

# The Amerindian Microcosm



# The Amerindian Microcosm:

*Anthropology, Comparative  
History, Ecology, Genetics  
and Evolution*

By

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# TABLE OF CONTENTS

LIST OF TABLES.....	xiii
PREFACE .....	xx
Chapter 1 .....	1
Origins, Archeology and Paleoanthropology	
1.1. The long journey .....	1
1.1.1. Starting point and the prehistoric environment .....	1
1.1.2. Heading south .....	2
1.1.3. Archeological sites and past migrations.....	2
1.2. Siberian and early North American archeologies .....	4
1.3. Latin America .....	6
1.3.1. Plant cultivation and domestication .....	6
1.3.2. Megafaunal extinction.....	8
1.3.3. Ecological-social relationships in Mesoamerica .....	8
1.3.4. Pre-Columbian South America – French Guiana and Bolivia.....	10
1.3.5. The Andes – from chiefdoms to empires .....	10
1.3.6. Southern Paleoindians .....	13
1.3.7. Brazil.....	15
1.4. Behavior.....	18
1.4.1. Ethnobotanical knowledge .....	18
1.4.2. Spatial patterns.....	18
1.4.3. Partible paternity .....	20
1.4.4. Numerical cognition.....	20
1.4.5. Violence and body disposal (see also the section on health) .....	213
1.4.6. Communal life and political organization .....	24
1.4.7. Anarchism .....	25
1.5. Mobility and population densities.....	25
1.5.1. General.....	25
1.5.2. North America.....	26
1.5.3. Central America .....	26
1.5.4. South America.....	27
1.6. Languages and past migrations .....	28
1.7. Diets.....	30

1.8. Health.....	31
1.8.1. Paleopathology and paleoparasitology.....	31
1.8.2. Global evaluations.....	32
1.8.3. Cribra orbitalia and porotic hyperostosis.....	33
1.8.4. Teeth.....	34
1.8.5. Life history indicators.....	35
1.8.6. Past pathogens and parasites.....	36
1.8.7. Trepanation.....	37
1.8.8. Violence.....	37
1.9. Morphology.....	38
1.9.1. Methodological questions.....	38
1.9.2. The Two Main Biological Components Model (TMBCM).....	40
1.9.3. The Arctic and North America.....	41
1.9.4. World and Native American craniometric patterns.....	41
1.9.5. Regional analyses.....	42
1.9.6. Central America.....	43
1.9.7. The Andes.....	43
1.9.8. Northern South America and Brazil.....	44
1.9.9. South America's southern cone.....	45
1.9.10. The effect of subsistence patterns.....	46
1.9.11. Craniometric and mitochondrial DNA comparisons.....	47
1.9.12. Lithic point weapons.....	47
Chapter 2.....	114
Clash of Cultures – European Conquest and Population Dynamics	
2.1. Population at the European Encounter.....	114
2.2. Impact of the European Conquest.....	115
2.3. Recovery.....	116
2.4. Brazil: National Censuses and Other Specific Studies.....	117
2.5. Population Structure.....	119
2.5.1. Migration.....	119
2.5.2. Reproductive physiology.....	122
2.5.3. Fertility patterns.....	123
2.5.4. Assortative mating.....	124
2.5.5. Mortality.....	126
2.5.6. Behavior.....	128
2.6. Case studies.....	129
2.6.1. Xavante.....	129
2.6.2. Ache.....	131
2.6.3. Yanomamo.....	132
2.7. Overview.....	134

Chapter 3 .....	164
Amerindians and the Outside World – Conflicts, Political Rights, and Integration	
3.1. Indigeneity and related concepts .....	164
3.2. Conquest and subjugation, attempts at change.....	165
3.3. Conflicts and Amerindian rights .....	166
3.4. Integration.....	168
3.5. Ethics .....	173
3.6. Overview.....	174
Chapter 4 .....	186
Ecology and Physiological Adaptation	
4.1. A general ecological model of social structure .....	186
4.2. Amerindian life and the physical and social environment .....	187
4.3. Physical fitness .....	188
4.4. Behavior.....	190
4.4.1. Patterns of activity, time investment, cognition, quality of life.....	190
4.4.2. Social exchange.....	194
4.4.3. Ethnobotanical knowledge and use .....	194
4.4.4. Violence .....	195
4.5. Growth .....	196
4.5.1. Growth charts and rates.....	196
4.5.2. Environmental and social variables.....	198
4.5.3. Intergenerational effects.....	199
4.5.4. Secular changes.....	200
4.6. Nutrition.....	200
4.6.1. Nutritional status, changing influences .....	200
4.6.2. Types of diet, food shortage.....	201
4.6.3. Obesity .....	203
4.7. Physique, comparative morphology.....	205
4.8. Metabolism .....	205
4.9. Altitude .....	207
4.10. Reproduction.....	210
4.11. Overview.....	212
Chapter 5 .....	245
Disease Patterns	
5.1. General.....	245
5.2. Environmental pollution .....	247
5.3. Oral cavities .....	248
5.4. Anemia.....	249

