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Perspectives on human migration: introduction

INTRODUCTION

Migration has a deep history, dating back to the very origins of our species. An evolutionary perspective suggests that an activity as deeply rooted and ubiquitous as migration must be imbedded in our human nature and genes. Thus, the social and cultural factors involved in migration are intertwined within our human biology. Not only are ecological factors such as climate important in the economic push/pull factors that social scientists consider to underlie decisions about migration, but there may be individual variation in our genomes that lead to a propensity to migrating in the first place (see the chapter by Ben Campbell and Lindsay Barone on the variation in dopamine receptors and its association with migration out of Africa).

Furthermore, far from being simply the bearer of ideas and institutions, as sociologists might have it, or job skills and economic goods as the economists may emphasize, migrants represent bodies that carry an imprint of their original surroundings. These include the transmission of disease vectors as well as physiological and behavioral traits that can influence chronic diseases, especially metabolic conditions associated with eating and activity and mental illness (see the chapter by M. J. Mosher on potential epigenetic effects associated with dietary changes in migrant populations). These imprints also include more behavioral and evolutionary factors such as fertility and fecundity patterns that have important demographic consequences in the migrant's new home.

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While the primary models for migration include the economic push/pull factors, these factors themselves are subject to other interacting factors and conditions. For instance, climatic changes which affect subsistence have been linked to patterns of migration (Dillehay, 2002), as have social patterns of kinship. The chapter by Michael Crawford and Dixie West examines genetic consequences of climatic changes in the Aleutian Archipelago that stimulated the settlement of the Central and Western Islands, approximately 6000 years ago. Understanding the biological and cultural dynamics that drive human migration will be highly significant in a globalizing world economic system subject to war, political unrest, climatic change, and massive human relocations. Chapters by John Janzen on the migration of Africans to Midwestern United States and by Felix Moos on the massive relocations of Chinese to Peru document how wars and economic incentives currently drive human migration in a global economy.

In terms of the consequences of migration, anthropologists and human biologists have long been aware of the health and demographic consequences of migration. Immigrant populations differ from both the population of origin and their host country in many health measures in ways that may reflect the socioeconomic, physiological, and genetic dimension of migration. Igor Mokrousov, in his chapter on the introduction of the Bejing strain of tuberculosis into Central Asia and Europe, brings a molecular genetic perspective and documents the spread of disease through conquest by Mongolian hordes of Genghis Khan.

This volume is intended to explore the causes and consequences of human migration from its beginning with the origins of the human species (see the chapter by Mark Stoneking on the molecular evidence of hominins migrating out of Africa). Based on the idea that while the scale and scope of migration has changed over time, its fundamental causes have not, this volume gives full attention to migration in the past as the key to understanding current and future patterns of migration. In addition, it stresses genes as one of the most important markers of migration that can be used to link patterns of the past with those of the present.

Thus the first section of the book focuses on the theory, processes, and history of migration relevant to all human populations. This section starts with a chapter by Mark Stoneking "Genetic evidence concerning the origins and dispersals of modern humans" updating the most recent genetic evidence for our growing understanding of the historical origins of human migration. Also included in this section are two chapters that consider migration as a context for selection

of the human genotype and phenotype. In "The biology of human migration: the ape that won't commit?", Jonathon Wells and Jay Stock consider the role of migration in promoting a flexible maternal response to the environment so as to maximally benefit fetuses and infants that may be born in different environments experienced by the mother. Ben Campbell and Lindsay Barone in "Evolutionary basis of human migration" take a similar selective perspective and apply it to genes of the dopaminergic system in the brain thought to be related to behaviors and personality traits that would promote individuals to move from one place to another – not only with modern humans, but with their hominid ancestors as well.

Two additional chapters consider the causes and consequences of migration. "Kin-structured migration and colonization" by Alan Fix provides a fundamental understanding of how social relatedness structures the migratory process and contributes to the genetic differentiation of offshoot populations from the parental groups. "The role of diet and epigenetics in migration: molecular mechanisms underlying the consequences of change" by M. J. Mosher suggests mechanisms for genetic change in migrant populations through modification of diets in new environments.

Michael Crawford and Dixie West, in their chapter entitled "Evolutionary consequences of human migration: genetic, historic, and archaeological perspectives in the Caribbean and Aleutian Islands," examine the evolutionary consequences of migration through two distinct examples in highly diverse tropical and Arctic environments. First, they present an evolutionary success story of a triracial hybrid population (Garifuna) and their ability to colonize most of the coast of Central America because of their genetic resistance to malaria – brought from Africa. The second example provides a clear picture of how changes in natural resource abundance have shaped the migratory process for foragers of all stripes. The Unangan (Aleuts) were hunters of sea mammals and foragers and their subsistence and availability of food was dependent on climatic conditions. Thus, population movement was driven by major climatic changes, such as periods of cooling and its subsequent effects on the turbulence of the sea.

