

Acclimatization as a Problem of Geography

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1. *Geography and acclimatization.*

Present distribution of human groups over the earth's surface is the result of their long-continued migrations and their adaptation to environment. There will be little dissent from the view-point to emphasize climate as the most important of environmental factors that influence the process of human adaptation. The close correlation between the geographical patterns of climatic regions and cultural ones is the best proof of the predominance of climatic influence. Through the strong influence of climate to the distribution of various geographic elements both physical and cultural, acclimatization makes one of the most important problems of geography. It also has, however, fundamental relations with aspects of human activities whose studies basically belong to the areas of other fields of science, and there are many difficulties to deal with it as a problem of geography. So far, no conclusions are attained in geography in the method of studying this problem.

From etymological reasons, the present writer is tempted to interpret the word acclimatization to mean the processes in which men change themselves in adaptation to climatic environment. In this case, besides biological adaptation, men are able to widen their adaptability using their cultural attainments. Thus cultural elements as well as biological ones are involved in the problem of acclimatization. On the other hand, the time factor comes to play an important role in the process of the changes. The time thus involved, covers not only historical period, but also further ancient prehistorical time beyond the reach of modern sciences. Needless to say, many changes and migrations in historical period too, are valuable materials for the study of acclimatization.

At the same time, this problem is closely connected to the administration of colonies, policies towards other racial groups, and many other aspects of practical interest. By this reason, many of the discussions on acclimatization consisted of the arguments of colonial policies, environmental hygienics, and other practical problems. Even in the geographical articles on this problem, those have often made the major part of discussions, which induced not a little confusion in the concept of the word. One should not forget, however, the fact that many geographers have shown deep interest in the problem of acclimatization, and great was their contribution to the study. Perhaps it is because geography is by its nature in the position to deal with this problem on a world-wide standard. Many

of the geographic studies by western scholars, however, have been too much concentrated to the analysis of the problems of white-men's acclimatization to humid tropics. Among them, for instance, that of so-called Poor Whites in Bahama Islands, and that of white workmen in cane plantation of Queensland, have attracted world-wide interest. Concerning tropical hygienics, there are particularly many researches in former British India, and on the American troops in the Canal Zone of Panama. Through numerous studies, there have been hot arguments between optimistic and pessimistic opinions on the ability of white-men's acclimatization in humid tropics.

From the nature of this problem itself, geographical studies are made difficult also by the confusion of not purely scientific elements ; such as practical interest, administrative policies, racial prejudices and so on.

2. *Acclimatization and biogeography.*

As a member of natural life, a man has the ability of adaptation in its biological sense, to change himself in response to climate and its changes. There are seasonal changes such as darkened skin colors in summer, and thickened adipose tissue in winter. More durable changes are caused by migrations into regions of different climate. For instance, it is reported that the second generation born of Japanese immigrants in the torpics have more sweat glands than their parents.

Adaptation itself is a purely biological concept, but when natural life as a group or as an association, shows distribution in harmony with climatic environment, it becomes an important theme of biogeography as a branch of geography. The stable condition of an association at the final stage of long-continued adaptation to climate is defined by Em. de Martonne as *association climatique finale*. It is a stage in which number of species or individuals settling in a definite region, shows little change through very many generations. It is also called a harmonic condition. One may say that the acclimatization is completed when an association has attained to this condition. It will be logical to start from this idea in the consideration of human acclimatization. Of course it is difficult to presume such a final stage in the case of human society, but this may be interpreted as an ideal stage, and we may adopt biogeographical ways of thinking as an approach. As a stage close to it one must consider a state at least before the great migrations in historical period. It may be reasonable to assume that the geographical distribution of peoples in regions where migrations were not so frequent will approximately show a condition not too far from it.

The peoples who lost their harmony with their environment by their migrations are considered to be in the process of renewed acclimatization to the new

environment to which they came to belong. It is easily supposed that the greater the difference of the nature of the environments before and after the migration, the more difficult is their acclimatization, and the longer it takes to accomplish it. If there is any method to evaluate the degree of the peoples' harmony with their environments, a map of the distribution of peoples in the world would show a complicated mozaic of different degrees of acclimatization.

When one considers on the groups of peoples showing harmonic distribution in the sense above mentioned, he should be strongly impressed by the close correlation between racial characteristics and the nature of environments surrounding them. No one can deny the importance of the role played by natural environment in making up racial characteristics of men, when he compares e.g. the skin colors of peoples living in regions of different latitudes, physical characteristics of mountain dwellers and residents of plains, and so on. Notwithstanding the fact that it is hard to doubt the validity of Weissmannism that denies the heredity of acquired characteristics, the great role played by the environment in the determination of racial characteristics is, in a metaphorical sense, so decisive that one is tempted to believe in the validity of Lamarckian theory. The processes are understandable only through the introduction of time factor, and it is not a subject of geography but of genetics how to explain the time moment involved in this problem.

