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ADAPTATION OF MAN AS A SOCIAL-NATURAL PROBLEM

The problem of man's adaptation arose and took shape within the framework of biology and for a long time was remaining a purely biological problem. The notion "adaptation" was applied in a narrow sense, namely, for describing the adaptive behavior of individuals in the animal kingdom and of the various forms of life's evolution. As regard the definition of the notion "adaptation", the one given by A.B. Gheorghievskij is the most perspective: "Adaptation is a special form of response by systems to the action of the external and internal objects; this action results in establishing a dynamic equilibrium in the systems"¹. It is reasonable to emphasize in this definition the essential moments which distinguish adaptation from the more general and philosophical standpoint, and also from the purely biological definitions.

Firstly, the phenomenon of adaptation is presented as the whole consisting of the two components—the process (the self-conservation of the system in the course of evolution) and the result (the formation of the resistance to the unfavorable conditions of environment). The distinguishing of those two components leads to a better understanding of adaptation itself and its definition. Secondly, there is a co-adaptation of the parts inside the system, that is, the adaptation is produced as a response to the action external as well as internal to the system. Thirdly, adaptation has not absolute character; it manifests itself as a tendency to establish a certain harmony with internal and external media.

Recently, we can with no doubt say that the problem of adaptation, at first, "turned to face man", that is, passed from the study of adaptive peculiarities of animals to the analysis of adaptive strategies of man in the continually changing medium. Secondly, the problem of adaptation acquired interdisciplinary status. It became a concern of scientists at the conjuncture of the various sciences and humanities: biology and medicine, psychology and sociology, the humanities investigating culture, and philosophy.

Whereas man is a biosocial entity, in the study of his adaptive peculiarities two directions—biological and social—can be determined. Within the **biological** framework (more correctly, **natural**, not restricted by the boundaries of biology) it is possible to combine evolutionary–genetic, medical- biological and ecological investigations. Here the adaptation of man as an organism, as a living entity, is the object of research. Such an adaptation may be defined as the accommodation to the environment, emerged in the course of evolution of man's organism; this accommodation is realized in the changing of inside and outside structures and functions of some organ or of the entire organism, to changing ambient conditions.

The evolutionary-genetic direction emerged as a result of synthesis of the genetics and theory of evolution. It takes into account and unites genetic and biological bases of man's adaptation to the changing environment. A central problem of this direction is the study of biological bases of man's adaptation. This direction is associated with the discussion of four features of adaptation as a form of harmonization of interaction between man and nature.

¹ A.B. Georgievskij, *Ewolucyjna adaptacyj*, Leningrad 1989, p. 27.

Secondly, the issue of the essence of the notion “evolution” is defined more precisely by referring it to man as a biological species, inasmuch as his morphological signs remain stable from the time of the Cromagnon man. The changes of the of human ecosystem structure take place on the socio-cultural level.

Thirdly, the question of the role of natural selection in human ecosystems and of the possibility of transformation of the contemporary human species into another, more enduring, more perfect and adaptive is now under discussion. According to the I.I. Schmalhauzen’s conception of stabilizing selection, the present-day man passes through evolution within the framework of inner reserves of changeability, intrinsic to the species, based on the already formed adaptive norm of reaction. V.I. Vernadsky asserted that the place of man, as a biological species, in the biosphere of the planet, is conditioned by man’s specific form of adaptation, that is, by cultural adaptation. However, the ecologic niche of a species is always restricted by selective and noospheric criteria.

According to hypothesis of renowned Russian anthropologist T.I. Alekseeva concerning adaptive types, *Homo sapiens* is characterized by a considerable mutability of his morphologic and physiologic features. This mutability is considered in two ways: on the one hand, it is the biological precondition and biological peculiarity of the species; on the other hand, it is a response to some external influences. As Alekseeva says, “human ecosystems manifest a certain reactive changeability in correspondence to the impact of environment. Evaluating by the character of multifunctional features of the ecosystems living in certain geographic conditions, this reaction bears the character of accommodation, underlying the adaptive type condition which determines the norm of biological reaction to the combination of ambient conditions, providing the equilibrium of the ecosystem with environment; this accommodation is a morpho-functional peculiarity of ecosystems”². The adaptive type does not depend on the race or ethnic status. Under the same geographic and climatic conditions, the groups of different origins have one and the same tendency of adaptive reactions, as well as under various ambient conditions the groups of close genetic characters show morpho-functional differences in correspondence with the action of their environment.

