INTRODUCTION

The indigenous peoples of eastern Bolivia suddenly found themselves without an employer or steady source of food supplies following the land redistribution program instituted by the *Movimiento Nacionalista Revolucionario* (National Revolutionary Movement, MNR) in 1952. In the haste to grow corn, the local population chopped down dense jungle areas of the *alturas* and *bandas* wherever the land naturally formed a relatively flat *mesa* above the Machupo River flood line. In doing so, they inadvertently disrupted the natural habitat of the *Calomys callosus* field mouse and provided the rodent with a superior new food source: corn.

The rodent population proliferated, and by the time Machupo virus surfaced, mice could be found anywhere in the village of San Joaquin. Each night, while the mice scampered about the village nibbling at the food supplies, they urinated. Infected food and air spread the virus throughout the village, and ultimately to other communities in the Department of Beni, developing into an epidemic in a matter of years. A steady stream of travelers passed through the town of San Joaquin on their way from even more remote areas in the savannas to larger Bolivian towns, producing an epidemic within a few years.

Bolivian Hemorrhagic Fever (BHF), more commonly identified as Machupo virus, emerged in 1959 as a sporadic hemorrhagic illness in rural areas of the Department of Beni in eastern Bolivia. From 1959 to 1962, Bolivian health officials reported 470 cases of BHF, at that time unidentified, resulting in 142 deaths, making for a 30% case fatality rate.[1] The primary factor in the emergence of Machupo virus into the human

[1] Stephen S. Morse, ed., *Emerging Viruses* (New York: Oxford University Press, 1993), 226.

population was the development of the lowlands, brought about by Bolivia's National Revolution in 1952.

The international interests of the United States guided the development of the eastern lowlands in conjunction with the upper-class dominated Bolivian government, without respect for the indigenous population. Nineteenth-century travel writers had first introduced the valuable natural resources of Bolivia's lowlands to the West, long since establishing the ethnocentric approach that shaped the development of the lowlands. This thesis correlates the interwoven relationship between the role of nineteenth-century travel writers in defining indigenous identity, the development of the eastern lowlands, the emergence of Machupo virus, and the actions of international health organizations mobilized to combat its spread.

Nineteenth-century travel writers provided the impetus for Western interests in the development of the eastern lowlands of Bolivia. The publication of travel writers' accounts in both British and American geographic journals established the physical and ideological maps instrumental to foreign investment in Bolivia. Nineteenth-century travel writers defined indigenous identity for the West by ascribing an insignificant racial and cultural identity that led to the marginalization of the indigenous population in the twentieth century. This Western perception of the insignificance of Bolivian Indians led to the development of colonization plans that excluded the Indians as primary participants. Left out of the national developmental programs, the indigenous population cleared uncultivated land near the Machupo River, bringing *Calomys callosus*, the natural host of Machupo virus, into contact with the human population.

Throughout history, emerging diseases have included some of the most dreaded diseases known to mankind. Diseases such as the bubonic plague, yellow fever, and smallpox, have decimated the population of many countries, disrupting not only lives, but social patterns, commerce and development as well. Diseases have played a significant role in the history of the world, and changes made by mankind have been instrumental in their emergence.

Historiography

Trade between Asia and Europe, possibly beginning with the silk route and continuing with the Crusades, brought the Bubonic Plague to Europe in the fourteenth century, resulting in significant depopulation of Europe.[2] The level of depopulation that resulted from the plague has long been a subject of scholarly discourse due to the lack of accurate census figures and reporting systems for deaths in Europe during the Middle Ages. Deaths among landholders and clergy were recorded with a dependable degree of accuracy; however, as Josiah Russell argued, peasant deaths were not always recorded. Russell's figures are considered controversial by some scholars in that they are lower than other historians' estimates, due to the statistical techniques used in calculating the number of extended family members who lived in peasant households.[3] Philip Ziegler, on the other hand, estimated the European death toll at approximately one third of the

[2] Philip Ziegler, *The Black Death* (Dover: Alan Sutton Publishing Inc., 1991), 5.
[3] Josiah C. Russell, *British Medieval Population* (Albuquerque, University of New Mexico Press, 1948), 54. Russell did not include extended family members (grandparents, siblings) living in peasant households in his calculations. Refer to other publications by Russell concerning the plague and population: "The Preplague Population of England," *The Journal of British Studies* 5, no. 2 (May 1966): 1-21; "Late Mediaeval Population Patterns," *Speculum* 20, no. 2 (April 1945): 157-171;and "Recent Advances in Mediaeval Demography," *Speculum* 40, no.1 (January 1965): 84-101.

population, using clerical records and contemporary chronicles.[4] The methodological approach to determining pre-plague populations and the effects of the plague rested largely on estimation due to the availability of accurate documentation.

A similar situation existed in Bolivia, which lacked reporting systems to document accurately the outbreaks and subsequent effects of diseases on the indigenous population until the mid-twentieth century. The endemic region for plague was isolated from the political center of La Paz, and consequently there is no accurate method to determine the occurrence of plague until the twentieth century.

During the first century of exploration and conquest, Spanish vessels brought smallpox to the Americas, which was instrumental in the depopulation of the Latin American indigenous population. The history of Latin America from the age of conquest has been a history of disease. William McNeill argued that despite dense populations, the indigenous population of the Americas was free of significant disease problems prior to the conquest; however, with no previous opportunity to develop any degree of immunity to an incoming epidemic, the Indians were devastated by exposure to European diseases.[5]

Death from smallpox far outweighed the deaths resulting from massacres by the Spanish conquistadors. Accounts from the Spanish conquest of Mexico in the early sixteenth century demonstrate the rampant spread of smallpox and the ensuing deaths that enabled a handful of conquistadors to defeat the Aztecs at Tenochtitlan.[6] Bartolome de las Casas estimated the first epidemic of smallpox in 1518-1519 in Santo Domingo

[4] Ziegler, 180-186.
[5] William H. McNeill, *Plagues and Peoples* (Oxford: Basil Blackwell, 1977), 58.
[6] Miguel Leon-Portilla, *The Broken Spears: The Aztec Account of the Conquest of Mexico* (Boston: Beacon Press, 1992), 92-94.

destroyed almost half the indigenous population.[7] A Maya Indian recorded the effect of smallpox on the indigenous population brought by the Spanish.

> There was then no sickness; they had no aching bones; they had then no high fever; they had then no smallpox; they had then no burning chest; they had then no abdominal pain; they had then no consumption; they had then no headache. At that time the course of humanity was orderly. The foreigners made it otherwise when they arrived here.[8]

This account poignantly demonstrates the indigenous perception of an orderly world prior to the arrival of the Spanish conquistadors, and firmly places the responsibility for smallpox on the arrival of the Spanish conquistadors.