Among the factors changing the peoples' harmony with their environment, we can point out two as the most important ; namely climatic changes and migrations. There are many examples in which climatic changes are considered to have been the impetus that caused migrations. Especially in arid regions, many migrations are explained to have been caused by climatic changes. Some scholars even go further asserting that climatic changes are not only responsible to migrations, but they were also the main factors for the evolution of mankind. In many cases, however, human migrations have not been caused directly by the changes of environment, but have taken place as autonomous movements, of which main motives have been economic, political, and in some cases religious ones. In any case, once the harmony existing between men and environment is broken, there come out many observable results, and the problem of acclimatization comes to attract attention. In the culture of Maya, for example, highland dwellers migrated to the lowland of Yucatan Peninsula, causing the death of majority, while the small number of survivors left healthy descendants.

Thus, the problem of acclimatization particularly attracts attention at an early stage of readjustment after the harmony has been broken, and when the process of acclimatization starts to work. To this process of adjustment, time factor plays a decisively important part. However we do not have sufficient materials to

estimate the importance of the part, our knowledge covering too small a portion of the history of mankind. Many premature conclusions have been given based on insufficient examples, and on the studies of the results of too short readjustments. Thus, in the studies of acclimatization, there are particularly many contradictory arguments concerning environmental influences. It would rather be more fruitful to analyse the relations now existing between men and their environment, taking examples of groups considered to show harmonic distribution at a stage close to the final equilibrium, in order to study the problem of adaptation itself. In this case, it is the matter of the greatest concern to estimate to which extent can men adapt to various climatic conditions, and how different the ability is by different groups of men. For instance, O. Maull pointed out that there were *stenotherme* and *eurytherme* races. Based on the study of monthly mean air temperatures, he compared eurythermal peoples of Eastern Asia and stenothermal Europeans. Many scholars conclude that in so far as our present knowledge is concerned, there is little hope for the peoples of Northwestern Europe to adapt to the climate of inner tropics without losing their racial purity.

While many scholars put importance to the annual distribution of monthly mean temperatures, G. Taylor, in his early work, pointed out the importance of humidity besides air temperature. His devices to use hythergraphs and climographs for the understanding and comparison of climate made a great contribution to the study of acclimatization. Before these, E. Huntington in his effort for the numerical expression of factors influencing colonization, evaluated the relative importance of air temperature including the influence of altitude as 15%, and precipitation including humidity as 15% respectively, of the total environmental factors. A series of endeavour to deal with such abstract matters quantitatively is of importance in the history of geographical thoughts on acclimatization.

3. *Adaptation and acclimatization.*

Besides adaptation in biological sense, men can adjust themselves to diverse climatic conditions using various methods invented by their cultural ability. Here is the fundamental difference between biological adaptation and acclimatization, and here also lies the reason of the complexity of human acclimatization, uncomparable to adaptations of other animals. Men are able to acclimatize by the help of diverse means such as different modes of life, and tools and utensils for daily use which are the products of human culture. Through the enlargement of adaptability using such means, it is no more an exaggeration to say that there is no place on the earth's surface where human existence is impossible. Meteorological stations on high mountains or on floating ice, the winter camps of Antarctic

expeditions etc. are a few examples showing the extent of human ability. Improved equipments allow the seamen to stay longer on the ocean, and nowadays oceans themselves are a part of human oecumene; the reason of distinction between the life on the sea and that on land is getting weaker. Although it is necessary to make distinction between mere existence and real living, it is not easy to find a solid basis to do this.

In these days of world economy, there are few regions self-sufficient of all the goods necessary for daily life. Even for food, the degree of dependence on other regions is getting higher and higher. When self-sufficiency cannot be the indicator of acclimatization any more, perhaps the final criterion will be that of time, implying the length of time for which men are settled in a region. Here again, however, the distinction between permanent and temporary settlements is not so clear as is ordinarily considered. Concerning the development of settlements, the distinction can be made in double ways; namely by the length of time, and by the stages of peoples' psychological development. Both of these elements can be used as indicators of the progress of acclimatization.

Acclimatization being a human reaction to the influence of environment in its broader sense, there are no bases other than the element of the relative length of time to estimate its progress. In his very pertinent article on this problem, G. T. Trewartha made a remark that "to live on a plane of civilization similar to that at home, retain their original physical health and vitality, mental and moral vigor, and perpetuate their kind." I would prefer the biogeographical interpretation, and will rewrite it as follows; acclimatization is attained when a human group is considered to have reached to its climatically final association, taking all the cultural elements into consideration.

When acclimatization is considered to include the changes by means of human devices for life, it is related to all the aspects of human culture. Diversified devices for clothing and housing have radically reduced the control of climate over men, meaning consequently an artificially changed climate. Here are many problems of geographical interest such as the types and materials of clothing and housing different by region. Beyond that, such are closely related to the study of environmental hygienics.

Some combinations of climatic elements are very difficult to adapt for the peoples of middle latitudes, of which that of inner tropics to the peoples of Northwestern Europe is a typical example. As this is one of the most densely populated areas of the world, it is very natural that much attention is paid to this problem. To solve this difficulty, it is believed that temporary stays in mountain resorts help the attainment of permanent acclimatization. Thus the problems of

mountain resorts and leave system may be considered, to enable the dwellers in the tropics to rest once in a while in cooler climate. Here geography has its own area of study along with medicine. Great achievement has been done in recent years in the control of tropical diseases, lowering the death rate of white-men in the tropical lowlands of Asia and Africa, once called white-men's graveyard.