The remainder of the volume is divided by geographic regions, including Africa, Europe, Asia, Oceania, the Americas, and the Caribbean. Each section includes case studies, from different disciplinary perspectives. Examples run from the current experience of African migrants in Kansas, displaced by warfare, to the use of tuberculin bacteria to trace human migration in Asia, and to the genetic consequences of migration onto the Tibetan plateau. Special attention is paid

to migration in the Americas, both ancient and current because of the richness of the available research and the vast geographical and environmental expanses of the two continents – from the Arctic to the temperate zones to the tropics to the cold of Tierra del Fuego.

Within the section on Africa four chapters are devoted to a variety of widely disparate approaches and topics. These include a discussion of history of population movement and cultural change in North Africa, in a chapter entitled "Human migrations in North Africa" by Philippe Lefèvre-Witier. Based on historical sources, he reconstructs the migrations and conquests from the earliest inhabitants of the Mahgreb to the present day. Jibril Hirbo, Alessia Ranciaro and Sarah Tishkoff in their chapter "Population structure and migration in Africa" consider the relationships among archaeological, linguistic, and genetic data in the examination of migration patterns of sub-Saharan Africa. John Janzen's chapter "Identity, voice, community: new African immigrants to Kansas" tells the story of African migrants to Kansas based on yet another time frame, contemporary United States of America, the here and now, using different methods – primarily oral interviews. Rodrigo Barquera and Víctor Acuña-Alonzo reconstruct the patterns of forced African migration into Mexico due to the slave trade and colonial expansion. The consequences of the African relocation included the presence of specific morphological phenotypes, HLA haplotypes, hemoglobinopathies, glucose-6-phosphate dehydrogenase (A- form and deficiency), Duffy null, and specific immunoglobulins – GM*zabst. Initially, the first Africans were brought as domestic slaves of Moorish, Berber colonists, followed by larger numbers brought for labor in Vera Cruz and Campeche.

The section on Europe contains four chapters mostly based on genetic research within an archaeological and historical framework, tracing population affinities across a number of different groups. These include "Demic expansion or cultural diffusion: migration and Basque origins" by Kristin Young, Eric Devor and Michael Crawford, which examines several theories of Basque origins and possible demic expansions from the Middle East associated with the Neolithic period. The molecular evidence suggests that the Basques represent a Paleolithic population but with more recent Neolithic admixture. "Consequences of migration among the Roma: immunoglobulin markers as a tool in investigating population relationships" by Moses Schanfield, Raquel Lazarin and Eric Sunderland uses immunoglobulin markers to trace the origins and relationships between different Roma groups in Europe. The authors conclude that little can be said about the Roma beyond the

fact that they appear to have interbred with local populations. Their geographic origins remain unconfirmed by the immunoglobulin data presented in this chapter. However, recent mitochondrial DNA (mtDNA) analyses have shown specific high-resolution haplotypes that are shared by Indian populations and Roma groups (Pericic Salihovic *et al.*, 2011).

Two other chapters are featured in this section, "Migration, assimilation and admixture: genes of a Scot?" by Kristie Beaty and "Mennonite migrations: genetic and demographic consequences," by Phillip Melton, consider the histories and European origins of two U.S. populations. Beaty's chapter examines the relationship between social identity and genetics of Scots from the "Highland Clearances" and transplanted to the United States. She finds, on the basis of mitochondrial DNA and Y-chromosome markers, that the Scottish migrants to the Midwest show a greater genetic resemblance to Scottish populations than do the maternally based mtDNA markers. Melton is able to reconstruct the population history of six Mennonite communities through the use of mtDNA markers. He traces the migration of the Mennonites, initially forced by religious persecution, from Switzerland, Germany, and Holland to Ukraine to Midwestern United States. The final leg of the Mennonite relocation to the United States was caused by the loss of the exemption from military service that an earlier Tsar of Russia had offered to attract the pacifist Mennonites to settle in the Molotsniya region of the Crimea.

The section on Asia includes two genetically based accounts of human population movements in this rather large region of the world, as well as the reconstruction by Felix Moos of current migration of Chinese workers out of Asia and into Peru. "Migration, globalization, instability, and Chinese in Peru" by Felix Moos tells the little-known story of the flow of Chinese workers into Peru, which they often leave to head north to North America. Unfortunately, it is currently not possible to enumerate the flood of emigrants streaming out of the People's Republic of China into the Americas. The numbers are substantial and the economic effects can be seen in Peru and North America. In "Human migratory history: through the looking glass of genetic geography of *Mycobacterium tuberculosis*," Igor Mokrousov uses *M. tuberculosis* genomes to reconstruct human migratory events. The tuberculosis lineages, such as the Beijing strain, are characterized by spoligotyping and its geographic distribution follows the routes of the Mongol invasions from Asia to Europe. By comparing the genomes of the bacteria to the human host, coevolution can be assessed in ancient or modern migration patterns.