5.5. Non-infectious diseases .....	250
5.5.1. Cardiovascular disorders.....	250
5.5.2. Diabetes.....	251
5.5.3. Cancer and other non-infectious conditions.....	252
5.6. Infectious diseases .....	253
5.6.1. Diarrhea and intestinal parasitoses.....	253
5.6.2. Malaria .....	254
5.6.3. Tuberculosis.....	255
5.6.4. Chlamydia infection and trachoma .....	257
5.6.5. Other infectious conditions .....	258
5.6.6. Viruses .....	259
5.7. Alcoholism and dependence to other drugs, suicides.....	261
5.8. Overview.....	262
Chapter 6 .....	294
Mitochondrial Dna – Amerindian History through Maternal Lineages	
6.1. General.....	294
6.2. The prehistoric colonization of the Americas .....	296
6.3. Variability by region – Siberia, Mongolia, and neighboring areas .....	297
6.3.1. Historical information on mtDNA results (1999-2015) ..	297
6.3.2. Haplogroup distribution .....	298
6.4. North America .....	300
6.4.1. Historical information on mtDNA results (1996-2015) ..	300
6.4.2. Haplogroup distribution .....	300
6.4.3. Languages .....	301
6.5. Central America .....	302
6.5.1. Mexico, historical information (1992-2015).....	302
6.5.2. Mexico, haplogroup mtDNA distributions.....	302
6.5.3. Central America outside Mexico, historical information (1993-2015).....	304
6.5.4. Central America outside Mexico, haplogroup mtDNA distributions.....	304
6.6. Northern South America .....	305
6.6.1. Historical information (1999-2016).....	305
6.6.2. Colombia, haplogroup mtDNA distributions .....	307
6.6.3. Outside Colombia, haplogroup mtDNA distributions.....	308
6.7. The Andes (Peru and Bolivia).....	308
6.7.1. Historical information (1995-2015).....	308
6.7.2. Haplogroup mtDNA distributions.....	309
6.8. Central and Southern South America.....	310
6.8.1. Historical information (1993-2015).....	310



6.8.2. Haplogroup mtDNA distributions .....	311
6.9. Overview .....	312
Chapter 7 .....	379
Sex Chromosomes	
7.1. X-Chromosome .....	379
7.1.1. Peculiarities .....	379
7.1.2. Historical information (2002-2011) .....	379
7.2. Y Chromosome .....	380
7.2.1. General .....	380
7.2.2. The prehistoric colonization of the Americas .....	381
7.2.3. Variability by region – Siberia, Mongolia, and neighboring areas (1999-2013) .....	383
7.2.4. North America .....	385
7.2.5. Central America .....	386
7.2.6. Northern South America .....	386
7.2.7. The Andes .....	388
7.2.8. Central and Southern America .....	389
7.3. Overview .....	390
Chapter 8 .....	434
Autosomes - Human Leukocyte Antigens (Hla)	
8.1. General concepts .....	434
8.2. HLA variability – results up to 2002 .....	435
8.3. Variability by region – Siberia, Mongolia, and North America (2001-2009) .....	436
8.4. Central America .....	436
8.5. Northern South America and Andes (2001-2013) .....	437
8.5.1. Northern South America .....	437
8.5.2. The Andes .....	438
8.5.3. Central and Southern South America .....	438
8.6. Overview .....	439
Chapter 9 .....	461
Autosomes – Non-Hla Investigations	
9.1. The genome as a tool for population analyses .....	461
9.2. Back to the question of prehistoric colonization .....	463
9.3. Specific systems variability .....	464
9.4. Single-gene variability .....	464
9.5. Variability by region – Siberia, Mongolia, and neighboring areas .....	466
9.6. North America .....	467

9.7. Central America .....	469
9.8. Northern South America .....	470
9.9. The Andes .....	472
9.10. Central and Southern South America.....	473
9.11. Overview.....	475
Chapter 10 .....	548
Virus, Bacteria, and Amerindian History	
10.1. Host-parasite relationships and biological history .....	548
10.2. Virus/bacterial infections and Amerindian history .....	549
10.2.1. <i>HTLV-I, II</i> .....	549
10.2.2. <i>JCV</i> .....	551
10.2.3. <i>Helicobacter pylori</i> .....	552
10.2.4. <i>HHV8</i> .....	553
10.2.5. <i>HBV</i> .....	553
10.3. Overview.....	554
Chapter 11 .....	565
Synthesis	
11.1. Early life .....	565
11.1.1. In the beginning .....	565
11.1.2. Sociocultural development.....	566
11.1.3. Communal life and sociopolitical structure.....	566
11.1.4. Population structure .....	566
11.1.5. A cultural isolation factor: language .....	567
11.1.6. Energy intake and disposal.....	567
11.1.7. Health and disease.....	567
11.1.8. Bone morphology.....	568
11.1.9. General evaluation .....	568
11.2. Demography.....	569
11.2.1. Consequences of the European arrival .....	569
11.2.2. Population flow .....	569
11.2.3. Reproduction.....	570
11.2.4. Mortality .....	570
11.2.5. Studies at the tribal level and beyond.....	570
11.3. Subjugation, exploration, conflicts, rights, social integration, and ethics .....	571
11.3.1. Impact of the Conquest .....	571
11.3.2. Reaction .....	571
11.3.3. Integration .....	571
11.3.4. Ethics.....	571