The adaptive types do not present ecologically specialized forms; they are expressed in the form of tendency to change physiological and morphological features towards more favorable for existence in a certain environment and not impeding the possibility of existence in other ecological niches. There are two forms of the adaptive reactions: general and specific. The general form of the adaptive type is considered to be the increasing of the resistance of the organism to unfavorable ambient conditions. The specific reactions are of very great range. Just these specific reactions allow for calling certain morpho-functional complexes “Arctic”, “Alpine”, “continental”, “tropical”.

Thus, the adaptive type is only one form of man’s accommodation, that is, biological. “The adaptive type is a norm of reaction emerging under the equal conditions among the ecosystems which cannot be connected genetically one with another, while the race is supposed to have a common origin of all groups living on a certain territory, which are parts of this race”³.

² T.I. Aleksejeva, *Adaptacja człowieka w różnych ekologicznych niszach Ziemi*, Moskwa 1998, p. 200.

³ *Ibid.*, p. 201.

The history of the evolution of the adaptability of human species shows that tropical zone can be considered as a cradle of the adaptive possibilities of the mankind. The tropical type is thought to be the most ancient one with respect to that the rest types (Alpine, moderate, continental, arid, Arctic) which may be considered as filial.

The extension of the mankind all over the globe brought about the developing of new territories and forming of new adaptive types in which the changeability, intrinsic to the initial adaptive type, was realized. The increasing of the bodily mass and density, the intensification of metabolism and the resulting changes of physiologic features usual for the population of out-tropical latitudes, took place in the later periods of human history.

If we are to understand the initial steps of the man ecosystems adaptation in time and space, the information on the acclimatization is capital. As T.I. Alekseeva says, "from the contemporary conceptions about the proportions between phenotype and genotype in evolution it results that the acclimatization is to be conceived as individual reactions of the same type which are the first and immediate accommodative reactions to the changing conditions of the environment, while the adaptation is a new hereditarily fixed form arising as a result of the elimination of phenotypes unstable under given conditions"⁴.

The hypothesis of adaptive types is an attempt to show the evolutionary changeability in the present-day mankind. It serves as the proof of presence of adaptive changes which contemporary man (as a species) has.

The ecological direction of the investigation of man's adaptation took form at the thirties and forties of the twentieth century as a synthesis of theory of evolution, human genetics and ecology.

In man's ecology we can emphasize the three tendencies: factor ecology, ecology of the ecosystems, and global ecology. The difference in understanding of the ontogenic and phylogenic adaptation underlies this classification. The ontogenic adaptation is connected with the individual changes of organisms under the impacts of the environment, while phylogenic one is a result of the transformation of organisms in the course of historic process.

The representatives of the factor ecology research the influence of various conditions of the environment (biotic and abiotic) on the man's organism. This research was held in ecological biochemistry, morphology, physiology and ethology.

The research of the adaptive abilities of man with regard to the extreme factors of environment is very important in the set of the works on the factor man's ecology. In researching in the factor ecology a few important things were discovered: a) main peculiarities of adaptation mechanisms of residents of the extreme zones issue from accommodation to a certain ecologic niche (for example, the short stature of northern people is caused by peculiarities of food, processes of metabolism and ultraviolet irradiation); b) the velocity and stability of adaptation of people arriving at first time to the extreme zones depend on pre-adaptation to a new ecologic niche; c) returning to their own country, people revealed sometimes a number of unfavorable biochemical, physiologic and other shifts, which can be treated as difficulties of re-adaptation.

From the above mentioned facts it is possible to conclude that the factor ecology sets and tries to resolve the problem of the manifestation of adaptive abilities of man in concrete ambient conditions.

⁴ Ibid., p. 208.

Representatives of the ecology of ecosystems research the laws of formation, self-regulation and dynamics of the human ecosystems.

Many researchers held the opinion that the evolution of present-day man goes without any considerable changes in him as a biological species. According to V.Yu.Vereshchaghin, "the control of hereditary diseases and moderating of effects of the aging gave rise to inconsiderable changes in the genetic composition of human ecosystems (the normalization of the genotypes that were harmful in the past). The increasing of frequency of these genotypes will not considerably affect the future of the man while there are medicaments"⁵.

