction maintained or deviated from. Further, there good evidence (Douglas & Pribram 1966; Pribram 1967*c*) that deviations are coded into at least two classes by limbic structures: deviations which must be selectively attended (taken account of and those which have become momentarily irrel evant. In problem-solving situations, relevant deviations constitute reinforcements; irrelevant disequilibrations are manifest as distractions potentially interfering with learning and per formance. The limbic structures code these deviations from equilibrium not only by monitoring them but also by keeping them within bounds so that reinforcers and distracters can be usefully registered in memory instead of becoming manifest interferences which retroactively and proactively disrupt the psychological process. At the behavioral level, certain aspects of attention, memory, reinforcement, and utility (decision-making) come conveniently into the description of the functions of the limbic forebrain. Motivation and emotion can be added to the list: Reinforcers are nothing if not motivating; emotion springs from upset (disequilibration) and copes by making internal adjustments of the cybernetic mechanism (Pribram 1967*a*). It is important, therefore, to understand the functions of the limbic forebrain in its own terms first and then to apply this knowledge to the analysis of physiological functions and psychological processes. The limbic systems are not just a visceral brain, nor are they the sole substrate of emotion. The limbic forebrain monitors and maintains the equilibrium of the central nervous system; in the process, feelings (for instance, pain and pleasure) are generated, attention is called, reinforcement is fed back (recalled), memory is engaged, and thus behavior is steered.

The disposition to learn. Thus, two aspects of central nervous system function have been delineated by the recent research which studied the brain from the inside out. These aspects have little to do with the usual dimensions of stimulus and response—innate and learned, simple and complex—with which educators are familiar. Rather, the research findings deal with the equilibration and cybernetics of the elementary coding operations involving state (dispositional) variables. These dimensions have hitherto been taken into account only by clinicians in their assessments and remedial efforts. But psychological state and the steering of psychological processes (including learning through leading, *educare*—the Latin root of the English word "educate") ought to be the concern of the entire teaching profession if so much of the brain is devoted to these functions. Thus, all pupils must be disposed to learn and their equilibria jogged sufficiently to capture their attention. Further, the jogging must be done in an orderly manner so that coding through feedback (recall) can occur—that is, so that relevant events will be reinforced and registered in memory while irrelevancies are sorted out as distractions to be ignored.

In the light of these principles, one highly undesirable practice in American schools is the scheduling of physical education between classes in academic subjects. The student's brain after physical education is geared to overcoming physical obstacles, to fight, to flee, to labor physically. It is difficult for a mathematical equation to capture the attention of a brain so indisposed to it—and should the teacher succeed by extraneous means in calling attention, the equation will be correctly classified by the physical-education-disposed brain as an irrelevant distraction. A better time for physical education is after school, when it can accomplish release from the tensions of a long-maintained discipline of the disposition to learn.

The role of physical education in the school curriculum is only the most blatant example of current institutional disregard for the dispositional and equilibratory nature of the learning apparatus. A good educator, of course, intuitively makes up for the lack in the system by taking a few minutes at the beginning of each class to orient the pressured students, by cutting down on the amount of instruction he will give, and by attempting to gear his homework requirements to the demands made by others. But these efforts are not universally engaged in and are therefore apt to be unsuccessful when an individual teacher makes the attempt.

Memory storage and retrieval. There is, of course, more to the brain's coding apparatus than the setting, monitoring, and maintaining of dispositions. Important as these functions of the core brain systems are to attention and memory, they furnish only the context (the weaving together of the conditions) within which learning can be experienced. Content (what is learned and remembered) is coded by the remainder of the brain—sets of structures and systems that surround the core of the brainstem and forebrain, such as the specialized sensory and motor pathways and their associated neural systems. A study of these structures can shed light on the problem of the forms of memory storage and retrieval. A great deal was accomplished in this field by brain scientists between 1945 and 1970.

One of the major puzzles in brain research has been the fact that so much damage can be done to the brain without causing any specific loss of memory—any specific amnesia for one or another event or set of occurrences. What does result when the brain is damaged is a more or less overall incapacity in learning and/or remembering. This incapacity may be restricted to one or another sensory mode—for example, sight (Chow 1952; Mishkin 1966; Pribram 1954), hearing (Dewson et al. 1969; Weiskrantz & Mishkin 1958), touch (H. Pribram & Barry 1956; Wilson 1957; Wilson et al. 1960), or taste (Bagshaw & Pribram 1953; Pribram & Bagshaw 1953). Furthermore, in order to obtain such incapacities at all, a large proportion of the brain system involved must be impaired. Selective damage does not retroactively cut out a part of recorded experience.