There is a substantial body of scholarship that recognizes indigenous populations declined following the conquest and colonization of Latin America. Although there were other contributing factors, the general consensus by historians is that the introduction of Old World diseases was the fundamental cause for the depopulation of Latin America.[9] Scholars were faced with significant obstacles in determining the effect of disease on the pre-contact indigenous population due to the lack of written population figures. Unlike Europe during the Middle Ages, the Andean region, for example had no system of writing established to provide documentation for scholars to study; subsequently,

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[7] Bartolome de las Casas, *Historia de las Indias* (Madrid, 1957), 484.
[8] Juan Jose Hoil, Ralph Loveland Roys, *The Book of Chilam Balam of Chumayel* (Washington: Carnegie Institution, 1933), 89.
[9] Scholarly discourse on old world diseases can be found in the following selection of articles: David Henige, "Primary Source by Primary Source? On the Role of Epidemics in New World Depopulation," *Ethnohistory* 33, no. 3 (Summer 1986): 293-312; Cary W. Meister, "Demographic Consequences of Euro-American Contact on Selected American Indian Populations and Their Relationship to the Demographic Transition," *Ethnohistory* 23, no.2 (Spring 1976): 161-172; Dauril Alden and Joseph C. Miller, "Out of Africa: The Slave Trade and the Transmission of Smallpox to Brazil, 1560-1831," *Journal of Interdisciplinary History* 18, no. 2 (Autumn 1987): 195-224; Robert McCaa, "Spanish and Nahuatl Views on Smallpox and Demographic Catastrophe in Mexico," *Journal of Interdisciplinary History* 25, no.3 (Winter 1995): 397-431; and W. George Lovell, "Heavy Shadows and Black Night": Disease and Depopulation in Colonial Spanish America," *Annals of the Association of American Geographers* 82, no. 3 (September 1992): 426-443.

statistical data remain controversial.[10] Development by the West had a significant impact on disease emergence in Latin America that extended from smallpox epidemics in the sixteenth century to the viral hemorrhagic fevers in the twentieth century.

Alfred W. Crosby estimated the epidemics of smallpox in Peru and Bolivia after the Spanish conquest killed fewer Indians than in Mexico due to the climatic conditions existent in the Andean highlands.[11] Woodrow Borah, by contrast, argued the population was thick in the Andean highlands, and subsequently there were many more victims than previously estimated. In comparison to his study of the effects of disease in central Mexico, Borah cited estimated smallpox death figures provided by Cieza de Leon at 200,000 and Martin de Murua as "infinite thousands."[12] Wendell Gordon estimated the pre-contact indigenous population of the Americas to be between 13 million and 45 million.[13] Using census projection figures, N. D. Cook estimated the pre-contact population of the Andean countries of Ecuador, Peru, and Bolivia to range from a minimum of 3.2 million to a maximum of 14.9 million.[14] Scholars have not agreed on pre-contact figures for the Americas, so there is vast disparity in depopulation estimates.

Twenty identifiable smallpox epidemics between 1520-1620 significantly reduced the indigenous population of Peru and Bolivia to a fraction of its pre-conquest size. Based on disease mortality models for the series of smallpox epidemics from 1520-1620, Cook calculated the pre-contact indigenous population of Peru at a maximum of

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[10] Robert J. Alexander, "The Indians of Latin America," *Phylon* 13, no. 1 (1952): 35.
[11] Alfred W. Cosby, "Conquistador y Pestilencia: The First New World Pandemic and the Fall of the Great Indian Empires," *The Hispanic American Historical Review* 47, no. 3 (August 1967): 321-337.
[12] Woodrow Borah and Sherburne F. Cook, *The Aboriginal Population of Central Mexico on the Eve of Spanish Conquest* (Berkeley:, 1963), 4, 89.
[13] Wendell G. Gordon, *The Economy of Latin America* (New York: Columbia University Press, 1950), 26.
[14] N. D. Cook, *Demographic Collapse: Indian Peru 1520-1620* (Cambridge: Cambridge University Press, 1981), 60-61.

8,090,421, with the post-contact population reduced to 671,505 by 1620.[15] Henry Dobyns, on the other hand, estimated the population of the Andean countries substantially higher at 37.5 million.[16] Although scholars have not agreed upon an exact figure for pre-contact indigenous population of Latin America, they have agreed that Old World disease significantly depopulated the Americas.

There are scholars however, who argue that there were other significant factors that contributed to indigenous depopulation. Juan Friede argued the numbers estimated by other historians were too high, and suggested consideration had to be given to the effect of excessive work, malnutrition, separation of the sexes, ill-treatment, cruelty, conscription for expeditions, enslavement, and the labor draft known as the *mita*.[17] In addition, Newson argued that plague could have been responsible for a degree of depopulation prior to the arrival of the Spanish in Peru.[18]

The twentieth century saw the emergence of a new family of diseases, viral hemorrhagic fevers, to which Machupo virus belongs. Viral hemorrhagic fevers induce nervous system malfunction, coma, delirium, seizures, and signs of bleeding under the skin, in internal organs, and from body orifices like the mouth, eyes, and ears. Stephen Morse acknowledged ecological factors frequently precede the emergence of new diseases by placing people into contact with a natural reservoir or host for an infection

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[15] Cook, 108-110.
[16] Henry F. Dobyns, "An Outline of Andean Epidemic History to 1720," *Bulletin of the History of Medicine* 37 (1963): 495.
[17] Juan Friede, "Demographic Changes in the Mining Community of Muzo After the Plague of 1629," *Hispanic American Historical Review* 47 (1967): 339.
[18] L. A. Newson, "Indian Population Patterns in Colonial Spanish America," *Latin American Research Review* 20 (1985): 27.

unfamiliar but usually already present in the environment.[19] Stuart Nichol concurred, adding that tropical deforestation brought humans into contact with environments rich in natural hosts to a significant number of new diseases.[20] *Calomys callosus*, the natural host for Machupo virus, already existed in the eastern lowlands, but was relatively scarce and limited to isolated parts of the environment.[21] The indigenous peoples altered environmental conditions when they cleared land for planting corn to favor an increased population of the natural host to Machupo virus. Ecological changes, including those due to agriculture or economic development, are the most frequently identified factors in the emergence of new diseases.

One of the major long-term accomplishments of the Bolivian National Revolution in 1952 was the stimulation of agricultural and economic development of the eastern part of the country. The MNR is responsible for three major reforms during its 12 years in power: nationalization of the tin mines; granting universal suffrage to include the Quechua and Aymara Indians; and the institution of a massive land redistribution campaign.[22] Bolivia redistributed approximately one-third of its agricultural land after 1953.[23] Most significant for the emergence of Machupo virus was the issue of land redistribution.