The question also arises whether man's organism is getting less adapted to environment. Some researchers believe that till now no one has revealed a noticeable difference in the adaptive ability as a result of the mixture of human ecosystems. Man seems to lose his ecological adaptations which allowed him to thrive in specific conditions of environment. Nevertheless, the gradual loss of them will not make him less adapted to the environment. Yu.A. Filipchenko opposes this opinion when he describes the concrete signs of the deterioration of the people health: "recently, owing to the change of the normal selection, on account of culture, an undoubted deterioration of many properties of contemporary man is noticed. One of these symptoms is the decreasing ability to resist to various unfavorable conditions such as cold, starvation and many diseases. The people living in cultural conditions bear more heavily various hardships, laboriously react to cold and some others diseases, which were previously unknown. Meanwhile, in the recent times, the mankind suffers from an increasing number of diseases. No doubts, all this is the outcome of the known hereditary weakening of the constitution which takes place since not all weak elements are taken away by selection and they pass this weakness to posterity"⁶. It is reasonable to agree with Filipchenko that the present-day "languorous" man is surely worse adapted to the "savage" natural world, but this challenge is not set before him absolutely. As regard the decreasing of the general level of adaptive possibilities, it does not seem to be so. In fact, new conditions of existence require to set into action reserved adaptive mechanisms, and maybe to elaborate radically new ones.

Recently, the problem of man's adaptation to profound changes taking place in environment, under the impact of man's activity, becomes more and more important. As Vereshchaghin says: "the anthropogenic impact on the biosphere evokes mutations and even the disappearing of biocenosis that alters the conditions of functioning of vegetable and animal kingdoms that, in turn, determines vital man's activity"⁷.

The specialists have stated two periods in the process of mutual relations of man and nature: a) economic impact on environment which does not set man with his adaptive mechanisms out of the pattern of the reaction norm formed in the course of evolution; b) the creation by man a new environment (physical-chemical, informational, ecological-geographic, on the local and global scales). Man's organism has not a norm of reaction (prepared by evolution), and reacts on these changes by the arising of new professional diseases, by the chronic tension of adaptive systems, by the mass allergisation of the people. The range of adaptive abilities of man, as well as of any living being, is confined.

⁵ V.Ju., Vereshchaghin, *Filozofskie problemy teorii adaptacji człowieka*, Vladivostok 1988, p. 33.

⁶ Ju.A. Filipchenko, *Puti utuczshenija czelowieczeskogo roda. Ewgenika*, Leningrad 1924, p. 145.

⁷ V.Yu. Vereshchaghin, op. cit., p. 34.

Thus, in the ecological direction of research of the adaptation problems the main target is the analysis of the ecological and genetic determination of vital man's activity.

The formation of the thinking mode centered on ecosystems in the medicine and the problem of man's adaptation to new extreme zones of the environment underlie the *medical-biological* kind of research of man's adaptation. The following conceptions are the most valuable.

The first of them is the conception "disease-adaptation". It was put forward by I.V. Davidovskij: "in its biologic essence any disease is a phenomenon of adaptation"⁸. This conception remains an object for discussion in present-day medicine. Disease in the phylogenetic aspect is adaptation, because it arose in the process of evolution as the form of-its-own-kind of survival of not only organism but of the whole species. Most frequently, the disease as an ontogenetic phenomenon is associated with the breaking or decreasing of individual adaptive abilities. Therefore, the general biologic essence of disease can be discovered not only by exploring genotypic changes taking place in the historically formed norm of reaction, but by taking into account the processes touching the phenotypic level which is under influence of social factors. The research of dialectics of adaptive norms changes in the evolution of the living is of great importance. The notion "adaptive norm" was introduced by I.I. Schmalhauzen; it means a combination of adaptive modifications. This notion allows to describe the process of development of man's adaptive mechanisms and to resolve the question of the adaptive abilities increase in various periods of man's ontogenesis.

The proportion of health and disease as a specific state of man is presented by the notion "adaptation": the better a man is adapted to natural and social factors the higher is the index of his social health.