Such results have made it necessary to view the brain's recording machinery as somewhat different from the traditional models (Plato's wax-impression model and Locke's writing-tablet model) even when these models are updated into discs and tape recorders. The basic fact of memory in living organisms is that it is redundant and distributed; that is, the same event must be multiply represented over a large portion of a system in the brain in such a manner that any part of such a system contains many different representations. An experiential occurrence must be broken down into parts while being coded into memory, and during retrieval (remembering) a constructive and reconstructive coding operation must take place. Behavioral evidence that remembering is reconstructive has been available for some time (Bartlett 1932). What psychologists and neurophysiologists have not been able to discover is the process by which any mechanism, physical or biological, might accomplish reconstructive remembering.

Programming the brain. The advent of large-scale information-processing devices has made it much easier to conceive of ways in which a distributed, highly redundant memory might operate. First, general-purpose computers are capable of reconstructive processing by means of sequential operations in which an instruction is given to the machine to go find an item in its memory. Series of such instructions can register or deposit in memory components of the instruction, and these or similar commands can restructure or reconstruct from memory a replica of the original or some new combination of components. The commands can be hierarchically arranged so as to refer to one another in a structured fashion. Components in storage are thus cross-referenced, and the command sequence becomes a program or plan.

The biological machinery of man's brain functions in a similar way. The brain must be readied to cope with an instruction. Readiness can be based on inborn capacities or on learned accretions. In either case, the instruction must be matched against the current capabilities of the brain. Experimental psychologists have referred to readiness in terms of expectancy; physiologists, in terms of neuronal models against which inputs must be matched. Psychophysiological experiments (Sokolov 1960) have shown that the organism reacts with an orienting mechanism whenever any change is made in a previously repetitive input pattern. Neurobehavioral experiments performed in my laboratories (Bagshaw & Benz 1968; Bagshaw, Kimble, & Pribram 1965; Kimble et al. 1965) have shown that this orienting mechanism is composed of at least two parts, one of which is involved in selectively sampling the input; the other, in registering the change. When registration takes place, habituation (the gradual decrease of the orienting responses) can occur. The structures of the limbic forebrain are involved in the attentional and mnemonic processes necessary to registration and habituation; selective sampling is a function of the specific sensory and motor pathways and their associated systems.

In nonhuman primates and in man, selective sampling is dependent on the systems associated with the primary sensory and motor pathways. The areas of the cerebral cortex involved in selective sampling are ordinarily called association cortex, in part because they have multiple connections with other cortical areas and in part because it was thought that higher mental processes were exclusively dependent on associative structure. The term "association" is a misnomer, however. A good deal of research on discrimination learning has shown that progressive differentiation rather than associative accretion is involved (Gibson & Gibson 1955; Pribram 1960) and that configuration rather than mere associative juxtaposition is crucial in determining the selective aspects of reinforcement and recall (Pribram 1959). Furthermore, the idea that the association cortex serves as a way station between sensory and motor pathways has become untenable (Chow 1952; Pribram, Blehart, & Spinelli 1966; Pribram, Spinelli, & Reitz 1969): extensive circumsections and crosshatchings of the sensory and motor areas of the cortex have little or no effect on discrimination performance. Further, the parts of the cortex which are involved in discrimination (and are better called associated or intrinsic cortex rather than association cortex) are some distance from the primary pathways, and another major puzzle which has occupied neuroscientists is how these "associated" or "intrinsic" cortical areas get involved in the discriminative process. One answer, based on results obtained in my laboratories (Reitz & Pribram 1969), has been that the associated cortex sends signals down from the brain into the input pathways of the brainstem. In this way, control is imposed by the brain on the input it receives (Pribram 1967*b*). Thus, the input to the brain is preprocessed by the output from the associated cortex at various stations along the way before it reaches the primary cortex. Psychologically, preprocessing means that "raw sensory data" are difficult to become aware of and are unlikely to be stored. Each person codes and therefore experiences the event world uniquely.