11.4. Ecology and physiology.....	572
11.4.1. Models.....	572
11.4.2. Amerindian everyday life.....	572
11.5. Health and disease.....	573
11.5.1. General.....	573
11.5.2. Environmental pollution.....	574
11.5.3. Dental health.....	574
11.5.4. Non-infectious diseases.....	574
11.5.5. Infectious diseases.....	575
11.5.6. Alcohol and other addictions, suicides.....	575
11.5.7. Health care.....	576
11.6. Mitochondrial DNA and Amerindian history.....	576
11.6.1. General.....	576
11.6.2. Prehistoric colonization.....	576
11.6.3. Siberia, Mongolia, and neighboring areas.....	576
11.6.4. North America.....	577
11.6.5. Central America.....	577
11.6.6. Northern South America.....	577
11.6.7. The Andes.....	578
11.6.8. Central and Southern South America.....	578
11.7. Sex chromosomes.....	578
11.7.1. General.....	578
11.7.2. Prehistoric colonization of the Americas.....	579
11.7.3. Siberia, Mongolia, and neighboring regions.....	579
11.7.4. North America.....	579
11.7.5. Central America.....	580
11.7.6. Northern South America.....	580
11.7.7. The Andes.....	580
11.7.8. Central and Southern South America.....	580
11.8. Human Leukocyte Antigens (HLA).....	580
11.8.1. Characterization.....	580
11.8.2. Distribution patterns in Amerindians.....	581
11.9. Non-HLA autosomes.....	582
11.9.1. Genome analyses.....	582
11.9.2. Prehistoric colonization again.....	582
11.9.3. Specific systems and single-gene variabilities.....	582
11.9.4. Siberia, Mongolia, and North America.....	582
11.9.5. Central America.....	583
11.9.6. Northern South America.....	583
11.9.7. The Andes.....	583
11.9.8. Central and Southern America.....	583

11.10. Infections and Amerindian history.....	584
11.11. Coda.....	584

## LIST OF TABLES

- TABLE 1.1 <sup>14</sup>C dates for Early Paleoindian sites found in North America
- TABLE 1.2 <sup>14</sup>C dates for Early Paleoindian sites found in South America
- TABLE 1.3 Crop plant occurrence in archeological sites and postulated plant domestication areas in Latin America
- TABLE 1.4 Cultural sequence on the Santarém – Monte Alegre region
- TABLE 1.5 Temporal sequence, socioeconomic characteristics and material culture of the Marajoara people
- TABLE 1.6 Main information about the Lagoa Santa archeological site, Central Brazil
- TABLE 1.7 Frequencies of perimortem injuries found in different sites and periods in the Central Andes
- TABLE 1.8 Population density and number of native mammalian species in the territories of 27 hunter-gatherer groups from North America
- TABLE 1.9 Selected studies related to mobility and population densities in North America (2002-2015)
- TABLE 1.10 Selected studies related to mobility and population densities in Central America (2005-2018)
- TABLE 1.11 Selected studies related to mobility and population densities in South America (2002-2018)
- TABLE 1.12 Some of the main extant Amerindian languages and the places where they are spoken
- TABLE 1.13 Amerindian language families still spoken in Brazil, with estimates of the numbers of speakers
- TABLE 1.14 Selected examples of studies on Amerindian prehistoric diets
- TABLE 1.15 Selected characteristics which can be considered in paleopathology and paleoparasitology
- TABLE 1.16 Prevalence of cribra orbitalia and porotic hyperostosis in selected sites from the USA and Peru
- TABLE 1.17 Prevalence of caries in selected Amerindian populations
- TABLE 1.18 Degenerative joint disease prevalence in different time periods, in the Mochica population, Lambayeque, northern coastal Peru
- TABLE 1.19 Zapotec war in the Valley of Oaxaca, Mexico, 10,000-1,700 YBP: an attempt at a synthesis

- TABLE 1.20 Selected bibliography related to the Two Main Biological Components Model (TMBCM) for the early settlement of the Americas
- TABLE 1.21 Selected morphological studies in arctic and North American populations (2003-2018)
- TABLE 1.22 Selected morphological studies in Central American populations (2007-2017)
- TABLE 1.23 Selected morphological studies in South America's southern cone
- TABLE 2.1 Estimates of Amerindian population sizes at the time of the first European contact
- TABLE 2.2 Selected quantitative estimates of the impact of contact with outsiders in the Amerindian population
- TABLE 2.3 Selected information on Amerindian population recovery
- TABLE 2.4 Geographical distribution of Brazilian Amerindians living in reservations in 2000 and 2005
- TABLE 2.5 Selected demographic characteristics of the Brazilian Amerindian population as given in two national censuses
- TABLE 2.6 Estimates of isolated Amerindians living in protected areas of the Brazilian state of Acre in 2013
- TABLE 2.7 Types of migration events
- TABLE 2.8 Selected examples of intermediate types of migration in Amerindian populations
- TABLE 2.9 Reproductive characteristics (averages or proportions) of two traditional populations
- TABLE 2.10 Mortality characteristics of hunter-gatherers and forager horticulturalists
- TABLE 2.11 A summary of the mortality findings observed among the Tsimane' of Beni, Bolivia
- TABLE 2.12 Selected aspects of Xavante history
- TABLE 2.13 Total population, age intervals, fertility and mortality rates in Xavante reservations, 2004<sup>1</sup>
- TABLE 2.14 Additional selected information on Xavante demography
- TABLE 2.15 Selected aspects of Ache history
- TABLE 2.16 Selected aspects of Ache demography
- TABLE 2.17 Population size, sex, and age distribution among the Yanomamo
- TABLE 2.18 Selected aspects of Yanomamo demography
- TABLE 3.1 Excerpts from the International Labor Organization Indigenous and Tribal Convention, 1989

