Alterations of Human Adaptation to Environment

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The problem of human adaptation is so fundamental that many textbooks appeared so far. The author briefly took up this subject previously (Ueda, 1984), so the topics will be reiterated not from the same point of view, but from the other angles. Most physiologists tend to investigate only a short period of phenomena, though anthropologists seem to take a long period of changes into consideration. Thus by means of physiological anthropology, the study of human will be better developed.

ENVIRONMENT AND TIME

Environment is in usual sense a spatial extension. It is thought to surround the human, but sometimes the human is a component of the environment. The relation between humans and environment is changeable. As the surface of Moebius strip can be simultaneously the reverse side, the human can be interchangeable with the environment. Here the environmental size which affects human can be changed by the quality of receptors. The teleceptors widen the space recognizable, though tangible receptors let it feel narrower. Inside the muscles also there are proprioceptors. When the impulses arise from there, the area is regarded as the environment by the central nervous system. No absolute environment exists. The relativity of environmental characters must thus be assumed.

Talking of the time next, it flows from the past to the present and then towards the future. It does not flow inversely. However, in Buddhism a series is arranged in the order of the past, future and present, because both the past and the future are affecting the present (Saigusa, 1977). The time effect of biology is stressed particularly in chronobiology. Physiology itself observes phenomena in the time change, though morphology concentrates on the space changes, fixing the time. The time scale is not always the same from individual to individual, and from cell to cell. For example, cancer cells grow very rapidly, so that one meaning of "growth" is "tumor".

TIME-ORIENTED REACTION PATTERNS

In long-term changes of organisms to the environment, the word evolutionary adaption is used for the past phenomena. For the present, the words, acclimatization and adaptation, are used. When the external parameter is single, the change is acclimatization. For the future, the changes may be exploitative adaptation and in the worst cases the extinction will follow. Further, for the recovery period, the word readaptation is known. As one individual grows, matures, becomes senile and then dies, the maintenance of the species becomes essential. In short term responses, the past effect appears as hysteresis. The present one is an immediate reflex or response, though there is some delay or latency. Meanwhile, the future effect acts as a target or purpose. Thus, anticipation or desire deals with the target, which is instinctively or voluntarily processed. The physiological study is mostly focused on these problems.

When a localized area is stimulated, some sort of reflex takes place if the stimulus intensity exceeds a level of so called threshold. Physiologists believe the existence of an exact value of the threshold, but if it is measured precisely there is no such definite value. Rather the value should be expressed as a range (Ueda, 1963). Also, the existence of simple reflex seems to be dubious. When such reflex arises, there
occurs some subthreshold fringe around the direct pathway. In the central nervous system, the direct response causes inhibition or induction around the stimulated cells. Further, it sometimes happens that even hallucinatory responses can be evoked without any real stimuli.

To maintain the homeostasis of the body in response to changing environments, there exists various feedback or feedforward reflex mechanisms. Feedback reacts after a phenomenon happened, so it is likened as Doronawa-mode, whereas feedforward one is likened as Atsumono-mode. It is due to a saying, which goes that after experiencing hot pieces (Atsumono) one tends to cool even cold pieces. The programs obtained by experiences are stored in the memory, from which useful measures in response to new environment can be retrieved.

LEARNING

Human being is a multiple response system. In man, the development of the central nervous system is particularly unique. The significance of language in animals is less, but in man, languages form a very important stimulus. Fundamental reactions are in general instinctive, but after the repeated stimuli of some combined parameters a new reflex can be formed. This is called a conditioned reflex and it is the basis of learning. By the progress of learning stages, human can adapt better in natural and social environments. The autonomic system can also form conditioned autonomic reflexes.

EPILOGUE

To solve space-oriented problems, environmental biology or physiology plays an important role, though physiology involves many short-term time-related phenomena. To solve time-oriented problems, mainly chronobiology and evolution study are relevant. These fields are concerned with the real world. In addition to these, imaginary or purely philosophical aspects must be explored. Along these lines, human should be studied. Here the object ranges from the individual to the species. In the latter respect, physiological anthropology must play a main role. The transfer of characters from one individual to the next generation is a problem of genetics. For the future, not only the medical care and preventive medicine, but problems of the population control must be solved. If they are not controlled well, a stable world will not be attained even if technological success is to be developed in the future.

REFERENCES


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