Mark Aldenderfer's contribution, "Peopling the Tibetan plateau: migrants, genes, and adaptation," considers the accumulating evidence, both genetic and archaeological, for the movement of humans on to the Tibetan plateau as well as the evidence for adaptation to hypoxia. He concludes that some human groups on the plateau during the Paleolithic would have contributed genes to the modern day Tibetan's ability to work efficiently and, more importantly, reproduce surviving babies at high altitude.

Oceania is represented in a comprehensive chapter by Lisa Matisoo-Smith entitled "The great blue highway: human migration in the Pacific." Matisoo-Smith reviews current theories of human movement through the Pacific based on both genetic and archaeological evidence. She concludes that the peopling of the Pacific is much more complex than merely two migrations: first the Papuans (dating back to 50 000 years ago), chronologically followed by the Austronesians (who migrated 1200 years ago). Many of these reconstruction complications are due to the depopulation following European Contact, contemporary work migration, and forcible relocations.

Migration into the Americas is explored by a series of four chapters. Because of the intensive excavations and genetic analyses conducted in these regions, emphases are placed on Central American (Mexican) and South American (Amazonian and Brazilian) populations. Migration into North America is represented in this volume by the populations of the Aleutian Archipelago, discussed in the chapter by Crawford and West. A fabric of pre-Hispanic migration in Mexico has been woven with archaeological and molecular threads in a chapter entitled "Migration of pre-Hispanic and contemporary human Mexican populations," by María de Lourdes Muñoz, Eduardo Ramos, Alvaro Díaz-Badillo, María Concepción Morales-Gómez, Rocío Gómez, and Gerardo Pérez-Ramirez. They reconstruct the migration patterns using the material culture of the dominant populations of Mexico, initiated by kin migration. They focus on the earliest civilizations of Mexico – Olmecs, the city of Teotihuacan, Toltecs and Aztecs – followed by Spanish colonization.

Amazonian migration is explored in two chapters: "A review of the Tupi expansion in the Amazon," by Lilian Rebellato and William Woods and "Molecular consequences of migration and urbanization in the Peruvian Amazonia" by Anne Justice, Bartholomew Dean and Michael Crawford. Rebellato and Woods compile ethnohistorical, geographic, and linguistic data to examine the origins of the Tupi languages and their expansion throughout the Amazonian lowlands.

The authors pose a significant question in regards to the Tupi speakers: "Does this numerical increase represent an expansion of agriculturalists or are the Tupi migrating?" They conclude that these agriculturalists are obtaining land and expanding through warfare and cannibalism. The chapter by Justice and her colleagues focuses on rural to urban migration in Yurimaguas, a principal city of Amazonia. The application of mtDNA revealed no non-native maternal admixture but that gene flow was directed from surrounding Native American villages.

Carlos Eduardo Guerra Amorim, Carolina Carvalho Gontijo, and Silviene Fabiana de Oliveira's chapter entitled "Migration in Afro-Brazilian rural communities: crossing historical, demographic, and genetic data." They examined the causes and consequences of migration in Afro-Brazilian rural communities. These communities were formed by African slaves and their descendants. As a result of this forced migration, the molecular genetic markers indicate the vast predominance of African ancestry, which contrasts with the majority of such rural Brazilian communities.

In terms of the Caribbean, the focus is on the use of genetic markers in delineating population history. The chapter "Indentured migration, gene flow, and the formation of the Indo-Costa Rican population" by Lorena Madrigal, Monica Batistapau, Loredana Castrì, Flory Otárola, Mwenza Blell, Ernesto Ruiz, Ramiro Barrantes, Donata Luiselli and Davide Pettener uses molecular markers (mtDNA and Y-chromosome) from an Indo-Costa Rican population to measure the genetic effects of migration and marriage patterns. Christine Phillips-Krawczak's contribution "Causes and consequences of migration to the Caribbean Islands and Central America: an evolutionary success story" suggests that genes brought from Africa were protective against malaria and allow for the Garifuna groups to colonize much of the coast of Central America. The indigenous Native American populations on the coast of Central America were ravaged by the introduction of falciparum malaria – carried by African slaves imported to work in the fruit plantations. In contrast to African and Mediterranean populations, Native Americans had not been subjected to natural selection from malaria and at European contact lacked the genetic adaptations against *Plasmodium falciparum*.

Having revealed the deep history of human migration from the beginning of the species and covered the globe with a variety of case studies in migration, the volume concludes with an overview by Dennis O'Rourke.

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Section 1 Theory