- TABLE 3.2 Excerpts from the United Nations Declaration on the Rights of Indigenous Peoples (2007)
- TABLE 3.3 Degree of integration into the market of five Ecuadorian Amerindian populations
- TABLE 3.4 The basic ethical principles
- TABLE 3.5 The World Health Organization guidelines to be followed in human population genetics studies
- TABLE 4.1 A hierarchical ecological model of human adaptive systems
- TABLE 4.2 Levels of sociopolitical integration
- TABLE 4.3 Ethnobotanical knowledge in three Amazonian indigenous societies
- TABLE 4.4 Height growth rates in 10 Amerindian communities
- TABLE 4.5 Selected studies on secular changes in Amerindians
- TABLE 4.6 Selected examples of studies relating anthropometry to diet in Amerindians
- TABLE 4.7 Types of diet and calorific content among Ache and Hiwi populations
- TABLE 4.8 Additional information about the diets and the activities involved in obtaining them among the Ache and Hiwi
- TABLE 4.9 Dietary intake during the previous 24 hours reported by Honduran Miskito subjects (n=195)
- TABLE 4.10 Number of groups of insects and other invertebrates consumed by seven Amerindian populations
- TABLE 4.11 Prevalences of overweight and obesity in selected Amerindian populations
- TABLE 4.12 Selected examples of Amerindian studies on aspects related to metabolic traits
- TABLE 4.13 High-altitude stresses and the physiological adaptations to them
- TABLE 4.14 Selected information on factors influencing the reproduction of Amerindian females
- TABLE 4.15 The amount of direct childcare provided by different relatives of mothers in three Amerindian populations
- TABLE 5.1 Age standardized mortality rates due to three infectious diseases in three Mexican states and Mexico in general
- TABLE 5.2 Decayed, missing and filled teeth (DMFT) of Xavante Amerindians living in the Etêñitépa (São Domingos) village, sampled along 43 years
- TABLE 5.3 Dental occlusion in the Brazilian Xavante, Bakairi, and Arara

- TABLE 5.4 Prevalences (in percentages) of intestinal parasites in selected samples of Amerindian populations
- TABLE 5.5 Prevalences of reaction to the purified protein derivative (PPD) test in selected Amerindian populations
- TABLE 5.6 Prevalences of cases of tuberculosis detected in selected Amerindian populations, with some information from the results of the treatment
- TABLE 5.7 Studies which examined immune responses among Amerindians, compared to those of other ethnic groups
- TABLE 5.8 Prevalence of *Chlamydia* antibodies, frequency of high IgG titers, and presence of specific IgM in Brazilian Amazonian Amerindians
- TABLE 5.9 Selected studies on infectious conditions investigated in Amerindians
- TABLE 5.10 Selected examples on the prevalences of infection by the Human T-cell Lymphotropic Virus Type 2 (HTLV-2) in Amerindians
- TABLE 5.11 Selected examples on the prevalences of infection by the Human Herpesvirus Type 8 (HHV-8) in Amerindians
- TABLE 5.12 Selected examples on the prevalences of infection by six types of virus in Amerindians
- TABLE 5.13 Selected information about suicides in six population samples of Brazilian Amerindians
- TABLE 5.14 Information about the frequencies of diseases or their agents among Amerindians
- TABLE 6.1 Selected examples of mtDNA studies bearing on the pre-historic colonization of the Americas (1991-2016)
- TABLE 6.2 The founding mtDNA lineages that are presently identified in Amerindians
- TABLE 6.3 Comparison between ancient and modern mtDNA samples according to regions, haplogroup frequencies, and genetic diversities (*h*)
- TABLE 6.4 Selected historical information of the mtDNA results obtained in Siberia, Mongolia, and neighboring regions (1999-2015)
- TABLE 6.5 Selected haplogroup mtDNA studies in Siberia, Mongolia, and neighboring regions
- TABLE 6.6 Selected historical information of the mtDNA results obtained in North America (1996-2015)
- TABLE 6.7 Selected haplogroup mtDNA studies in North America (only sample sizes greater than 15 individuals are listed)
- TABLE 6.8 Selected historical information of the mtDNA results obtained in Mexico (1992-2015)



- TABLE 6.9 Selected haplogroup mtDNA studies in Mexico (only sample sizes greater than 15 individuals are listed)
- TABLE 6.10 Selected historical information of the mtDNA results obtained in Central America outside Mexico (1993-2015)
- TABLE 6.11 Selected haplogroup mtDNA studies in Central America, outside Mexico (only sample sizes greater than 15 individuals are listed)
- TABLE 6.12 Historical data on mtDNA studies performed in Northern South America (1999-2016)
- TABLE 6.13 Selected haplogroup mtDNA studies in Colombia (only sample sizes greater than 15 individuals are listed)
- TABLE 6.14 Selected haplogroup mtDNA studies in Northern South America outside Colombia (only sample sizes greater than 15 individuals are listed)
- TABLE 6.15 Historical data on mtDNA studies performed in the Andes, Peru, and Bolivia (1995-2016)
- TABLE 6.16 Selected haplogroup mtDNA studies in the Andes (only sample sizes greater than 15 individuals are listed)
- TABLE 6.17 Historical data on mtDNA studies performed in Central and Southern South America (1993-2015)
- TABLE 6.18 Selected haplogroup mtDNA frequencies in Central and Southern South America (only sample sizes greater than 15 individual area listed)
- TABLE 7.1 Historical data on X-chromosome studies performed among Amerindians (2002-2011)
- TABLE 7.2 Information about the Y-chromosome nomenclature system
- TABLE 7.3 Numbers of Y-chromosome mutations and haplogroups identified by Karafet et al. (2008) with their defining mutations and the main geographic areas where they occur
- TABLE 7.4 Historical data on Y-chromosome studies performed in Siberia, Mongolia, and neighboring regions (1999-2013)
- TABLE 7.5 Siberian haplogroup frequencies tested at the level of 12 biallelic and 4 STR loci
- TABLE 7.6 Siberian haplogroup frequencies tested at the level of 14 biallelic and 9 STR loci
- TABLE 7.7 Historical data on Y-chromosome studies performed in North America (2002-2016)
- TABLE 7.8 The prevalences of Y-chromosome haplogroups considered to be of Amerindian origin in eight North Amerindian (USA) populations (6-8 biallelic loci)