The second conception is the theory of adaptive syndrome. Its main principles were formulated by G. Sellier in 1936. It focuses researchers' attention on the problem of the proportion between the specific and the nonspecific in the adaptation of man. Sellier discovered the presence of the common nonspecific reactions of organism under the action of any irritator which surpasses a physiological norm of adaptation. A special group of diseases was singled out on the base of the nonspecific, common, intrinsic to the majority of diseases. This group was named "diseases of adaptation". Recently this aspect is explored in connection with the problem of re-adaptation of man (re-adaptation of sportsmen, divers, astronauts after functional disturbances).

The third conception is V.P. Kasnacheev's "syndrome of polar tension". It characterizes the specific tension of organism of man who arrived at the North. This syndrome is connected with certain pathogenetic peculiarities which reflect specific and nonspecific mechanisms of adaptation. Firstly, the author distinguishes adequate and inadequate conditions of the environment. The adequate conditions are those which correspond to the genophenotypical constitutional properties of organism in some period of its existence. Mechanisms of biological adaptation to these conditions issue from long evolution and ontogenesis. Inadequate conditions are those which do not correspond in a given moment to the main properties of the organism and, in consequence, the vital man's activity is possible only by putting into action of the reserved mechanisms of adaptation. The inadequate action

⁸ I.V. Davidovskij, *Otwiet moim kritikam*, "Klinicheskaya medicina" 1957, v. 35, no. 1, p. 136.

during long time can cause adaptive reconstructions in man's organism. These reconstructions are the universal mechanism of adaptation to durable tensions.

Natural interaction intends an open contact of man with the factors of the outward environment (rigorous conditions of existence). But there is also the artificial adaptation of man to nature, for example, by the use of biomedical technology. By use of intensive therapy medicine can artificially prolong human life. In-vitro fertilization enables the sterile couples to leave posterity after themselves. Artificial adaptation satisfies the right of man to go on to live even when the nature takes him; to give birth to children in spite of natural impossibility; to alter the sex despite the natural arrangement; to exterminate the life in course of formation (abortion).

Various environmental factors affect the man's organism evoking adaptive changes. Together with the factors influencing on organism it is possible to mark respectively neutral in this regard. These factors can be, as N.P. Naumov said, "all that render influence on organism, independently of the character of influence. It is necessary to distinguishing in them those determining the possibility and successfulness of development, of growing, of survival and of regenerating; they are called usually conditions of existence (conditions of life)"⁹. Just to these "factors of environment (to conditions of life)" the adaptations are created. It is worth to mention that the elements of environment which are neutral for one species can play a role in the life of others species, hereby influencing indirectly on the given species.

According to their nature, the factors of environment are divided in inorganic (abiotic), organic (biotic) and anthropogenic; according to their extent of impact on organism—in leading factors and secondary ones. The division of the factors in leading and secondary is conditional, inasmuch as one and the same factor can have different significance depending on the concrete situation. All this requires a particular approach to resolve a problem "organism-environment" and, as a consequence, a problem of adaptation as a form of connection between organisms and environment. A classification of-its-own-kind was proposed by biologist A.S. Monchadskij in his work "On Classification of Environment Factors" published in 1958. According to character of the factors, he proposed to emphasize the followings:

1. Stable factors, unchanging during a long periods of time and, by this reason, not evoking changes of the size of population and of the geographic expansion of animals. These factors are: gravitation, composition and properties of atmosphere, hydrosphere and lithosphere. The adaptation to these factors was produced and fixed hereditarily inside of the structure of DNA in the course of evolution of life on Earth.

2. Changing factors: a) regularly periodic factors (daily, seasonal and others depending of movements of planets), which determines daily, seasonal and other biological cycles, seasonal dynamics of the size of population, and boundaries of natural habitat. Adaptations to this kind of factors are produced and fixed hereditarily inside of structure of DNA in evolution course; b) factors not having regular periodicity (wind, precipitations, humidity, food, diseases, parasites, predators), considerably influencing on peculiarities of seasonal biologic cycles and partially on the changes of the size of population in various years and distribution of animals inside of natural habitat.

⁹ N.P. Naumov, *Ekologija żywotnych*, Moskwa 1963, p. 32.