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[19] Stephen S. Morse, "Factors in the Emergence of Infectious Diseases," *Emerging Infectious Diseases* 1 (January-March 1999): 904.
[20] Stuart T. Nichol, Jiro Arikawa, Yoshihiro Kawaoka, "Emerging Viral Diseases," *Proceedings of the National Academy of Sciences of the United States of America* 97 (November 2000): 12411.
[21] World Health Organization, *"Report of a WHO Expert Committee, World Health Organization, Viral Haemorrhagic Fevers,"* Technical Report Series no. 721 (Geneva: World Health Organization, 1985), 64.
[22] Herbert Klein, *Bolivia, The Evolution of a Multi-Ethnic Society* (New York: Oxford University Press, 1982), 38.
[23] Herbert Klein and Jonathan Kelley, *Revolution and the Rebirth of Inequality*: *A Theory Applied to the National Revolution in Bolivia* (Berkeley: University of California Press, 1981), 12.

Scholars have acknowledged the minimal participation by the indigenous population during the early days of the revolution from April 9 to 11, 1952.[24] Herbert Klein firmly espoused the role of the middle classes in the revolution, noting the Indians and working class were not involved in crucial arrangements.[25] Richard Patch, however, asserted that the revolutionary impetus actually sprang from the Department of Cochabamba in the lowlands, where organized syndicates of Indians seized the land of *patrones*, taking the *campesino* movement completely outside the control of the national government of MNR party leaders.[26]

As a result, through the Agrarian Reform Decree of August 2, 1953, the MNR sought to enhance it's position as a reformist government, when the *campesinos* had already seized many of the *haciendas*. Patch argued, "The Indian population organized syndicates independent of the government and forced enactment of agrarian reform."[27] The MNR, according to Patch, had plans for an eventual agrarian reform, but no plan could have been as "sweeping as the one initiated by the Indians themselves and only

[24] James V. Kohl, "Peasant and Revolution in Bolivia: April 9, 1952 – August 2, 1953," *The Hispanic American Historical Review* 58 (May 1978): 239. Additional scholarly articles on the role of the indigenous population in the revolution include: Richard Patch, "Bolivia: The Restrained Revolution," *Annals of the American Academy of Political and Social Science* 334 (March 1961); Dwight Heath, "The Aymara Indians and Bolivia's Revolutions," *Inter-American Economic Affairs* 18 (Spring 1966); and David Greene, "Revolution and the Rationalization of Reform in Bolivia," *Inter-American Economic Affairs* 19 (Winter 1965).

[25] Herbert S. Klein, "The Crisis of Legitimacy and the Origins of Social Revolution: The Bolivian Experience," *Journal of Inter-American Studies* 10 (January 1968): 102-116.

[26] Richard Patch, "Bolivia: U. S. Assistance in a Revolutionary Setting," in Richard Adams, et al., *Social Change in Latin America Today: It's Implications for United States Policy* (New York: Published for the Council on Foreign Relations, 1960), 122. For similar interpretations refer to: Cornelius Zondag, *The Bolivian Economy, 1952-1965: The Revolution and its Aftermath* (New York: Praeger, 1966); Eldon Landing, "Government Capabilities in a Revolutionary Setting: The MNR in Bolivia," *Inter-American Economic Affairs* 23 (Autumn 1969); James M. Malloy, *Bolivia's MNR: A Study of National Popular Movement in Latin America* (Buffalo: Council on International Studies, State University of New York at Buffalo, 1971).

[27] Richard Patch, *Bolivia: The Restrained Revolution* (Madison: Land Tenure Center, 1961), 128.

formalized by the government decree-law of August 2, 1953."[28] Patch's argument bears examination, for it is reflective of the stance the Bolivian government took toward colonizing the lowlands. Far more effort was extended in the establishment of colonies for immigrants than in colonization programs for the indigenous population, further reinforcing the marginalization of the indigenous population.

The MNR government began the policy of encouraging migration to eastern Bolivia in the form of resettlement programs to stimulate the development of commercial agriculture. The major objectives of the resettlement programs were to increase the production of domestic food crops, to encourage migration to the less populated lowlands, and to integrate the indigenous population into the national economy. Three factors influenced the migration policies of the government following the Bolivian National Revolution: national poverty, under-development, and fear of encroachment on its borders by Brazil. The majority of Bolivia's population was crowded into the *altiplano* and highland valleys, leaving the territory of the eastern provinces virtually uninhabited by the national society. In a series of wars lost during the nineteenth and twentieth centuries, Bolivia ceded much of its territory to neighboring countries. The first of these losses was the nitrate-rich Atacama Desert and the port of Antofagasta to Chile in 1884, followed by the Acre territory to Brazil in 1903, and soon afterward by three quarters of the Chaco to Paraguay in 1935.[29]

The Bolivian National Revolution's agricultural development plan designated eastern Bolivia as a priority area of colonization. When the MNR came to power in

[28] Ibid.
[29] E. Bradford Burns, *Latin America: A Concise Interpretive History* (New Jersey: Prentice Hall, 1994), 344-345.

1952, the United States was concerned about the ideological orientation of the party, and about the strong Marxist influence that could end up controlling the Bolivia during the era of McCarthyism.[30] The fear of communism had a significant impact on the policies of the United States with regard to Bolivia. The National Security Council, Stephen Zunes argued, was instructed to "combat Communist agrarian reform by encouraging land development of our type." Subsequently, the United States supervised international aid distributed in the form of directed colonization efforts. Due to depressed economic conditions and the established marginalization of the indigenous population, the MNR government welcomed funding from the United States, and redirected its efforts at immigration rather than migration.

Resettlement and immigration programs were seen as viable solutions to the problems identified by the MNR. With the proper economic incentives, colonization would stimulate agricultural and economic development, thus alleviating some of the problems associated with national poverty and under-development. The presence of a population integrated into the national economy would concomitantly eliminate the threat of future encroachment by Brazil. These were fundamental objectives of the Agrarian Reform Act initiated by the MNR following the Bolivian National Revolution in 1952.

These developmental objectives were designed without regard for the existent indigenous population. The territory designated for colonization comprised a diversity of indigenous cultures. Thirty distinct groups representing eleven language families occupied the eastern lowlands in the middle of the twentieth century.[31] The Aymara and

[30] Stephen Zunes, "The United States and Bolivia: The Taming of a Revolution, 1952-1957," *Latin American Perspectives* 28 (September 2001): 33-34.
[31] Summer Institute of Linguistics, http://www.sil.org/linguistics.

Quechua were the best known and most numerous throughout the country, but the real diversity was found in the lowland forests and savannas of eastern Bolivia. Due to the combined effects of disease and development, only a limited number of *indios foresteros*, the original inhabitants of the region, remained and continued their traditional subsistence hunting and gathering lifestyle following the resettlement programs.