- TABLE 7.9 Y-chromosome haplogroup prevalences in four populations living in the northern region of North America
- TABLE 7.10 Historical data on Y-chromosome studies performed in Central America (1999-2012)
- TABLE 7.11 Y-chromosome haplogroup frequencies in Mexican populations (4 biallelic, 8-17 STR loci)
- TABLE 7.12 Y-chromosome haplogroup frequencies in Panamanian populations (13 STR loci)
- TABLE 7.13 Historical data on Y-chromosome studies performed in Northern South America (1997-2013)
- TABLE 7.14 Y-chromosome haplogroup prevalences in populations from Northern South America (7 biallelic, 6 STR loci)
- TABLE 7.15 Y-chromosome STR prevalences in populations from Northern South America (sample sizes equal or greater than 14)
- TABLE 7.16 Historical data on Y-chromosome studies performed in Andean populations (2001-2015)
- TABLE 7.17 Y-chromosome STR allele distributions in six Andean populations
- TABLE 7.18 Historical data on Y-chromosome studies performed in Central and Southern South America populations (1997-2015)
- TABLE 7.19 Y-chromosome STR distributions in four Central and Southern South American populations
- TABLE 8.1 Composition of the main Major Histocompatibility Complex loci on Chromosome 6. Gene listing is given according to the corresponding position in the region
- TABLE 8.2 Selected examples of HLA studies performed in Siberian, Mongolian, and North American populations (2001-2009)
- TABLE 8.3 Selected examples of HLA studies performed in Central American populations (2000-2014)
- TABLE 8.4 Selected examples of HLA studies performed in Northern South America and the Andes (2001-2013)
- TABLE 8.5 Selected examples of HLA studies performed in Central and Southern South America (2000-2014)
- TABLE 9.1 Selected information on genomic studies performed in Amerindians (2000-2017)
- TABLE 9.2 Selected genomic studies dealing with the question of the prehistoric colonization of the Americas
- TABLE 9.3 Selected autosome studies considering specific systems variability (2000-2011)
- TABLE 9.4 Selected autosome studies considering single gene variability (2000-2017)

- TABLE 9.5 Selected autosome studies performed in Siberia, Mongolia, and neighboring areas (2000-2017)
- TABLE 9.6 Selected autosome studies performed in North America (2000-2016)
- TABLE 9.7 Selected autosome information in Central America (2000-2017)
- TABLE 9.8 Selected autosome information in Northern South America (1995-2016)
- TABLE 9.9 Selected autosome information in the Andes region (2000-2017)
- TABLE 9.10 Selected autosome information in Central and Southern South America (1993-2017)
- TABLE 10.1 Selected studies on microorganisms prevalences investigated in Amerindian populations (1994-2016)
- TABLE 10.2 Frequency of JCV positive urine samples from Siberian and Amerindian populations
- TABLE 10.3 Herpesvirus type 8 (HHV8) seroprevalence studies in South Amerindians
- TABLE 10.4 Hepatitis B virus (HBV) seroprevalence studies in South Amerindians

## PREFACE

On September 27, 2018, science lost one of its most devoted followers, Francisco Mauro Salzano. His life extended for 90 incredibly productive years and his last work was this book, which he completed writing whilst in hospital. Unfortunately, he passed away soon after finishing the book. As his closest collaborators, we decided to proceed with this publication, because we believe this account of the fascinating history of Native Americans and the significant evolution of a key portion of our species needs to be read by other scholars and students around the world. This book aims to be as comprehensive as possible, examining all information that could influence the fate of Amerindians. Therefore, this work contains information of interest to archeologists, physical and cultural anthropologists, physiologists, physicians, geneticists and all those interested in evolution in general.

A general review of anthropological, historical, demographic, ecological, health, morphology, genetics and evolutionary studies in South Amerindians was published by Francisco Salzano and S. M. Callegari-Jacques. 1988), called *South American Indians. A Case Study in Evolution*. The aim of that book was the broad coverage and in-depth analysis of the genetic variability of South American Indians using the tools available at that time. The field of human molecular population evolution has recently been revolutionized by the development of sophisticated laboratory and bioinformatics approaches that can now interrogate both whole genomes and specific genetic regions in order to understand classical questions of the past, present and future of humankind. Therefore, a new synthesis was warranted to update existing resources and to offer, in a single source, a wealth of information on these topics. The present book currently has no parallels as far as scholarly works on Amerindians are concerned, despite the fact that this major (and diverse) continental group is an integral portion of our species. Any analysis which does not include them would be incomplete.

The book is divided into eleven chapters with many subdivisions. Chapter 1 discusses the origins, archeology and paleoanthropology of Amerindians. This important subject is returned to in more detail in Chapter 6, where mitochondrial DNA and maternal lineages are described. Chapters 2 and 3 address the clash of cultures that resulted from European conquest and the

indigenous population's recovery after this first contact. Chapters 4 and 5 describe the ecology, physiological adaptations and disease patterns observed among Amerindians. Genetic information is given in Chapters 7 to 9. Studies on sex chromosomes are summarized in Chapter 7 whereas Chapters 8 and 9 describe the main findings with autosomes at the DNA level. The objective of Chapter 10 is to ascertain ways in which some infectious agents could furnish relevant information on Amerindian patterns of migration. These studies provide an additional contribution to unraveling the complex factors that influenced Amerindian history. In the last chapter (Chapter 11), Salzano shows his preference for a synthetic approach to science instead of the reductionist approach preferred by most scholars. The book ends with Salzano's optimistic view that Amerindians will preserve at least part of their biological and cultural identity, assuring a more interesting and varied picture of the world of tomorrow.

