

MIGRATION AS SEEN BY PHYSICAL ANTHROPOLOGY

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My purpose is to take up in one context –that of studies of the biological aspects of human migration– the theme of my talk at the First Coloquio de Antropología Física “Juan Comas”, Biological Anthropology, “The Two Faces of Physical Anthropology”.

There are two virtually independent lines of migration study.

1. Human migration is the mechanism that injects DNA from one gene pool into another. Premarital migration, marital migration, and post-marital migration can each have the effect of altering the composition of the genetic endowment of the recipient population. Problems with studies of migration as a transporter of genes involve such issues as the lack of clear boundaries between human populations, and difficulties in determining the genotypes of migrant and non-migrant individuals in respect to characteristics of interest.

2. Human migration is also the mechanism that inserts similar kinds of individuals into diverse environments. Thus for the study of environmental influences on human beings, the comparison of migrants with non-migrants of similar genotypes provides a laboratory-like situation for the analysis of the influence of the factors that differ between the environments of the places which donate emigrants and those which receive immigrants. Problems with this kind of study lie in determining which of a complex array of environmental variables, that differ between donor and receiving places, are responsible for the biological effects evidenced by differences between migrants and non-migrants.

3. Theoretically there should be a third approach studying the interaction of genetic and environmental results of migration. In fact, however, to discover genetic effects of migration it has been necessary to confine attention to traits of high heritability such as

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blood groups, serum proteins and the like. Whereas, to study environmental effects, it has been used a different set of variables, such as anthropometric and physiological measurements.

Unfortunately the conceptualization of the role of migration on human biology has often been crude and sometimes downright misleading. At a time when almost every characteristic of the skeleton was considered to be an inherent racial hallmark, the geographic distribution of such characteristics was assumed to result solely from movements of peoples who possessed the characteristics. When these characteristics appeared in modified form or reduced frequencies, the modifications were arbitrarily ascribed to race mixture. There was some evidence that did not fit with that kind of explanation, however.

Migration

Fishberg (1905) reported that migrants had offspring different in stature from themselves; apparently the children had grown up to be taller than their parents because of a biological response to the different environment. Franz Boas presumably knew of these studies as he set out to test on adequate-sized samples and with the best available controls and statistical methods of the time, the thesis that the differences resulted from improvement in conditions rather than from some unspecified selection of genetically-determined traits. Boas' (1910) own extensive studies of the results of migration to the United States of Old World Jews and Sicilians is, of course, a classic and it and the studies by others that confirm its findings (e.g. Shapiro 1930 and Goldstein 1943) demonstrated that stature, cephalic index and other anthropometric measurements can be modified in the offspring of migrants to a different environment.

The role of migration in human biology through its moving of DNA from one place to another (in the gametes of migrant individuals) and through subjecting the products of DNA to effectively different environments (in the sense that attributes of living organisms are products of DNA) are subject to qualitative differences in the human migrations. Migration can be an individual matter, a family matter or a group matter. These and their subtypes have varying biological implications. An individual migrant may transport cultural ideas with significant biological implications (food preferences, for instance) but he or she is likely to be

absorbed into the population of the receiving place with little influence on its gene pool and even less on the population left behind. Migration together of numbers of people can have quite different aspects. Groups can occupy empty territory and transplant the culture and DNA of the donor population and merely subject them to new physical conditions. Groups may swamp the receiving population or deplete the donor one in respect to selected genetic or other traits.

With such a variety of migration types it is hardly surprising that anthropologists put quite diverse emphases on migration, conduct their studies in different settings, and reach "conclusions" that are diverse. Only a combination of such studies and a synthesis of the points of view is likely to give a rounded image, in which the biological outcome can be seen to depend on the differences between donor and recipient people, cultures and places, the numbers of migrants and their ages and sexes.

A contrast exists between a view of migration as an historical event and a view of migration as steady pressure constantly making for greater genetic similarity among populations. The so-called "historical" view has little scientific validity. It is based on the mere assumption of strong genetic determinism. Contrary to what is now known, this view assumes that the peoples of the world (proponents of the view would say "races", not "peoples") remain biologically the same for indefinitely long periods. When people with some similar biological traits are observed in different parts of the world, proponents of this view invent hypothetical migrations to have gotten them there. Typically one of a pair of such populations is thought of as newer than the other, and hence the new one, they say, must be a migrant one. This kind of thinking was prominent in most of the older accounts of the peoples of the world. Because of the usual dearth of evidence surviving from the time of these supposed migrations and conquests, much of the interpretation was founded on the comparison of biological characteristics of individuals who lived much later or are now living. However the writers of these accounts generally pushed the human similarities and hence the assumed migrations back into an unknown and distant past.