3. A third group of factors presents interest for resolving the problem of adaptation, inasmuch as here various situations can be created: a) organism does not produce adaptation while interacting with various factors, and dies; b) organism produces adaptations and hereby keeps proper existence; c) it may happen that organism does not come across a number of factors during all its life, so these factors are important for the species but not for individual. Here the problem arises how to distinguish between adaptations of individuals and of species.

Impossibility to provide the formation of adequate adaptive reactions gives rise to a partial adaptation or to breakage of adaptive abilities—to disadaptation. Disadaptation can also arise as a result of initial malfunction of some system.

The research of man's adaptation is closely associated with characteristic of his environment. Mechanisms of adaptation become conceivable not before the conditions to which man is to adapt himself are investigated in details. The more extraordinary and complicated for man are new ecologic conditions the heavier and more laboriously his adaptation goes. The aged and ill men have adaptive abilities considerably lower than the young and healthy ones. But in some regions even they cannot adapt. A.P. Avzyn underlines that sometimes by force of some reasons the reserves of organism get exhausted before the adaptation is obtained. Sometimes adaptive reserves get exhausted after some period when organism was in the state of adaptivity.

As a whole, the main questions arising at research of biologic base of man adaptation, are as follows: whether biological evolution of man is completed or it is possible that the adaptive morphobiological changes would take place as a reaction to the impact of environment (hypothesis of adaptive types of T.I. Alekseeva)? What are the limits of adaptive abilities of man and how the organism reacts if these limits are surpassed (the theory of total adaptive syndrome of G. Sellier; the adequate and inadequate conditions of environment according to V.P. Kasnacheev; the problem of informational stress).

The evolutionary aspect is one of the most important aspects of the problem of adaptation of the living organisms in environment. Adaptaciogenesis or evolution of adaptations has a number of objective restrictions, conditioned by nature itself and by the situation in which the evolution of adaptive signs is held. As was justly remarked by Vereshchagin, "the part of the man's biological adaptation has already arrived to a possible limit of improvement. It testifies to the completeness of the process of man's evolution, defined by this indication. Another part of adaptations is coming to that limit, the third part is able to be improved farther with relatively greater possibilities"¹⁰.

The improvement of already acquired adaptations distinguishes man as a biologic species. Just this is the peculiarity of adaptaciogenesis.

Men and animals have a common biologic structure. Man, as well as members of other biological species, consists of tissues, organs and systems which are subjected to common laws of biological organization. Nevertheless, in spite of man's being an object of biologic laws, the problem of adaptation seems to touch his social essence in a greater extent than the biological one.

The second direction of research of man's adaptation may be called **social or socio-cultural**. Besides the proper biological adaptation, another adaptation type is created by

¹⁰ V.Yu. Vereshchagin, op. cit., p. 99.

human community. This adaptation is based not on the changes of man's physiological system. The reconstruction of all system of social, political, moral, psychological, economic, demographic relations between people underlies a new building of adaptation, the so called social adaptation. This adaptation takes place in the course of formation of personality, of education, of digestion by person of values, norms, arrangement and examples of behavior intrinsic to the society, to the social community or social groups. Social adaptation is realized in the course of purposeful influence on man by means of education and by various other actions such as family and out-family association, art, mass media. As A.A. Rhean, A.R. Kudashev and A.A. Baranov underline in their work "Psychology of adaptation of individual": "adaptation processes at a various kinds of professional activity play very important role. We can emphasize two aspects: firstly, adaptation to changed conditions of realization of activity (changes at a structure of social values, organizational transformations, technologic improvements and innovations); secondly—adaptation to the beginning of a new professional activity"¹¹.

The term "social adaptation" is usually conceived as a process of active accommodation of individual to the conditions of social environment and as a result of this process.

The following types of adaptation process can be distinguished: (1) a type characterized by active influence of individual on environment and on pioneering and accommodating of this environment to proper needs; (2) a type connected with active correction of the proper personality by proper will, with correction of proper social sets and of habitual instrumental behavioral stereotypes; it is type of self-changing, of self-adaptation to environment; (3) a type of active search at a social space of new medium with high adaptive potential for the given individual; (4) a probability-combinational type based on usage of all versions of above mentioned "pure" types; the selection of the version is effected as a result of assessment by individual of the probability of successfulness of adaptation with different types of adaptational strategy.