Noteworthy, that present book is primarily a survey of the huge and varied literature on this topic, all units and dates are presented in the same way as the sources being cited. It therefore uses a mix of date formats (YBP – years before present as well as BC/AD) and units.

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# CHAPTER 1

## ORIGINS, ARCHEOLOGY AND PALEOANTHROPOLOGY

*It was the final act in the prehistoric settlement of the earth... A band of hardy Stone Age hunter-gatherers headed east... without realizing they were leaving one hemisphere for another.*

—David J. Meltzer

### 1.1. The long journey

#### 1.1.1. Starting point and the prehistoric environment

Presently there is consensus that the prehistoric colonization of the Americas started from southern Siberia and continued through Beringia, a vast, flat, ice-free region that existed 27-11,000 years ago where the Bering Strait now separates Asia and America.

The colonization started during the Last Glacial Age, also known as the Wisconsin glaciation, which can be further subdivided into (a) Early – a cooler, major glacial episode which occurred 80-65,000 years ago; (b) Middle – a warmer stage, 65-35,000 years before present (YBP); and (c) Late – also called the Last Glacial Maximum (LGM), from 35-10,000 YBP. The present interglacial period is termed the Holocene. During the LGM, Beringia was more than 1,000 kilometers wide from north to south (Dixon, 1999; Meltzer, 2009).

What kind of environment existed in Beringia at the time? Fossil estimates suggest that temperatures ranged from 5.5°C colder than today's 20,000 YBP to 0.9°C warmer than today's 28,000 YBP, with maximum temperatures of 12-13°C in northeastern Siberia. These numbers point to relatively mild climatic conditions, allowing the development of a closed, dry, herb-rich tundra with a continuous moss-layer type vegetation (Elias, 2002). The region also provided a major refuge for large mammals,

including four species of mammoth, a mastodon, four genera of giant ground sloths and the glyptodont. Preying on these herbivores were carnivores such as the giant short-faced bear. All these megafauna ultimately vanished, although it is not clear if their extinction was due to over-hunting by humans who had arrived at the region or to climate change (Meltzer, 2009).

### **1.1.2. Heading south**

The colonists stayed for an extended period of time in Beringia (Hoffecker et al., 2016), but ultimately started migrating south. The problem they had to face at the beginning was a massive barrier formed by the merging of two huge ice sheets, the Laurentide and Cordilleran glaciers, stretching all the way from the Atlantic to the Pacific Ocean, extending 800 km. There is evidence that a habitable corridor between the two glaciers would have been open 13,000 YBP (Waters et al., 2015; Heintzman et al., 2016; Pedersen et al., 2016), but any midcontinental migration by this route could only have occurred after that date.

The alternative is the use of watercrafts, possibly skin boats, following the Pacific coast, enabling the migrants to enter the southern areas before the melting of the continental glaciers. As new early dates have been obtained using archeological and genetic data, this route is increasingly suggested (Dixon, 1999; Waguespack, 2007; Meltzer, 2009). Hall et al. (2004) stress the importance of the living conditions of the migrants. The warming period that occurred from 14,000 to 12,800 YBP would have offered extensive food resources, and provided more daylight hours in mid-winter along the coastal route than the interior route (Braje et al., 2017).

### **1.1.3. Archeological sites and past migrations**

By the end of the 19<sup>th</sup> and beginning of the 20<sup>th</sup> century, controversy was emerging in the USA over the antiquity of humans in America. The first clear, indisputable evidence for the presence of bison hunters was provided by the Folsom site in New Mexico in 1927/1928, with the association of fluted points made from the bones of these animals. Subsequently, in 1933, similar observations were made at another site in the same region, Clovis. The fluted points were longer, broader and less finely made than the Clovis artifacts, and proved to have a widespread distribution across the continent. The radiocarbon dates approximately coincided with the opening of the Laurentide-Cordilleran corridor, providing a nice scenario for the early



colonization of North America. But the question remained, were there pre-Clovis people in the continent? If not, how could one explain “the apparently sudden appearance” of these artifacts over much of North America 11,500 years ago? (Meltzer, 2009).

This question was considered by Hamilton and Buchanan in 2007 using statistical models. Based on the dates of 23 Early Paleoindian sites spread throughout the USA (Table 1.1), they used a time-delayed wave-of-advance model to measure the lifetime dispersal of the migrants. Spatial gradients were observed, but only the northern origin model furnished a statistically significant value. The Clovis colonists would have arrived at the mouth of the ice-free corridor 11,342 <sup>14</sup>C YBP and would have traveled at a rate of 5 to 8 km per year. But Surovell (2003), also using a migration model, concludes that the coastal route cannot explain the age discrepancy between the Clovis complex and the Monte Verde site (see below). Note, also, that three more recent studies (listed in Table 1.1) furnish earlier dates than those considered by Hamilton and Buchanan (2007).

The question of the pre-Clovis colonists was considered by Waters et al. (2011). They described the tip of a projectile point made of mastodon bone embedded in a rib of another mastodon found at the Manis site in the state of Washington, USA. Radiocarbon dating and DNA analysis indicated that this material dates to 13,800 YBP. They referred to other evidence suggesting that people were hunting proboscideans at least two millennia before the Clovis.

Against the absence of pre-Clovis colonists is a vast array of finds from early sites in South America (Table 1.2). The dates obtained for 30 of them show values of about the same order of magnitude as those found in North America, without a clear north-south cline. Differential site preservation (less in the north) could explain this curious result, although hesitation to accept or tendency to reject earlier dates in the north is also a tenable hypothesis.

