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The Value of Human Life

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NEUROBIOLOGICAL FACTORS IN THE DEVELOPMENT OF PERSONHOOD

by

Jose M. R. Delgado
Director, Center for
Neurobiological Studies
Madrid, SPAIN

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Prof. José M. R. Delgado, Director,
Center for Neurobiological Studies. Caleruega 29, Madrid, Spain.

The attempt to understand ourselves, the conception of our own personality, the investigation of the elements which structure our identity and of the options and consequences of our behavior, are some of the essential characteristics of human beings. The brain looking at the brain, with the possibility of influencing intelligently the functions of the brain, is one of the most important accomplishments of natural evolution. Consciousness of these facts and their utilization to understand, use, and modify ourselves and our environment are human characteristics not shared with the rest of the universe.

These characteristics do not appear suddenly: to the contrary, they are the result of a very slow process of phylogenetic evolution which is repeated at a much faster pace in the ontogenic development. The value of human existence and the possibilities to enhance its individual and social qualities depend on neurobiological factors the origins, characteristics, development and consequences of which may be analized.

In biology "development" may be defined as the sequential changes which continuously transform any biological system of relatively simple organization into one of increasing complexity and differentitation until a final stable stage is reached (Prechtl, 1969). Conscious understanding and establishment of VALUES are necessarily related to the development of human beings and to the evolution of the human brain which is the only organ capable of processing, experiencing and reacting to the codes of information originating in the external world, with the added meaning of values and human emotionality.

We are surrounded by material elements of earth, water, and air, with the possible beauty of cliffs, sea waves and sun sets. These elements do not have sensors for the perception of their existence or for the appreciation of their esthetic qualities which are only human interpretations. Appreciation is not intrinsic to the inorganic world. It is not shared by bees or frogs because their little developed nervous systems lack the necessary neuronal complexity and capacity to understand any values.

It is convenient to differentiate "identity" from "awareness of personhood". A rock or a tree has identity as a material structure, with shape, color and a variety of physical, chemical and functional properties which are

integral parts of it with independence of their recognition by an observer. Each stone is different from any other.

Personality is defined in the book Psychology Today (1970) as "an individual's characteristic pattern of behavior and thought" which may be evaluated by tests and questionnaires, having also, according to Jung, some unique unconscious elements resulting from the repression of individual experience.

Spermatozoa, ovae, gastrula and early stages of embryonic human development do possess a specific identity, but do not have a nervous system and therefore lack awareness and personhood. Evaluation of the initiation of neuronal activities necesssary for the appearance of personality and for the awareness of values and identity are matters of definition and investigation but we may state that they are not a SUDDEN phenomenon, and that the many neurobiological factors which intervene in the development of personhood appear and evolve rather SLOWLY, being related to genetic factors, nutrition, neuronal maturation, sensory inputs, cultural codes, and other elements which can and should be investigated.

DEFINITION OF PERSONHOOD

To discuss the development of personhood, it is convenient to give a definition of the term, which we shall use as equivalent to human personality and closely related to intelligent behavior.

Definitions of personality are confusing and often contradictory. Some of them emphasize the importance of unconscious determinants, while others pay more attention to consciousness. A theory of personality should be a formulation of systems of interrelated statements that describe and explain all aspects of man's nature. Some have been based on animal experimentation, whereas others are based on clinical observations. Different importance is given to heredity versus environment, to childhood experiences, to the past versus the future, to single or plurality of motives, to individual uniqueness or to self-concepts. One of the broadest theories was originated by Freud with his concepts of the Id, the Ego and the Superego, but even this sophisticated conception of man was incomplete. In the analytical psychology of Carl Jung, the great importance of the unconscious is recognized, differentiating two levels a) the personal, containing individual experiences that were once conscious but have been repressed or forgotten, and are capable of returning to consciousness; and b) the collective unconscious, meaning the memories and behavior patterns

inherited from man's ancentral past. All human beings have a similar collective unconscious. Its universality is related to the similarity of brain structures in all races, due to a common evolution.

The assumption that man's behavior is motivated by INBORN instincts (Freud), or archetypes (Jung) was challenged by Alfred Adler who stated that man is motivated primarily by social urges, being related to other people and engaging in cooperative social welfare. Adler emphasizes the uniqueness of individual personality and the awareness of the reasons for his behavior.