In the historic-psychological plan in the investigation of the problem of social adaptation three directions could be conditionally separated:

1. A first direction mainly is connected with the *psychoanalytic conception* of interaction between individual and environment. As a whole, following this direction, a social adaptation is considered as a result, manifesting in the homeostatic balance of individual with challenges of outward surroundings (medium). The process of adaptation is described by the general formula: conflict—anxiety—protective reactions. Except of works of authors of psychoanalytic orientation (L. Berkowitz, E. Erikson, Z. Freud, A. Adler, E. Fromm), the approach close to it is realized in the G. Sellier's conception of general adaptive syndrome. In this direction conflict is considered to be an outcome of discrepancy between wants of individual and restricting regulations of social environment. A result of this conflict is an actualization of a state of individual's anxiety. The grade of adjustment of the individual is determined, within this approach, by a character of its emotional general state. As a result, two levels of adaptation are put into light: state of adaptation and state of unadaptation. The state of adaptation is a state when an individual has not sensation of anxiety. The state of unadaptation is determined by the manifestation of the signs of anxiety.

2. A second direction is associated with the so called *humanistic psychology*. It present the investigations in which the achievement of positive spiritual health and correspondence

¹¹ A.A. Rean, A.R. Kudashev, A.A. Baranov, *Psychologija adaptacji licznosci*, Petersburg 2002, p. 4.

of individual's values to values accepted by society are considered as a target of adaptation. So, an individual in the process of adaptation is supposed to develop certain properties of personality. In this approach (G. Allport, C. Rogers, A. Maslow, V. Francel), the conceiving of adaptation is criticized within the framework of homeostatic model. In humanistic psychology the process of adaptation is a process of optimal interaction between individual and environment, the state of optimality being considered as dynamic. The process of adaptation is described by the relation: conflict—frustration—acts of adjustment. What is more, conflict emerges in the case of discrepancy of reality not with any need of individual, in general, but only when the fundamental individual's needs are frustrated. According A. Maslow, among them there are needs to belong to a group, need of association, need to be respected and need of acknowledgment, of love, of self-actualization. The main touchstone of the state of adaptation is a grade of interaction of individual and environment.

3. A third approach (L. Festinger, R. Lazarus) in the research of social adaptation is connected with the *conceptions of cognitive psychology of an individual*. The relation is the same: conflict—menace—reaction of adaptation. But its content is different. It is supposed that, if in the process of informational interaction with environment an individual runs into information opposed to the arrangements which the individual earlier accepted, the discrepancy arises between the substantial component of arrangement and the image of the real situation. This discrepancy (cognitive dissonance) is experienced as a state of discomfort (menace). The menace, in turn, inspires an individual to search the possibilities for eliminating or decreasing cognitive dissonance. The manifestation of cognitive dissonance is seen rather frequently in the field of social perception, that is, in the field of perception of man by man. The active search of eliminating or decreasing of cognitive dissonance can be crowned with finding the following possibilities to overcome the disadaptation: (a) individual can find rational (in fact, justifiable) explanations for presenting contradiction; (b) individual can “filter” outward information, and realize its unconscious selection with the goal to eliminate discomfort, disadaptation; (c) an individual can achieve a rather satisfying level of adaptation on account of an active self-correction and a self-change of the proper arrangements.

In the course of social adaptation man acts as adaptively-adapting entity, inasmuch as, unlike animals, he does not only adapt himself to environment, but transforms it in the course of his activity, sometimes creating a new environment. A great importance in the analyzing of social adaptation is attached to the culture accent, inasmuch as culture is a universal system of investigation of adaptively-adapting regulations.

The complex study of human being makes necessary a synthesis of natural-scientific and social-humanistic sides of the problem of man's adaptation. The analysis of above mentioned directions of research of social and biological man's adaptations enables us to come to the conclusion that no one direction, taking separately, can resolve the problem of man's adaptation, which has a complicated pattern with many aspects. The problem of man's adaptation emerged within the framework of biology, and during a long time bearing evolution-biologic character, in the course of the evolution of science has acquired interdisciplinary features. It may be conceived profoundly and in all its aspects only by means of an interdisciplinary analysis.