Another puzzle relates to the introduction of hookworms in America. The earliest record of their presence dates from 7,200 YBP, in human coprolites from northeast Brazil. Taking into consideration the parasites' biology, it would be impossible for them to have been introduced by land migration about 13,000 YBP (Montenegro et al., 2006).

A more recent migration took place involving the Aleutian Archipelago colonization. This region represents Beringia's southern margin, and has

been the subject of not less than 140 years of archeological research (Veltre and Smith, 2010). The earliest settlement date is thought to be 9,000 YBP, and the evidence points to an overall cultural continuity, the sequence being divided into five phases: (a) Early Anangula (9,000-7,000 YBP); (b) Late Anangula (7,000-4,000 YBP); (c) Margaret Bay (4,000-3,000 YBP); (d) Amakmak (3,000-1,000 YBP); and (e) Late Aleutian (1,000-200 YBP) (Davis and Knecht, 2010).

## 1.2. Siberian and early North American archeologies

Arctic Siberian archeology was reviewed by Pitulko et al. (2017). According to them, humans began colonizing the area around 45,000 years ago, and these populations were likely supported by mammoths, which were a source of both food and weapons, via the processing of their tusks for long points and full-sized spears.

Hoffecker (2005) provided an overall evaluation of the Upper Paleolithic record of *Homo sapiens* in northern Eurasia, comparing southern Siberia with western, central and eastern Europe. He remarked that the rapid pace of innovation and the complexity of artifact design were unprecedented, characterizing what he called behavioral modernity. Dixon et al. (2005) described new methods for discovering sites emerging from under melting and retreating glaciers and ice patches, which represent important sources of knowledge about the Siberian prehistoric past, while Hall et al. (2002) reviewed how 323 North American sites from the Pleistocene-Holocene transition (dating from at least 7,500 YBP) were discovered.

Beringia's early archeology has been described by Dixon (2001), Hoffecker and Elias (2003) and Hoffecker et al. (2016). Dixon identified three archeological traditions and two complexes in eastern Beringia and the Pacific Northwest. The three traditions are: the American Paleoarctic (10,500-8,000 YBP), the Northern Paleoindian (10,500-8,500 YBP) and the Northwest Coast Microblade (10,500 to <7,000 YBP); the complexes are Nenana (>11,600-10,500 YBP) and Denali (10,500-8,000 YBP). The Yana RHS site described by Pitulko et al. (2004) lies well above the Arctic circle and dates to 27,000 YBP, at least twice the age of other sites (for instance, Berelekh: 13,000 YBP; Zhokov: 8,000 YBP).

The spatiotemporal distribution of Holocene populations in North America was assessed by Chaput et al. (2015) through aggregated radiocarbon ( $^{14}\text{C}$ ) dates, used as a proxy of population size. Demographic changes were mapped for the past 13,000 years. On the other hand, Halfman et al. (2015)

found evidence of human use of salmon in North America at 11,500 years ago; and O'Shea et al. (2014) discovered a 9,000-year-old caribou hunting structure beneath the waters of Lake Huron.

The archeology of the northwest coast of North America was considered by Ames (2003). The area studied extends 1,800 km from Cape Mendocino, California, to Yakutat Bay, Alaska, and seems to have been occupied 13,000 YBP or earlier. The settlers of the region formed what could be classified as complex hunter-gatherer societies which displayed social hierarchy. Additional characteristics include: (a) large corporate households; (b) sedentary communities; (c) logistical mobility patterns; (d) complex division of labor; (e) mass food harvesting, processing and storage; (f) regional interaction; and (g) key technological acquisitions including boats, waterproof boxes and plank houses.

The cultural context of plant domestication in eastern North America was examined by Smith (2011). At least four indigenous seed-bearing plants were domesticated there between 5,000 and 3,000 YBP: squash (*Cucurbita pepo*), sunflower (*Helianthus annuus*), marsh elder (*Iva annua*) and pitseed goosefoot (*Chenopodium berlandieri*). Seven archeological sites dating to this period (the Late Archaic) were considered. None of them had pottery vessels, and artifact assemblages were dominated by chipped-stone tools and debitage, with chert and quartzite used to manufacture bifacially flaked knives, drills, spear points, unifacial end scrapers and side scrapers. Floral and faunal assemblages suggested continued reliance on many wild species, with no evidence of resource depletion or high site density. Therefore, models of domestication and agricultural origins based on population pressure and/or depletion of natural resources do not apply here.

On the other hand, the presence of maize in the southwestern United States by 2,100 calibrated calendrical years before the Christian era had previously been explained through the migration of Proto-Uto-Aztec farmers who had left their homeland in Mesoamerica. But Merrill et al. (2009) suggest that the dispersal of maize agriculture in this region would have been by cultural diffusion across a southern Uto-Aztec linguistic continuum, without a specific demic migration.

The phenomena that have been called the North American Neolithic transitions were examined by Bingham et al. (2013) plus 17 other contributors in a special issue of *Evolutionary Anthropology*. A question was raised as to whether the use of bows preceded increased social complexity (the warfare theory) or followed other correlates of increasing

complexity (the social coercion theory). The contributors to this debate concluded that the weight of the evidence favored the second over the first alternative.