According to Erich Fromm, man's existence requires five specific needs: a) relatedness, to diminish the problem of being torn away from the animal's primary union with nature; b) transcendence, to overcome animal nature and become a creative person; c) rootedness, to be an integral part of the world, with a sense of belonging and of brotherliness; d) personal identity, to feel distinctive and unique; e) a frame of reference which will provide stability and consistency to personal behavior. In his book, Escape from Freedom (1941), Fromm develops the thesis that as man gains freedom he feels increasingly alone. For the proper functioning of a particular society, a child's character should be shaped to fit the needs of society.

Psychoanalysis and Behaviorism, two of the main schools of interpretation of personality, were based on the study of brain-damaged and mentally disturbed persons.

In contrast another investigator, Abraham Maslow, arrived at his formulations regarding personality from the study of healthy and creative persons (self-actualized). In this way Maslow avoids a pessimistic, negative and limited conception of man. He feels that psychology should take into account gaiety, exhuberance, love and well being to the same extent that it deals with misery, conflict, alienation, shame, and hostility. The inner nature of man is not strong like the instincts of animals, but rather weak and easily transformed by habit, cultural pressures, and right or wrong attitudes. Maslow differentiates: a) basic needs including hunger, affection, security, and self-esteem; and b) metaneeds such as justice, goodness, beauty, order, and unity. The basic needs are prepotent over the metaneeds. Maslow has conducted investigations of a group of self-actualized people, some famous like Lincoln, Thoreau, Beethoven, Einstein, and others who were friends of Maslow. Apparently they shared several distinctive personal characteristics.

From a different point of view, several conditions have been proposed as prerequisite for the existence of intelligent behavior in any organism: a) a functional cerebral cortex; b) presence of sensory telereceptors;

c) upright posture; d) use of tools; e) verbal (and written) communication; f) cultural background; g) achievement of substitutive or symbolic behavior.

SOME NEUROBIOLOGICAL DATA

The definitions and comments presented in the previous section refer to the established human personality and there are numerous studies relating brain mechanisms and behavior in adult organisms which in part were the efforts of illustrious investigators such as Pavlov, Sherrington, Lashley, Luria,and Hess. There are also a large number of studies concerning early infant behavior and development. However few attempts have been made to analize early behavior from a neurobiological point of view: Which are the correlations between the appearance of organized movements and neuronal development? Which areas of the brain are related to the onset of mother - child communication? Where are the traces of early imprinting stored ? Which are the neuronal bases of symbolic behavior? These and many other questions remain to be determined.

Animal research has provided some important clues: In sheep, cats, rabbits, and guinea pigs the development of excitatory and inhibitory synaptic mechanisms in the spinal cord and the cortex have been investigated during pre- and postnatal periods. Maturing of the nervous system has been monitored using evoked potential techniques. Unitary recording from immature brain cells, including spontaneous activity, interval distribution and interdependence has given information about the codes used by growing brains for early

communication among different structures. Research on sensory systems, including receptors, pathways, receiving areas of the brain and processing mechanisms, has yielded fundamental data for our understanding of the decisive role of the environment and coded inputs in the neurochemical and neuroanatomical development of neurons.

Work on the human fetus (Minkowski, Hooker, Humphrey and others) demonstrated the importance of the appearance of fetal and postnatal reflexes for the genesis of certain brain structures and their connections. Behavioral observations of babies born before term allowed the extrauterin study of the prenatal genesis of brain mechanisms. Unfortunately correlative studies on postnatal brain structure and behavior are almost completely lacking (Prechtl, 1969). Also little is known about the underlying cellular events that give rise to the particular parts of the brain and their interconnections.

According to Cowen (1979), we can identify eight major stages in the development of any part of the brain: a) the induction of the neural plate; b) the localized proliferation of cells; c) the migration of cells from the region in which they are generated to the place where they finally reside; d) the aggregation of cells to form identifiable parts of the brain; e) the differentiation of immature neurons; f) the establishment of connections with other neurons; g) the

selective death of certain cells; and h) the elimination of some of the connections that were initially formed and the stabilization of others.

There is a process called "neural induction" through which some cells of the ectodermic tissue of the developing embryo become transformed irreversibly into the specialized tissue from which the spinal cord and the brain will develop. There is a limited period in development during which the ectoderm is able to respond to relevant inductive signals for neural induction.