The neural hologram. The problem remains of describing what the representations in the primary sensory and motor pathways look like. I have ventured a model based on the neurological evidence but given conceptual form by a physical information-processing device. Present-day computers are serial machines. By contrast, much of the brain's connectivity implies parallel processing. The brain depends on spatial as well as on temporal relationships (on configurations as well as on successions) to construct its codes. The limitations imposed by a strictly serial mechanism are felt throughout the computer industry, nowhere more intensely than in the field of pattern recognition. Today's machines simply cannot do this job efficiently. Tomorrow's machines will be able to, however, because of a new development in technology which derives from the science of optics. Optical information-processing is parallel and depends on spatial relationships. This technique is characterized by holography, the art of recording (on photographic film) the interference effects produced when two wave forms interact. To make a hologram of an object, a coherent light beam (laser produced) is split: part of the beam serves as a reference going straight to the photographic emulsion; the other part is reflected off the object before it reaches the film. The record of interference between the reference and reflected beams (the hologram) can be stored and used subsequently to reconstruct an image of the object. The image is reconstructed by reilluminating the film with the reference beam. (Where more than one object was involved in making the original hologram, a reflection off any one of the objects can be used to reconstruct a "ghost image" of the others.) In either case, the entire original scene will be reproduced. The hologram thus serves as a true case of associative storage.

Additional attributes of the hologram are of interest to the brain scientist. First, the hologram is a prime instance of distributed and redundant storage. The entire image can be reconstructed by illumination of any small part of the film. Severe damage or even loss of a great part of the hologram does not destroy any specific part of the image. There is some degradation of resolution of the whole, but all the parts are still there to be imaged. The hologram accomplishes this prodigious feat by modulating the reflected wave form onto the reference wave form in much the same way that the signal in a radio program is modulated onto the amplitude (AM) or frequency (FM) of the carrier wave. In the hologram, however, there are myriads of such carrier waves and the *spatial* rather than the temporal phase relations among them serve as the code. Thus, the reference can be (and has been) done away with entirely, each wave form acting both as a carrier and as a modulator for the next.

The mathematical relations which describe optical information-processing systems can be used to devise more ordinary computer-like systems. Such nonoptical devices based on optics are being built by computer firms to aid in pattern recognition and in making better memory-storage devices (Brown & Lohmann 1966).

A second characteristic of the hologram is that sets of interference patterns can be overlaid on the same film. Therefore, the storage capacity of holographic memories is great. Each layer can be separately addressed subsequently by the appropriate instruction—the original reference or reflected wave form that went into making one particular layer. This characteristic has already allowed the storage of some 100 million bits of retrievable information in a centimeter cube.

Optical information-processing systems have the characteristics demanded by the neurobehavioral facts of memory. Engineers have already demonstrated that these characteristics can be realized in nonoptical systems. I have suggested, therefore (Pribram 1966; 1969*a*), that certain neural information-processing and memory-storage mechanisms, especially those in the primary sensory and motor systems, depend on holograph-like coding operations. The construction of neural holograms is thus conceived to account for the spatially distributed, redundantly parallel nature of information storage which occurs in these systems. Remembering (reconstructive recognition) is effected whenever the appropriate input wave forms are generated by the sense organs. Recall occurs when the reference mechanism initiates the process.

It remains to state the evidence that interfering wave forms are generated in the brain. The evidence on this point is overwhelming. The size and speed of conduction of nerve impulses is proportional to the diameter of the nerve fiber which generates the impulse. Thus, near the ends of neurons where fibers are branched and fine, nerve impulses decrease in size and speed to become slow potentials. Especially at synapses and in dendritic (branching) networks such as those of the brain's cortex, slow potentials predominate over nerve impulses. Slow potentials are not created one at a time. Many of them are set up simultaneously when a nerve impulse becomes distributed among the branches of the neural network which occur at junctions between neurons. It follows that especially where such nets are arranged in horizontal sheets (as in the retina and brain cortex) wave fronts will be made up of these slow potentials. An arriving array of impulses will give rise to a new wave front which, by interacting with already existing wave fronts or those generated from other locations in the nervous system, will constitute interference patterns. These patterns could easily influence the conformation of proteins or other locally present tissue macromolecules to effect temporary or long-lasting biochemical storage which would be reactivated by subsequent inputs having sufficient similarity to the original.

Education and participation. The attributes of the brain make teaching and instruction difficult but also make education the best way out of the difficulty. By leading the student to give of himself rather than just exposing him to the makings and leavings of others, teachers can externalize the student's own coding operations so that the coding operations can be responded to and shaped. For better or for worse, it will be these same coding operations which the student will thereafter apply to his input. There must be less emphasis on mere exposure of the student to the external world and more on how he perceives this world and values it, that is, how he becomes disposed and how he himself intends (regulates) his exposures.