An alternative approach to migration studies may be characterized as generalizing rather than historical. It seeks to discover regularities in human migratory behavior and its biological results. Differentiation and assimilation are considered to continue over time. Proponents of this view draw inferences from other bio-

logical species and from demographic studies and they construct models and test alternative ones against the partial human biological evidence that is available. The models are evolutionary and imply a role of environment: migration determines the conditions of selection. In this approach migration is classified according to *origin, direction and distance*. By assuming that origins are point origins, that directions are equiprobable and that distances follow some law (such as that which statistically governs distances travelled by the brownian movement of tiny particles) a model can be constructed that can be compared with empirical data. The nature and extent of deviations from the model permit subsidiary modifications of the models to make them more realistic. Furthermore, comparison of the actual origins, directions and distances of migration with the theoretical model allows one to reevaluate—but objectively—the history of unique past migration. The impetus to this model building came through population genetics. Remaining issue for biological anthropologists include asymmetric exchange and its relationship to population sizes, densities, and levels of cultural development.

Long distance and short distance migrations may be somewhat independent of each other in frequency of occurrence and direction, perhaps because of different modes of transportation for journeys of different distances. As for directions, the role of geographic features in channeling human movements can be tested in specific situations. Time of migration is also important. Premarital, marital and postmarital migration have different implications since an individual migrating to mate may thereby lead to the recombination of genes sampled from two different gene pools, whereas a couple migrating together after marriage will have offspring comparable to those of couples left behind.

Lastly, there is the line of migration inquiry dealing with the direct impact of new environments on migrant individuals. A model for such studies was set forth by Goldstein (1943) who extended Boas' comparison of migrants with their offspring to a fourfold comparison of (1) sedentes and (2) their offspring in Mexico, and (3) migrants and (4) their United States-born offspring. Goldstein used the Mexicans in Mexico to serve as controls, their Mexico-resident offspring to show the effects of temporal (secular) change from one generation to the next; Mexican migrants to the United States to show any effect of selection of migrants; and the American-born offspring to show the effect of the environmental impact of being raised in a different setting plus

the generation-to-generation secular effect. The variables studied were anthropometric measurements and observations. My later studies of two extensions of Goldstein's model generally confirmed his findings. Returned emigrants living in Mexico tended to be slightly larger than sedentes if the migration had been at an early enough age for the environmental differences to have influenced growth. A small prospective study of selective emigration showed that those who were later to migrate to the U.S. were not appreciably different from others.

The possibility of differences in the influences of similar environmental shifts on people of different constitution was implicit in Boas' selection of more than one immigrant group for his study. It has been more explicitly approached in the studies of Baker and others of White North Americans, Peruvian Mestizos and Peruvian Indians in Highland and Lowland areas of Peru. In general, however, the diversity of results of migration studies of many kinds of people in many places seems to result more from the great diversity of environmental impacts than from diversity of the populations studied. Another reason for variation in results of studies of human migration is the wide range of variables tested. The original studies dealt only with anthropometrics. We now know that they change and how they change in migrants and their offspring. Interest has therefore now shifted to more labile traits in which one-generation changes (without genetic differentiation) could be expected. These traits include such physiological variables as basal metabolic rate, vital capacities, blood pressure, ability to perform work, and other indices of pulmonary, cardiac, muscular, and digestive responses to stresses of changed environments. Of the various results, the favorable response to life-long residence at high altitude in respect to pulmonary capacities is one of the most adequately documented findings. Development of special capacity to respond to extremes of temperature, demands of work, shortages of food, etc., are also shown in the results of some migration studies.

How then can one summarize our conception of migration study in respect to human biological traits? One can no longer speak of a single repeating pattern. Instead purely genetic and environmentally tractable traits must be distinguished. The purely genetic can be examined in respect to their transport by migration and the redistribution compared with theoretical models. The geographic distributions of genetic polymorphisms, at least among nearby places, are ordinarily much more the result of migrations

than of any selection by the varying environments. The more tractable traits can be studied as to the kind and extent of modification of similar genotypes between various kinds of pairs of environments and with migration between them at various ages. Inconsistency of results must be examined in the light of adequacy of sample sizes, comparability of variables and the techniques by which they are measured, and similarity of environments. There is little genetic difference among human populations in their capacities to respond to environmental changes.

By now the chief question raised by the earlier studies has been answered. This has freed modern research to look at other kinds of variables in migrants, such as sleep patterns, excretion of catecholamines, diabetes melitus, and obesity. Even where the direction and extent of the effects are well known, the mechanisms need to be revealed through the most characteristic of anthropological methods-comparison in studies on people of different cultures and in different natural settings.