Proliferative mechanisms of embryonic cells have a timing rigidly determined by genetic organization and provide the cells with a "birth date" and a definitive "address" of the brain area to which to migrate and the pattern of connections to establish. Cell migration is a slow process consisting of only about a tenth of a millimeter per day, and some neurons must travel for considerable distances from their starting point in the neural tube. During this long journey, some cells are misdirected and end up in distinctly abnormal positions, most of them being eliminated, or in other cases producing gross disorders in brain development and in subsequent brain activities.

During the development of neurons there is a progressive elaboration of their processes and the adoption of particular

modes of electrical and chemical transmission. Under the influence of certain environmental factors, some neurons can switch from one chemical transmitter to another, for example from norepinephrine to acetylcholine.

The information required for neurons to generate their distinctive pattern of dentritic branching seems genetically determined because it appears even in "in vitro" culture of tissue. During the normal development of the brain, however, most neurons may be influenced by local mechanical factors, by functional elements and by the codes of sensory inputs. The highly programmed phases of cell death represent another important factor.In many regions of the brain, the number of neurons originally generated greatly exceeds the number of neurons that survive beyond the developmental period, and the final neuronal population may be reduced to only 15 % of the initial group.

There is also a mechanism for the elimination of synaptic connections which has been demonstrated in young rats: At birth about five or six axons innervate each muscle fiber, but during the subsequent two or three weeks, these axons are progressively eliminated until only one survives.

The developing brain is an extremely plastic structure. Many regions are "hard wired" under rigidly determined genetic orders, while other regions, specially the cerebral

cortex, are open to a variety of influences, both intrinsic and environmental. In addition, brain growth involves a variety of errors in migration, connections, and functional mechanisms.

APPEARANCE OF MENTAL FUNCTIONS AND VALUES

When a lamb is born,its motor functions are well established and the animal is immediately able to walk, to approach its mother and to avoid dangers. This fact is shared by cats, dogs and other mammals. The reason is that the cerebral cortex, cerebellum, pyramidal tract and other parts of the sensory-motor system are well enough developed to allow voluntary movements and adequate coordination.

The situation in a new born human baby is very different: cerebral neurons are immature, motor functions are not yet established, and movements are disorganized and unefficient. The pyramidal tract will take months to acquire myelin. Human beings are born with such cerebral immaturity that their very survival depends completely on exterior help and their behavior is similar to that of a purely spinal being, or at most a midbrain preparation. Most neurologists agree that the neonate is a noncortical being. After birth there is a transitional period during which the cerebral cortex starts to function and its activities progressively increase until a reciprocal functional correlation is established with the rest of the brain.

Experiences provided by sensory inputs from the environment decisively influence the number as well as the structural connections of postnatal cells. Cajal suggested

long ago (1911) that the microneurons of the cerebellum, which serve as association elements, develop after birth under the influence of the infant's behavioral activities. Neurochemical activities in the brain, including the presence and functions of neurotransmitters, also require the reception of information from the external world. In the absence of sensory stimuli the neurons will remain in an infantile stage. Codes from the environment are absorbed as a structural part of the neurons in the developing brain.

Because of these facts and other anatomical and functional characteristics, it is impossible for a human baby to walk. This lack of maturity also signifies that no baby will be able to walk, to read a book, to play a musical instrument, to use a computer, or even to maintain a simple upright posture. At this time values and moral judgment are nonexistent.

The baby is born with anatomical and functional systems indispensable for his survival, including regulation of heart rate, respiration, blood pressure, temperature, and urinary excretion. These systems are ready to start inside the maternal womb during the last two or three months of pregnancy, as demonstrated by the survival of premature babies. Nothing, however, is preestablished concerning recognizable mental activities.

We cannot say, however, that the baby has no identity because he will be recognized by his parents and he has a wealth of fetal structuring and genetic determinants which are unique. also babies display individual characteristics in their limited repertoire of sleep-wakefulness, feeding, eliminating, and sensory reactivity.The term "personality", which is often equated with intelligence, in general is tested by instrumental methods or by questionaires, rating scales, interviews, and there is an attempt to predict reactivity and future behavior. Theories of personality discuss sexuality,motivation, conditioning, culture, learning, psychoanalysis, social determinants, and other factors which may be tested in adults but not in newborns.