Active participation by the student, mobilization of his dispositions and intentions, and monitoring and steering by means of the feedback to which he is subject are essential if the brain facts at our disposal have any meaning. The current school system is based on an antiquated model of neural function: the reflex arc, stimulus → organism → response. This model is not an accurate description of reality. The brain has considerabl control over its input, control which extend from cortex and limbic forebrain not only to th brainstem but even all the way out to the recep tor surfaces (G. Miller et al. 1960; Pribram 1960 1967*b*). Furthermore, the behavior of the orga nism is controlled in a fashion different from tha implied in the reflex arc, stimulus-response model The motor control exerted by the brain is *no* arranged as in a player piano whose keys are de pressed in response to a program in which each key press is represented by a hole in the paper tape. Instead, the brain controls action by regu lating muscle receptors much as it regulates the receptors of the eye and ear. What is represented in the programs initiated by the motor cortex is not muscle contraction or movement but the forces playing on muscle receptors (Bernstein 1967; Evarts 1967). Thus, the primary motor systems of the brain are best conceived as the sensory systems for action (Pribram, Kruger, Robinson, & Berman 1955–1956). Know-how is the function of these systems just as know-what is the function of the classical sensory systems. Participation (the utilization of his dispositions, equilibrations, and intentions) thus helps the student become proficient in guiding both his own perceptions and his own actions.

Participation would be a difficult, if not impossible, goal to achieve were there not available to the educator yet another, superordinate type of coding operation. Man's brain codes linguistically as well as in the ways already detailed. He can describe to others his external and his internal world in words, and he can manipulate words in thought and in writing.

Most of what is known about how the brain operates linguistically has necessarily come from clinical observations made on brain-damaged patients who manifest language disturbances. Some things can be inferred about brain mechanisms from such observations (Pribram 1970*a*). What is more important, new approaches in psycholinguistics make it likely that a great deal more research into these mechanisms is now possible with both normal and brain-injured man (and child).

Education can be improved by treating and transmitting as linguistic systems the accumulated knowledge of mankind. In a sense educators do this now, but covertly. They ask students to memorize names of authors, dates in history, facts in biology, formulas in chemistry, and equations in physics. It would be more productive to expose students to the world from the view of the novelist, the historian, or the behavioral, biological, or physical scientist, learning their languages but not merely parroting the words used in each discipline. Students should learn to apprehend a view of the world by participating in the verbal processing (the linguistic coding) which identifies each discipline. Once the various disciplines have been explored verbally, the student can choose to pursue one or another of them in depth. In current practice, most subjects are taught as if the aim were to make a professional of each student in each discipline. Ideally, the aim of education should be to make each student a professional man, a proficient linguist. Only when he has mastered himself in this fashion can the student creatively proceed to work with the other tools at his disposal.

A word of caution: Language-learning should not consist of mere talk, especially one-directional talk. To learn a language one must learn to communicate within it, and often it is necessary by gestures, demonstrations, and experimental trials to find common ground. But the purpose of such nonlinguistic enterprises is not to become proficient but to reach understanding. Unless the verbal is grounded in image and act, talk easily becomes meaningless (Pribram 1969*a*; 1970*c*). In short, the purpose of education is to make man human, that is to make it possible for him to communicate sensibly and effectively.

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KARL H. PRIBRAM

BRAZIL

Before 1962 Brazilian education was controlled by many separate and diverse laws, with the emphases and directions of education changing from time to time. Secondary and higher education was controlled by federal agencies, and elementary education was largely the responsibility of state and municipal authorities. The Ministry of Education and Culture, with the advice of the National Council of Education, operated on the federal level; and secretariats of education functioned on the state level.

In December 1961 the Brazilian Congress passed the first general education law, the Law of Directives and Bases of National Education. This law did not abolish the federal ministry or state secretariats but transferred the policy-making responsibility and some administrative authority to the Federal Council of Education. It also created state councils of education, which were to function according to state legislation in conjunction with the state secretariats. The general effect of the law was to decentralize the educational system and transfer educational responsibility and authority from the federal government to states, municipalities, and individual schools. Thus, the former rigidity at the secondary and higher levels has been relaxed, allowing a greater degree of flexibility for the various programs of study.

Organization. Brazilian education is divided into three levels: (1) elementary, (2) middle or