The task of managing the Indians occupying the land designated for immigrant occupation was relegated to missionaries, who worked to move the Indians into mission towns. There were several problems inherent in this process. First, the government failed to integrate the indigenous population into the national economy, condemning them to a marginalized existence. Second, the culture of the Indians was compromised in the process of integrating them into mission towns. Third, without proper integration into the economy, the Indians followed in the footsteps of past-assimilated *indios foresteros* and cleared land for subsistence living, which provided the opportunity for Machupo virus to emerge into the human population. The social, economic, and environmental impact of the increased population brought about by immigration and resettlement had a significant impact on the outbreak of Machupo virus.

There is a definitive lack of written primary sources produced by the *indios foresteros*, the original inhabitants of the eastern lowlands, which remains problematic. The indigenous population has a long history of its own, with its own view of the world, separate and distinct from the West. Due to the lack of a written history, others have ascribed the identity of the indigenous population from the outside. In this process, no one asked the Indians how they defined themselves, which ultimately condemned them to a marginalized existence in their own country.

There was a vast array of literature produced by travel writers and explorers that addressed the indigenous population. Travel writing as a genre described people, places, and things in detail, and it was in these descriptions that indigenous identity was defined for Western readers. There were distinct deficiencies in the literature produced by nineteenth-century travel writers. Caroline Brettell referred to the "cultural baggage" travel writers brought with them, which influenced how they saw the world they described.[32] Brettell argued that travel writers were the receivers and carriers of current literary, artistic, and cultural ideas. "When abroad, their eyes saw no more than their minds, shaped at home, were prepared to accept."[33] The excessive comments by travel writers about skin color, physical attributes, and cultural deficiencies in comparison with the "civilized" world, emanated from the extant prejudices of the observer.

Western travel writers provided a rich source of information regarding Western perceptions of the territory and the indigenous population of eastern Bolivia. Through these depictions of indigenous people, the Western reading public was able to construct an image of Indians, the region in which they lived, and their belief systems. Yet, these images are inherently problematic in that they were constructed from the cultural framework of the West in conjunction with Western ideological perceptions. According to Kristine Jones, British travel writers in Argentina, for example, de-legitimized the role of indigenous people in frontier expansion. Jones asserted that travel writers reflected shifts in expansionist ideology.[34] This relationship is evident upon examination of the

[32] Caroline B. Brettell, "Travel Literature, Ethnography, and Ethnohistory," *Ethnohistory* 33 (Spring 1986): 127.
[33] Brettell, 129.
[34] Kristine L. Jones, "Nineteenth Century British Travel Accounts of Argentina," *Ethnohistory* 33 (Spring 1986): 195.

nineteenth-century travel writers' accounts in comparison with the increased role of the United States in guiding the development of the eastern lowlands in the twentieth century.

Within these accounts lies the Western perception of the Indians, which ultimately defined indigenous identity for the literate world. Travel writers superimposed contemporary Western value systems on the indigenous populations observed, which determined how the West perceived the Indians. It was this perception of Indians as uncivilized savages that governed the direction of the development of the lowlands as a vast uninhabited territory. Concomitantly, travel writers provided the West with information regarding the economic resources of the region, as well as the geographic barriers to extracting those resources, without taking significant note of the indigenous population.

Economic development was historically the motivating factor for travel writers, and subsequently, the economic interests of Western countries subsidized the exploratory efforts of this genre of travel writers and explorers. Jacques Maquet contended the nineteenth-century traveler's accounts answered questions about places in which the writers had a commercial or colonial interest.[35] Political and economic interests both influenced British travel accounts of Argentina. Brettell argued published accounts were instruments to encourage settlement and stimulate trade. Later in the century they became exotic and mysterious, emerging into a distinct literary form in part in response to the appeal to the romantic and the primitive.[36] Her theory is definitively applicable to the lowlands of Bolivia, evidenced by examination of travel writers accounts and the

[35] Jacques Maquet, "Objectivity in Anthropology," *Current Anthropology* 4 (1964): 47.
[36] Brettell, 133.

subsequent colonization in the twentieth century. The trajectory of the development of the eastern lowlands was established within the framework of nineteenth-century travel writers.

Methodology and Sources

Chapter I analyzes the travel writings of the nineteenth-century and the effect of those publications on defining indigenous identity for Western readership. Although the development of the eastern lowlands is the primary cause of the emergence of Machupo virus into the human population, that development could not have occurred without the assignation of an identity that de-legitimized the indigenous population.

Chapter II addresses the development of the eastern lowlands, focusing on the settlement and colonization efforts instituted by the Bolivian government and directed by the international community. Awareness of the vast economic resources extant in the lowlands permeated the Western world, and provided the impetus for foreign investment to aid Bolivia in the development of an infrastructure to transport trade products to Western markets. Due to international involvement in the economic development of the eastern lowlands, the sources used in Chapter II are diverse, including national census figures, national and international developmental program reports, and international aid documents.

The lack of historiography concerning the relationship between the development of eastern Bolivia and epidemiology is problematic in itself. Historians have addressed the political, social, and economic factors emanating from the revolution, but the epidemiological impact has yet to be addressed in a scholarly manner. The twentieth

century demonstrated an apparent dilemma in Bolivia with epidemics of plague, yellow fever, and typhus, each of which was addressed by the international community as impediments to development prior to the emergence of Machupo virus. The continued presence of malaria was an obstacle that had to be overcome in order to integrate the region into the national economy, which led to the policy of spraying infectious areas with DDT, which was a contributing factor to the epidemic of Machupo virus. The immediate effect of large quantities of DDT was a massive feline die-off, eliminating the only natural predator to the rodent, *Calomys callosus*.

Chapter III examines the historical epidemiology of Bolivia, with particular attention to the endemic area of the eastern lowlands. The distance between the lowlands and the political center of La Paz, the lack of a transportation network, and the marginalization of the indigenous population all contributed to the lack of reliable data. The primary sources available for this chapter are limited. They include Pan American Health Organization reports, the Final Epidemiological Report prepared by the Peace Corps for the Research Institute for the Study of Man in 1967, and Public Health Department reports drafted in La Paz. Although this chapter is brief, it establishes the fundamental epidemiological framework in which Machupo virus emerged. Subsequently, an explanation of viral hemorrhagic fevers is provided in order to understand the nature of the epidemic that faced the indigenous population of the Eastern lowlands.