As definitions are controversial, it is preferable to clarify the use of terms, and we would like to reserve the concept of personality for the time when the brain is reaching maturity as shown by the presence of detectable mental characteristics. In this way we may analize the necessary elements for the appearance of PERSONALITY AND VALUES.

THE FALLACY OF POTENTIALITY

In the previous sections some neurobiological data are presented in order to emphasize the tremendous complexity, sequential events and genetic determinism in the development of the brain. Determinism, however, is relative because genes are only triggers of cellular evolution and at each stage many variables are present including biochemical elements from the mother and from the embryo which may influence, and even misdirect, neuronal changes and migrations.

There is no doubt that the fertilized egg has the potentiality to become a zigote, which contains all the essential factors for the development of a new individual. The zigote subdivides into blastomeres, while it is still high in the uterine tube and cell multiplications produce a cluster of 12 blastomeres which passes to the uterus where 12 to 16 blastomeres form the morula. Then the blastocyte appears which has a diameter of 0.2 mm. and will be implanted as a parasite in the uterine wall. During the fourth week of pregnancy, the essential arrangements have been made for physiological exchange between the mother and the fetus. At the end of the second month the embryo measures about 30 mm. and from this time until birth it is called a fetus. During the third month the young fetus clearly resembles a human being with a large head.

Human embryos are subject to disease, abnormal development and abnormal growth. One infant in 14 that survives the neonatal period bears some type of congenital abnormality. Disturbances may be induced by gene mutation, sex linked factors, abnormal distribution of chromosomes during cell division, irradiation, chemical teratogenic agents (remember the thalidomide babies), deficiency of fetal hormones, and a variety of other elements.

In summary fertilization of an ovum is not necessarily followed by the development of a human being. There is a POTENTIALIY, but not a REALITY, which requires time and the supply of many elements which ARE NOT in the fertilized egg.

Turning now to the newborn human baby, he has the potentiality to become a child, a youngster, and adult and an old person, but he is none of them. The newborn has the potentiality to walk, to speak any language, to drive a car, to be an astronaut, and to acquire many skills, cultures, and values, but in reality he has nothing - only the capacity to learn. Many roads are opened toward his future: many possibilities which will result in a comparatively limited reality.

It is natural that parents are full of expectations, hoping that their child will have a happy, healthy, and succesful

life, developing a loving and wonderful personality, but in reality they have only a little baby without detectable intelligence. During the initial weeks and months personality traits of personality will slowly appear, and genetic elements dormant in the baby will be important for the shaping of the evolving person. The task of scientific research is to evaluate the role of the many elements which play a role in the formation of personality and of values.

We can say that millions of spermatozoa are potentially human beings. It is true that a block of marble has the possibility of becoming a beautful creation, but in the absence of chisels and hammers, and specially of the skills and talents of a sculptor, the potentiality will persist while the work of art will never be created.

THE RIGHTS OF THE NEW BORN

The basic principle that inspired the French Revolution was its declaration that "all men are born free and equal in rights," specifying the rights of liberty, private property, the inviolability of the person, and resistance to oppression. In the words of the XIX Century historian Jules Michelet, this was "the credo of the new age". Later on, in 1948, the United Nations supported another collection of rights, including education and standard of living. These rights are supposed to be "unalienable" and to belong the the individual under natural law as a consequence of his being human.

As a symbolic expression of principles they are certainly commendable, but their practicality and specially the invocation of natural law are debatable. The fact of belonging to the human race does not automatically convey the possession of privileges. According to the biological law of a few centuries ago, pestilence desolated mankind, insects spread infections, more than half of the newborn died before the age of three, old age began at thirty or forty, and only a minority survived to the age of fifty. The spectacular improvements of the modern age are not due to nature but to the intelligence of man who provided better diets, hygienic practices and medical therapies. In a similar way the "rights of man" are not related to natural laws, which are

rather neutral about man's supremacy on earth, but to human agreements and moral sense. We should remember that in the time of Christopher Columbus, the indian race of Caribes stated that "only the Caribes are human beings", and therefor members of any other race were deemed suitable flesh to be devoured in their antropophagus festivities.