Through their regional manifestation, all these problems of human life are at the same time those of geography, but before that they are the technical problems of the improvement of life, and consequently that of civilization itself. In accordance with the improvement and rationalization of life, the ways of life in different parts of the world are becoming more and more standardized and homogenized. This is the tendency of modern civilization itself, and it is not fair to call it the Europeanization of the world as some scholars like to do. To make an extreme argument, climatic control on human residence will be dissolved when artificial regulation of temperature will be a little more advanced, and in the days of well developed transportation, the distance will lose its control over regional differentiation of supply and consumption of goods. What remains then will be a mere technical problem how to use the resources rationally, and how to distribute them to different parts of the world.

Thus, in accordance with the development of civilization, improved ways of life are becoming more and more effective to reduce the control of climatic conditions. Men are able, at least technically, to live under any climatic conditions conceivable. This, however, only means that they can live in the physical sense. One can not say that acclimatization is accomplished unless the existence in a region is backed by economic life with production within the bounes of modern society.

4. *Acclimatization through production.*

All the aspects of economy are also strongly influenced by climatic conditions. Primitive economy like fishing and hunting is almost entirely dependent on nature. Among branches of production supporting large population, agriculture is most driectly and strongly influenced by them. Accordingly, there are the most abundant materials for the study of acclimatization in this field.

The history of domestication of wild life and their dispersals is the record of magnificent achievement. Indeed, one may say that the history of human culture is that of endeavours along this line. Men were introduced into agricultural life through the domestication of wild life, and enlarged their oecumene by dispersals of crops and domestic animals into regions of different climate. Thus, men were able to settle in the regions of diversified climates. This was done

through the improvements of crops and domestic animals, and also by making different combinations of them.

According to C. O. Sauer, the cradles of agriculture were rather few in number. Tropical regions played an important role with their abundance of variety of natural life. To make the basic combination of crops and domestic animals was the first and fundamental step towards acclimatization by the aid of agriculture. Further expansion of agricultural regions necessitated debouchment into regions of different climate, for which the improvement of crops and domestic animals was indispensable. In this process, not a small part of them was removed from the list of useful plants and animals, others that fitted the climate remained, and several new ones were added. Thus considered, agricultural landscape of the world is in itself the final result of acclimatization. The process is still going on, and will be promoted by the introduction of new technics.

The development of engineering technics also makes a powerful measure for the acclimatization. For instance, irrigation alone has done much in arid regions for the enlargement of oecumene. Modern transportation is playing a leading part in the control of regional differences including climatic influences. Agriculture being the branch of production most directly and strongly influenced by the nature, acclimatization through it has done the largest success, but it is more or less the same in other fields of economic activities. In accordance with the development of such economic activities, the regional differences of the stages of economic development have gradually been dissolved, and geographic division of work is going on taking advantage of such differences replacing the control of distances. These are main problems of economic geography, but from a different view-point it is also a part of acclimatization by means of economic activities.

5. *Some suggestions for the method of study.*

On such a broad and manifold problem as this, the present writer dares not to pretend to have any definite idea for its method of study. He proposes a biogeographic approach, hoping to systematize it to some extent.

Acclimatization is a human response to the changes of climatic environment. Therefore it must be interpreted on the side of men. Biogeographically, it is a process towards a final stage. The judgement whether the process was completed or not, can only be made through the quantitative comparison of the changes. For instance, the degree of acclimatization by different racial groups will be interpreted not by comparison of some elements themselves, but by the comparison of the changes of the elements by the groups. The elements such as birth-rates and death-rates by different groups do not show their grade of accomplishment of

acclimatization, but the effects of their social, economic and other activities, in short, those of their culture as a whole.

Thus every aspect of life will make a problem of the study of acclimatization in the sense that its change may be used as an indicator of the degree of the process. The conception like "to live on a plane of civilization similar to that at home" contradicts to the basic understanding of the word acclimatization. Not only because it introduces a concept such as the plane of civilization which is very difficult to estimate scientifically, but also because men attain to acclimatization using their civilization, which in this sense is a tool to attain to it. Acclimatization is not accomplished by maintaining a standard of culture. The establishment of a new culture is an indispensable part of acclimatization itself.

The problem of acclimatization in the field of geography proper, should be more concentrated to the regional understanding of the ways of adjustment by different racial groups in various climatic regions. The degree of its accomplishment should be interpreted on basis of the quantitative study of the changes versus the length of time, and it is a matter of methodological concern, how one can evaluate them. Besides the problems of birth-rates and death-rates, or ways of life as was mentioned above, there are settlement types, crops, and numerous other problems, which seen in this light, will make the thema of geographic study of acclimatization. Their characteristics and changes in their relation to climate will make the core problems of the study. Many of these problems may be approached using the methods of human ecology, and to consider it as a problem of acclimatization is just to put a different emphasis on the various branches of human geography.

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