With the establishment of an indigenous identity defined by travel writers, the development of the lowlands underway, and the epidemiology of this historical juncture analyzed, Chapter IV addresses the emergence of Machupo virus. An examination of the

historical framework that led to the Bolivian National Revolution in 1952 and the subsequent policies of the *Movimiento Nacionalista Revolucionario* provide contextual information relative to the emergence of Machupo virus. Primary sources in this section include scientific articles published by the physicians and scientists who were active participants in isolating Machupo virus. There are problems inherent in this process, since the scientists wrote the articles for publication in scientific journals, often jointly, with a focus directed toward the scientific nature of the disease. A valuable source of information regarding the process of isolating Machupo virus lies in a dissertation prepared by Edwin Tyson, who studied the ecology of bats in relation to Machupo virus. Tyson's contribution lies in more than just the scientific methodology evidenced by his dissertation, but also the absence of any mention of the local population. Each of these sources served the purpose of illustrating the cultural identity of the physicians, which was in direct contrast with the identity of the population of the Department of Beni.

In the summer of 2003 I conducted two interviews relative to the emergence of Machupo virus. One interview was conducted with an architect of German descent whose family had immigrated to Bolivia in conjunction with the colonization programs aimed at developing the lowlands. His father befriended one of the physicians involved with the isolation of Machupo virus, Ronald MacKenzie, who was a guest in the family home when he was a child. The other interview was with a Tacana Indian who recalled stories his grandmother related about the disease and its' transmission. These interviews provide the historical perspective of both the indigenous and the immigrant population.

I have relied upon two secondary sources in reconstructing the case history of the emergence of Machupo virus, and consequently, have used sources with different

historiographical approaches whenever possible. The best source of primary information would involve interviewing the people of San Joaquin and the physicians involved in the research themselves; however that was not a viable option. Published interviews by journalists with Ronald MacKenzie and Karl Johnson have provided a narrative of the events as they occurred. I have identified two useful sources of interviews: Trevor Armbrister, Bureau Manager in Washington for *The Saturday Evening Post;* and Laurie Garrett, author of *The Coming Plague*. Armbrister's interview was conducted after MacKenzie's return to the United States in 1966, and was concurrent with the time of the epidemic, whereas Garrett's interview with Karl Johnson during the early 1990s was presented in the context of global disease. There are fundamental problems with the use of these interviews. First, each interviewer brought with them a set of values that influenced the presentation of the information gathered in the interview. Second, the possibility of misinterpretation exists. I have acknowledged discrepancies in these interviews without passing value judgments upon the authors. At the same time, this problem with sources is revealing in itself, replicating the incomplete and often biased representation of the Indians and their region to the outside world, which was one of the key dynamics shaping this history.

In an interview with virologist Karl Johnson, Laurie Garret coined the term "disease cowboys" and I instantly developed an affinity for the parallel, and have applied it to my work. Much like the Spanish *caballeros* who rode about their *haciendas* solving day-to-day problems, these "cowboys" rode into town, hunted the disease, and then rode off into the sunset. Literally speaking, they did ride into town. However, it was with mules carrying their scientific equipment to set up laboratories. They came with their

own cultural identities, separate and distinct from the identities of the indigenous population of San Joaquin, by all accounts to save the lives of the people affected by Machupo virus. There is, however, a second aspect of the analogy that is equally applicable, and that is the cowboy of the American West, who aided in the fight against savage Indians so that Western civilization could prevail. The "disease cowboys" aided in the fight against Machupo virus, which enabled the West to prevail in the development of the lowlands, securing the economic and political goals of the West, often in the guise of Bolivian elites.

The physicians responsible for isolating Machupo virus, the so-called "disease cowboys," however, had a significant impact on the intercultural relationship between Western physicians and the indigenous population. The severity of the epidemic forced the people of San Joaquin to rely on assistance from the West, a policy that in the past had contributed to the subjugation of the indigenous population. In an era guided by ethnocentric policies, the "disease cowboys" bridged the gap between the Western policy-makers and the local population. In a way, Machupo virus was responsible for instilling a sense of trust in Western medicine, which could do little else than improve the dismal situation of the marginalized indigenous population of eastern Bolivia following the National Revolution in 1952.

One of the political accomplishments of the Bolivian National Revolution was the stimulation of agricultural and economic development of the eastern part of the country. International interests guided the development of the eastern lowlands, in order to prevent Bolivia from succumbing to the burgeoning communist threat at mid-century.

Although the eastern lowlands have an extensive history of disease, the twentieth century saw the emergence of a new family of diseases, viral hemorrhagic fevers, to which Machupo virus belongs.

The emergence of new diseases occurs when populations are put into contact with a natural host for an infection unfamiliar but usually already present in the environment. The natural host for Machupo virus, *Calomys callosus*, already existed in the eastern lowlands, but was relatively scarce and limited to isolated parts of the environment. The indigenous population altered environmental conditions when they cleared land for subsistence agriculture to favor an increased population of the natural host to Machupo virus. The primary factor in the emergence of Machupo virus was the development of the eastern lowlands. The development of the lowlands could not have occurred, however, without the ascription of a de-legitimized identity of the indigenous population, defined by nineteenth-century travel writers and their twentieth-century intellectual heirs.

CHAPTER I

TRAVEL WRITING: DEFINING INDIGENOUS IDENTITY

Eastern Bolivia presents a paradox common in South America, of an area about which there is extensive literature, written by travel writers and scientists, but whose indigenous population were ignored or only described in the most summary fashion prior to the twentieth century. There was a vast amount written about the geography and resources of the continent, however, the lack of attention to the indigenous population in itself defined their identity for the Western world. Beginning with the Spanish conquest of Latin America in the sixteenth century, the identity of the indigenous population has been ascribed from the outside. During the conquest of Mexico, Bernal Diaz described the indigenous population as "savages and very stupid," a portrayal which was perpetuated by nineteenth-century travel writers.[37] This chapter analyzes the images produced by travel writers and analyzes the impact of those images on defining indigenous identity.

Nineteenth-century travel writers provided the impetus for Western interests in the development of the eastern lowlands of Bolivia. Publication of travel writers' accounts in British and American geographic journals provided the physical and ideological maps instrumental to foreign investment in Bolivia. This Western perception of the indigenous population led to the development of colonization plans that essentially dismissed the Indians as anything but secondary participants in the process. Alienated from national colonization programs, the indigenous population cleared uncultivated land

[37] Bernal Diaz, *The Conquest of New Spain*. Translated by J. M. Cohen (Harmondsworth: Penguin Books, 1965), 164.

in the Machupo River Basin to plant corn for subsistence agriculture, bringing the natural host of Machupo virus, *Calomys callosus*, into contact with the local population, resulting in an epidemic in a matter of years.