## 1.3. Latin America

### 1.3.1. Plant cultivation and domestication

A similar set of questions about the development of agriculture in Central and South America were tackled by Piperno (2011). She collected a large amount of molecular, botanical and archeobotanical data, which revealed some points of difference between this process in America, the Near East and China. In the American continent, food production did not originate and develop in association with larger permanent nucleated villages situated in major river valleys. Rather, the first events related to the process, for which there is evidence from between 11,000 and 7,000 YBP, took place in rock shelters and/or limited clusters of small open-air places beside secondary watercourses and seasonal streams, whose small stretches of alluvium were likely used for cultivation.

Crop origins, also, were spatially diffuse, with multiple areas of domestication. The wild ancestors of these first cultivated plants were native to the seasonal tropical forest, where for 4-7 months of the year little or no rain falls. The soils in these places were less weathered, and the dry season enabled the efficient clearing of vegetation and the preparation of plots for planting with the simple use of fire. Table 1.3 lists 7 and 15 species of plants which were domesticated in Mexico and South America respectively. Information from 16 archeological sites dates the first appearance of crops in those sites to between 10,100 and 4,000 YBP. More specific details about the work of Dolores R. Piperno and her colleagues can be found in Piperno and Stothert (2003), Perry et al. (2006), Pohl et al. (2007), Ranere et al. (2009) and Piperno et al. (2009).

A species not considered by Piperno (2011) was cacao (*Theobroma cacao*), which has been cultivated in Mexico and Central America for over 2,000 years. Since no truly wild populations were present in this region, its origin must be looked for elsewhere. Motamayor et al. (2002), based on DNA restriction fragment length polymorphisms and microsatellites, suggest that cacao was probably established there having originated from a few plants from South America, and was subsequently spread by humans through this region.

Maize derived from teosinte, a plant in which the grain is enclosed in a hard fruit case; the earliest maize cobs were very small and the grain was very low in proteins. Why, then, would our ancestors raise it? Tykot and Staller (2002) and Smalley and Blake (2003) suggest that during the initial period of maize domestication, this plant was grown because its stalk provided a key sugar source with many uses, including the production of alcoholic beverages. The social importance of alcohol production thus helped maize's early and rapid spread. Only afterwards, with the increase in size of pods and grains, was its food importance increased. Grobman et al. (2012) studied two sites on the north coast of Peru dating from 6,700 to 3,000 YBP and found that maize cultivation in this area could be traced from at least 6,000 YBP, with the early development of distinct maize racial groupings. These were roughly contemporary in age, with the earliest maize macrofossil remains from Mexico. The early Peruvian maize was of a popcorn type.

The Late Archaic period (3000-1800 BC) was a time of major cultural development in the Pacific Coast of Peru. Large permanent communities were established, monumental architecture built, and distinct religious practices were established. Archeological studies in the North Chico region provided broad information on the production, processing and consumption of maize. The data were obtained from coprolites, pollen records and stone tools residues, indicating that maize was a primary component of the diet there during this period (Haas et al., 2013).

The dynamics of genome variation during maize domestication and improvement was considered by Hufford et al. (2012). They performed genome-wide resequencing of 75 wild, landrace and improved maize lines and found recovery of diversity after domestication, introgression from wild relatives, and evidence for stronger selection in the earlier domestication events than in the later improvement lines.

Mesoamerica and the Andes have been alternatively considered as the origin of the common bean, *Phaseolus vulgaris*, but Bitocchi et al. (2012), based on the nucleotide diversity in five gene regions of the bean's wild forms, gave what they considered to be clear evidence of the Mesoamerican origin of *P. vulgaris*, most likely Mexico.

The bottle gourd, *Lagenaria siceraria*, indigenous to Africa, had long been an enigma to archeologists, due to its almost simultaneous presence in East Asia and the Americas 8,000 YBP. Erickson et al. (2005) through the use of ancient DNA, arrived at the conclusion that the plant has had a long

history of domestication, and that it arrived in the Americas via Paleoindian populations as they colonized the continent.

Combining archeology, archeobotany, paleoecology, soil science, ecology and aerial imagery, McKey et al. (2010) determined that pre-Columbian farmers of the Guianan coast constructed large raised-field complexes on which they grew crops such as maize, manioc and squash. They created physical and biogeochemical heterogeneity in flat, marshy environments by constructing raised fields. When they were abandoned, ants, termites, earthworms and woody plants would occupy them, giving rise to a distinct type of landscape.

### **1.3.2. Megafaunal extinction**

The widespread occurrence of megafauna in the Americas and its extinction in the late Quaternary (current geological period; from ~12 kya to present) has been a puzzle to researchers, who tend to fall into two camps: those who attribute this extinction to human action through hunting, habitat modification, or the introduction of new predators; and those who maintain that humans had a minor role in this extinction, suggesting that it occurred due to climatic changes.

Steadman et al. (2005) related the last appearance date of these organisms to the first arrival of humans in North and South America and the West Indies (respectively 11,000, 10,500 and 4,400 YBP), thus favoring the human predation hypothesis. Hubbe et al. (2007), however, after providing new radiocarbon dates for South America, argued that the general lack of megafaunal killing sites and megafaunal remains in archeological sites is against the overkill hypothesis. They favor climatic fluctuations as the main cause of the extinction, relating it in Central Brazil to a dry period which happened 9,500-8,200 YBP. The debate is ongoing.

### **1.3.3. Ecological-social relationships in Mesoamerica**

The association between Clovis artifacts and Proboscidean gomphothere (*Cuvieronius* sp.) in the Mexican Sonoran desert at a site dated 11,550 YBP (El Fin del Mundo – The End of the World!) is of significance because it broadens the age and geographic range of the Clovis culture, and expands our knowledge of continental megafauna (Sanchez et al., 2014).

Killion (2013) examined Olmec subsistence practices that occurred many thousands of years later (1200-400 BC), emphasizing the importance of