Considering the newborns, their "natural" rights are even more debatable. In old China it was acceptable to kill female children; in Greece the handicapped were thrown away and destroyed; and in modern times the legislation of several countries permits the abortion of embryos. The "right to life" is not so natural when we consider the several animal species that eat their progeny. The decision to bestow RIGHTS on embryos and newborns does not depend on biological considerations but reflects only CULTURAL AND LEGAL AGREEMENTS.

Freedom of the newborn, which is so cherished in democratic societies,is only wishful thinking from the biological point of view and the literal acceptance of this fallacy may cause frustrations and conflicts. Expecting freedom we may be surprised by the reality of biological dependence and early imprinting, compounded by the servitude to a mechanized society. Freedom is not a natural, inborn characterisrtic of human babies, but the result of later awareness and intelligent thinking, which must be learned by

conscious individual and collective efforts. Civilization has increased many human potentials, including the possibility for greater freedom, but its fulfillment requires purposeful efforts to escape from the countless elements of behavioral determination (Delgado, 1969).

Heredity is established by pure chance and is not chosen by parents or by their offspring, representing the potential to become a genius or an idiot. The newborn lacks the capacity to search and choose the sensory inputs which will be decisive for his neuronal structuring and mental activities. The intelligent planning by parents and by society should be (but is not always) superior to blind chance. The elements to be decided are: WHO is going to provide the necessary information and training; WHAT and HOW MUCH will be provided; the TECHNIQUES to be used; and the personal and social PURPOSE of the cerebral planning.

In any case the rights of the newborn are not intrinsic in his existence but are related to the gracious gift of moral values and environmental circumstances. This does not mean that babies should have no rights: to the contrary, there is a need for society to express clearly the rights that it is prepared to grant and protect.

BIOLOGICAL UNITY OF MAN

The attempt to estimate the percentages of genetic and environmental elements which structure the personality of each individual is an old and not very productive dilemma: Perhaps 50-50, or some other proportion ? In reality both elements are basic because without genes or without sensory inputs mental activities cannot appear.

Genes do not have dormant skills or personalities. They are partial determinants of the very complex chain of reactions leading to specific cellular architectonics and functions. In forming individual minds some elements are essential, such as the existence of consciousness and frames of reference which are somehow related to the hypothalamus, reticular formation and several other areas of the brain. Other elements are accessory, such as the ability to play the piano which requires a refined organization of the motor cortex and other brain structures.

Human neuronal activities have some properties which are shared with animals. Many functions of neural transmission have been investigated in frogs and lobsters with results directly applicable to man. The recent discoveries of neuropeptides have been based on studies of mammals. The liver of a chimpanzee has proven able to take over most metabolic activities in a human patient. The heart of a baboon has been implanted in a human baby.

In spite of certain immunological problems, individuals of different races may exchange blood, hearts, skin, kidneys, and other organs.

There is an urgent need to search for the elements which unify human beings, including many cerebral functions, and basic motivations, such as the attraction of pleasure and the rejection of pain. Surgery, medicine and pharmacology have similar scientific and technical backgrounds in capitalistic and in socialist countries. Most machines, including automobiles, tractors, and home appliances are used in a similar way around the world. Agricultural improvements are useful in many lands. All individuals would like to be healthy, comfortable and happy. Present mass communication, science and technology are unifying nations and people.

How is it then possible that , while sharing so many biological and technical elements, there are so many antagonisms between human beings? Biology seems to be a UNIFYING force, while ideologies may place people in conflict.

If we are spared widespread atomic holocaust, evolution of the human species depends on the formulation of plans which must be acceptable for all mankind, based on biological unity and respect for individual and cultural diversity. A

common destiny, without racial, economic or ideological discriminations, may be based on the functional cerebral elements and needs which are shared by all human beings. These elements should be investigated, and their development through appropriate education should be potentiated.

A relatively easy and immediate objective could be to raise the level of our understanding of personal mental functions and their biological, educational and cultural determinants. In this way individuals would be provided with a higher degree of intelligent freedom, allowing them to direct personal destiny in a realistic manner, while decreasing the manipulation of individuals by elites who monopolize knowledge and power. Democratization of science and the teaching of freedom could contribute to greater personal happiness, to a reinforcement of consciousness, responsibility and identity, and also could clarify the social interdependence of all human beings.

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