The ascription of a substandard identity upon the indigenous population by the West was a fundamental step in the progress of developing the eastern lowlands. With the Indians assigned a marginalized role in eyes of the developed world, the foundation was laid for the development of eastern Bolivia for Western economic expansion. Agricultural development was an intrinsic component of the development plans, and was instrumental in bringing the natural vector for Machupo virus into contact with the human population. Western travel writers provided a rich source of information regarding the territory and indigenous population of eastern Bolivia, yet bring a distinct set of problems in that travel writers have defined the cultural identity of indigenous populations for the Western world. Through their representations, people in the West were able to construct an image of indigenous people, the territory in which they lived, and their religious belief systems, particularly as it pertained to matters of life, death, and disease. These images are problematic in that they were developed from the cultural mindset of the West, in conjunction with Western ideological constructs.

The publication of Charles Darwin's *On the Origin of the Species* had a significant impact of the cultural perspective of the travel writers in their perception of Indians. Although Darwin's publication revolutionized the study of natural history by introducing the theory of evolution, the concepts of natural selection were applied to mankind, resulting in a system of racial classification recognized as Social Darwinism. The role of race in Latin America has deep historical roots. Many forms of racism arose

out of the conditions of conquest, exemplified in the case of the indigenous population of Latin America. Dante Puzzo asserted that racism rests on two fundamental assumptions: that a correlation exists between physical characteristics and moral qualities; and that mankind is divisible into superior and inferior stock.[38] The division of races into superior and inferior classifications was produced according to Western standards, condemning all other ethnic groups to a marginalized position.

By the middle of the twentieth century, the defining role of race in identity diminished significantly. Even though Joseph Deniker used the word race in the title of his book, *The Races of Man*, he devoted much of his introduction to the difficulties involved in the application a term directed toward the zoological classification to man.[39] Ashley Montagu argued the pre-existing term of "race" determined the manner in which the term was perceived, and urged its abandonment by biologists and social scientists.[40] It was not until the middle of the twentieth century following the repercussions of global independence movements concomitant with the attempted annihilation of the Jews during World War II that it was recognized racism had evolved into a global societal problem. UNESCO published a report in 1968 stating that all men belonged to the same species and came from the same stock, in an effort to diminish the role of race in existent prejudices.[41]

Montagu stressed that race was defined and used in the mid-twentieth century much as it had been in the nineteenth century, "as a subdivision of a species the members

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[38] Dante A. Puzzo, "Racism and the Western Tradition," *Journal of the History of Ideas* 25 (October 1964): 579.
[39] Joseph Deniker, *The Races of Man* (London: The Walter Scott Publishing Co., Ltd., 1900), 2-3.
[40] Ashley Montague, "The Concept of Race," *American Anthropologist* 65, Part 1 (October 1962): 919.
[41] UNESCO, "UNESCO Statement on Race and Racial Prejudice," *Current Anthropology* 9 (October 1968): 270-272.

resemble each other and differ from other members of the species in certain traits."[42] Reflective of this concept, nineteenth-century travel writers provided incredibly detailed descriptions of the physical traits of Indians they encountered, in comparison to the characteristics of the West. In doing so, travel writers furthered the concept of the existence of lower races in their publications.

Latin American historian Richard Graham asserted that racist ideology was more closely linked to the concept of the other rather than to the biological concept of race.[43] The process of describing the other was the subject of significant scholarly discourse in the late twentieth century. Anthropologist Tzvetan Todorov presented the paradigm that specific images and ideas regarding other remote populations were imposed upon newly discovered peoples.[44] Within the confines of this model, Todorov developed a typology of relations to the other that accounted for a dimension of the presentation of indigenous cultures by travel writers.

Todorov's three-part typology included a value judgment wherein "the other" was determined to be either equal or inferior. In the context of travel writing, "the other" was constantly perceived as inferior for failing to meet the cultural standards established by the West. The second part of the typology presented by Todorov was the action of distancing oneself in relation to the other. Travel writers did indeed distance themselves, and in doing so, imposed their own image upon the Indians, reducing the Indians to a

[42] Montague, 920.
[43] Richard Graham, ed., *The Ideas of Race in Latin America, 1870-1940* (Austin: University of Texas Press, 1990), 147.
[44] Tzvetan Todorov, "*The Conquest of America: The Question of the Other*" (Norman: University of Okalahoma Press, 1999), 5.

subjugated role. The third part is the typology was the acknowledgement of ignorance of "the others" identity.[45]

Colonial Latin American Historian, Stuart Schwartz suggested the description of "other" cultures by writers informs scholars more about the observers than those observed.[46] Schwartz argued travel writers brought with them certain cultural characteristics such as language, dress, religion, and social standards that were applied to the Indians the writers encountered, which resulted in a perception of "uncivilized" savages. Subsequently, the cultural construct of the travel writers themselves is evident in the judgments recorded regarding the identity of indigenous people.

The assessment of Western ideological constructs needs to include the vocabulary, imagery, and rhetoric used by travel writers to define indigenous identity. Literary Critic Edward Said argued that the British used language to define the Oriental as depraved, childlike, and different, making the European appear rational, virtuous, mature, and thus, normal.[47] Western travel writers exhibited the same technique in describing the indigenous peoples encountered in Bolivia. Language used to describe Indians included terminology such as hostile, lazy, slovenly, and the assignation of a role as one of the lower races, which made the travel writers appear more civilized in comparison.

Travel writers superimposed contemporary Western value systems on the indigenous populations they observed, which determined how Western readers perceived them. Furthermore, over a period of time, this imagery affected how the indigenous

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[45] Todorov, 185.
[46] Stuart Schwartz, *Implicit Understanding: Observing, Reporting, and Reflecting on the Encounters Between Europeans and Other Peoples in the Early Modern Era* (Cambridge: University Press, 1994), 2-4.
[47] Edward Said, *Orientalism* (New York: Vintage Books, 1979), 40-41.

peoples viewed themselves, evident in the body of literature produced by travel writers. Mary Louise Pratt suggested that travel writing produced the rest of the world for Western readers.[48] This concept was instrumental in the formation of this chapter. Through analysis of travel writing, a distinct image of indigenous identity was defined for Western interpretation. This image was formulated in comparison to Western cultural standards that represented what the West perceived as civilized.

Individual traveler writers were unique, and each developed a style based on the time he was writing, the place he was writing about, the audience he was addressing, and his own motivations. The more scholars understand about the individual travel writers, the easier it is to judge their accounts. These are the fundamental methods of history, asking of any source, who wrote it, when, where, and why. Subsequently, this chapter attempts whenever possible to provide an understanding of each of the travel writers analyzed.

Many travel accounts were published after Bolivia achieved its independence from Spain in 1825.[49] The selection of travel writers used in this chapter is representative of the genre instrumental in defining indigenous identity and shaping the development of the eastern lowlands. In an examination of nineteenth-century British travel writers, Samuel Trifilo identified commercial travelers interested in establishing trade relations, mining engineers, technicians, metallurgists, army and navy personnel, naturalists, and colonizers as the primary writers in Chile.[50] The same variety of travel writers explored the lowlands of Bolivia, much to the same purpose. Defining indigenous identity was not

[48] Mary Louise Pratt, *Imperial Eyes: Travel Writing and Transculturation* (London: Routledge, 1992), 5.
[49] Burns, 343.
[50] Samuel Trifilo, "Early Nineteenth-Century British Travelers in Chile: Impressions of Santiago and Valparaiso," *Journal of Inter-American Studies* 11 (July 1969): 392.

the objective of early travel writers; instead exploration and travel writing for economic development were historically the motivating factors for travel writers. The economic interests of the West frequently subsidized the exploratory efforts of this genre of travel writers and explorers. A significant point of reference in the travel account is the readership members of the traveler's own culture.

Significant historical and ideological transformations occurred toward the end of the nineteenth century, which influenced the perceptions of the travel writers. Three key events that affected the ideological constructs of Western travel writers toward the end of the nineteenth century were the American Civil War, the expansion of the United States Western frontier, and the end of slavery. First, with the end of the American Civil War, there was a supply of well-trained and disciplined military men, accustomed to the hardship of war, who continued their careers with the United States government as explorers in South America. Second, the expansion of the American frontier established a policy of displacement of indigenous populations for development. Third, the end of slavery resulted in a search for an inexpensive source of labor to produce trade goods.

The travel writers selected for analysis in this chapter are listed in Table I, with the dates of publication, the journals, and books in which the accounts were published. Examination of the publications provides insight into the significant role of Great Britain in the economic development of Bolivia. Nine of the eighteen travel accounts were published in London, the economic center for Great Britain, six accounts in New York, the economic center of the United States, and two in Washington D.C., the political center of the United States.

Table I
Selected Nineteenth-Century Travel Writers

Author	Date	Publication
Thadeus Haenke	1799	*Journal of the Royal Geographic Society of London,* London
Alexander Humboldt	1814	*Research Concerning the Institutions and Monuments of the Ancient Inhabitants of America, With Descriptions and Views of Some of the Most Striking Scenes in the Cordilleras!* London
Dr. J. J. Von Tschudi	1847	*Travels in Peru During the Years 1838-1842. On the Coast, In the Sierra, Across the Cordillera and the Andes, Into the Primal Forests,* London
Count Francis de Castelnau	1847	*Proceedings of the New York Historical Society,* New York
J. A. Palacios	1852	*Exploracion de los Rios y Lagos del Departamento del Beni, y en especial el Madera, practicada de orden del Supremo Gobierno de Bolivia,* La Paz
W. Bridges Adams	1853	*The Dwarfed Races of Mankind,* New York
William Lewis Herndon	1853	U. S. Government, Washington, D. C.
Lardner Gibbon	1854	U.S. Government, Washington, D. C.
Colonel George E. Church	1872	*Northern Bolivia and Its Amazon Outlet,* New York
Franz Keller	1875	*The Amazon and Madeira Rivers. Sketches and Descriptions from the Note-Book of an Explorer,* Philadelphia
Henry Eckford	1877	*From the Atlantic to the Andes,* New York
George Chatsworth Musters	1877	*Journal of the Royal Geographic Society of London,* London
C. Barrington Brown	1878	*Fifteen Thousand Miles on the Amazon and its Tributaries,* London
A. W. Buckland	1879	*Journal of the Anthropological Institute of Great Britain and Ireland,* London
Edwin R. Heath	1883	*Proceedings of the Royal Geographic Society and Monthly Record of Geography,* London
Clements Markham	1883	*Proceedings of the Royal Geographic Society and Monthly Record of Geography,* London
H. Arnous de Riviere	1900	*Journal of the American Geographical Society of New York,* New York

Great Britain was the preeminent foreign investor in Latin America from the 1820s until the outbreak of World War I.[51] According to Irving Stone, nearly fifty per cent of British capital was invested in railways, public utilities, and financial ventures in the late nineteenth century. Between the years of 1885-1895, railway investments in Latin America increased significantly, ranking second to government loans.[52] The economic interests of Great Britain are evident in examination of the publication sources examined in this chapter. The predominant British journal in which travel writers published their accounts was *Journal of the Royal Geographic Society of London.*

Physical Geography

Travel writers and explorers faced enormous difficulty in traversing the topography of Bolivia. It seems appropriate in the context of a chapter on travel writing to use geographical description of the topography from the South American Handbook, which was a popular twentieth century travel guide to South America, and continues to be such in the early twenty first century.[53] Bolivia is a land-locked country in the center of South America, bordered on the north and east by Brazil, on the south by Paraguay and Argentina, and on the west by Chile and Peru. Bolivia currently occupies 1,500,000 square miles of land within its borders. There are three distinct regions within Bolivia's borders: the *altiplano*, the *yungas*, and the *oriente*. Historically, the country has been examined in cultural terms rather than geographical, reducing the number of regions to two: the highlands (the *altiplano* and *yungas*) and the lowlands (the *oriente*). From the

[51] Irving Stone, "British Direct and Portfolio Investment in Latin America Before 1914," *The Journal of Economic History* 37 (1997): 690.
[52] Stone, 692.
[53] Ben Box, *South American Handbook* (Suffolk: Clays, Ltd., 1996), 243-246.

summits of the Andean *Cordillera Real*, Bolivia's northern boundary plunges north and northeast into the rainforests of the interior. This vast frontier covers more than 1800 miles of central South America and comprises more than half the total Bolivian territory.

Within the upper Amazon Basin, the rugged nature of the Andean *Cordillera* obstructs east-west communication and transportation, separating the populations of *altiplano* and lowlands. The descent from the Cordilleran peaks of over 20,000 feet into the plains of the *Norte* and *Oriente*, less than 600 feet above sea level, is abrupt. The country is divided into nine political units identified as departments. The departments are further divided into provinces, and then into *cantones*.

The Andean mountains, known as the *Cordillera Real*, separate at the Chile-Argentina-Bolivia frontier into two chains that spread until they become furthest apart in Bolivia before joining again to the north. Between these two chains that reach an altitude of 22,000 feet, lies the *altiplano*, a high plateau at 10,000 to 13,000 feet of altitude in the *Cordillera Real*. The region is cold, barren and dry. The average daily temperature is forty-eight degrees, which frequently drops below freezing at night. Due to the high altitude, there can be a difference of twenty degrees between the sun and shade. There is little seasonal variation in temperature in the highlands; however, seasons are marked by changes in precipitation. Despite the cold, barren, arid climate of the altiplano, seventy five per cent of the population live in the territory, which comprises only fourteen per cent of the national territory.

The valleys along the eastern slope of the *Cordillera Real* represent part of the Departments of Tarija, Potosi, Chuquisaca, and Cochabamba. These valleys have an altitude of 5,000 to 9,000 feet, with a semi-arid climate with average temperatures around

sixty-five degrees. The yungas cover about ten per cent of the national territory, and currently support approximately fifteen per cent of the population.

The lowlands encompass approximately sixty per cent of Bolivia's land area, and are hot, humid, flat, and sparsely populated. *Yungas*, an Aymara word meaning valleys, describes the river valleys on the lower slopes of the Andes with an altitude of 2,500 to 5,000 feet with a semi-tropical to tropical climate. The *yungas* are important to the development of Bolivia because of their proximity to La Paz, which lies approximately one hundred fifty kilometers northeast. The lower ends of these valleys form the headwaters of the Beni River, and represent part of the territory the MNR visualized for resettlement programs. The semi-tropical region east of the yungas includes savannas and wooded plains that comprised from four to eight per cent of the population at mid-century. Until completion of the Cochabamba-Santa Cruz highway in 1954, transportation between this region and the political center of La Paz was limited to air travel and dirt trails.

The *Oriente* is comprised of the Beni River Basin, and represents the tropical region of the lowlands. This plain extends from the Andean foothills to the Brazilian border with an altitude of 600 to 1,000 feet. Two seasonal changes are characteristic of the Department of Beni. The rainy season, lasting from November until April, and the dry season, May to October. This *oriente* represents fifty per cent of the Bolivian territory, yet supported only two per cent of the population at mid-century. It is this region the MNR government sought to populate in order to meet the goals of development.

Over Bolivia's eastern frontier sprawl the jungles surrounding the Guapore and Verde rivers, which together with the Abuna, Madre de Dios, and Beni systems, carry the drainage of much of northern Bolivia into the cataracts of the Madeira-Mamore in the Brazilian outlet to the Amazon Basin. Between February and May, run-off from the Andean Cordillera and heavy local precipitation result in widespread flooding over much of lowland Bolivia. Enclosed between the rugged Andean Cordillera and the vast stretches of jungle and swamp, the environment represents the quintessential image of emptiness and isolation. Wherever early travel writers penetrated the interior of this extensive region of Bolivia, rivers provided a natural path through the *Cordillera* to the otherwise impassable and seemingly boundless forests of the lowlands.

Historically, Bolivia has been thought of as an Andean nation, yet two-thirds of its land lies in the Amazon Basin. This lowland area, known in Bolivia as the *oriente*, remained unimportant to most Bolivian nationals and to the international community until the twentieth century. With the exception of the *indios foresteros*, a small *mestizo* population, and adventurers, this part of the country remained virtually uninhabited until the Bolivian National Revolution. Western travel writers and novelists filled people's imaginations with images of disease-ridden jungles and savage Indians.[54]

It was in this physical environment the early travel writers explored and mapped the rivers, savannas, forested lowlands, and jungles of eastern Bolivia. Nineteenth-century travel writers provided the impetus for Western development of the eastern lowlands of Bolivia in conjunction with the programs implemented by the MNR government after the Bolivian National Revolution of 1952. The Western perception of

[54] Julian Duquid, *Green Hell: Adventures in the Mysterious Jungles of Eastern Bolivia* (New York: The Century Company, 1931), 11.

the indigenous population ascribed by these travel writers, led to the development of colonization plans that addressed the indigenous population in the most summary manner, limiting them to a marginalized role as a workforce for European colonists.

The Ideological Mapping of the Lowlands

Ronald Hilton presented the concept of travel writers as intelligent men who considered it an obligation to understand other countries and other cultures, to analyze and explain them.[55] For this genre of travel writers, there was an abiding desire to see other places and cultures first hand and report their observations methodically, a from of ideological mapping. One of the most renowned Western travel writers to explore and describe the region and its inhabitants reflective of this concept was Alexander Humboldt. Humboldt was renown for his impeccable descriptions of the people and places he encountered more than for the maps he produced.

In 1814 Humboldt published his findings in *Research Concerning the Institutions and Monuments of the Ancient Inhabitants of America, with Descriptions and Views of Some of the Most Striking Scenes in the Cordilleras!* The title of Humboldt's book is striking it itself and deserves attention. First, Humboldt does not suggest research into the nature of the inhabitants of the region, only the institutions and monuments. Second, the title provides a mental image of incredible descriptions and views. Third, Humboldt's use of an exclamation point demonstrates the allegedly astounding nature of the material in the book.

[55] Ronald Hilton, "The Significance of Travel Literature, With Special Reference to the Spanish and Portuguese-Speaking World," *Hispania* 49 (December1966): 840.

Sketched images depicting the rugged landscape Humboldt encountered were included in this book. Humboldt described the landscape with the copious use of adjectives, engendering a sense of awe in the reader. The journey documented in the following excerpt was supplemented by an illustration, described as part of the town of Ibague of the valley of the river Magdalena, in the lowlands of Bolivia. The eastern chain of the Andes was illustrated in the background of a sketch associated with the following excerpt.

> A few persons in easy circumstances travel on foot, in these climates, though roads so difficult, during fifteen or twenty days together, they are carried by men in a chair, tied on their back; for in the present state of the passage of Quindiu, it would be impossible to go on mules. They talk in this country of going on a man's back (andar en carguero), as we mention going on horseback, no humiliating idea is annexed to the trade of carguerros; and the men who follow this occupation are not Indians, but mulattoes [sic], and sometimes even whites. It is often curious to hear these men, with scarcely any covering, and following a profession which we would consider disgraceful, quarrelling in the midst of a forest, because one has refused the other, who pretends to have whiter skin.[56]

This infamous portrait of a *carguero* transporting a white traveler, sitting in a chair on his back, over the rugged mountainous terrain is representative of the characteristic of the genre of travel writers that emerged in the early nineteenth century. Humboldt's description of the profession of *carguerros* in transporting travelers as "disgraceful" is in itself paradoxical, since it was travelers in need of assistance to traverse the difficult terrain that instituted this position. The image presented in this passage emphasized the difficulty of traveling in the region, but more importantly,

[56] Alexander de Humboldt, *Research Concerning the Institutions and Monuments of the Ancient Inhabitants of America, with Descriptions and Views of Some of the Most Striking Scenes in the Cordilleras!* Written in French and Translated into English by Helen Maria Williams (London: Longman, Hurst, Rees, Orme & Brown, J. Murrray and H. Colburn, 1814), 66.

defined the feature of whiter skin as superior, a racial construct imbedded in nineteenth century Western culture due to the popularity of Social Darwinism.

Travel accounts are fundamentally about situations of contact. Travel writers provided a rich source of information concerning how the West saw itself in relation to the indigenous population. The nature of Indians encountered was presented in a summary manner, with the primary focus on physical geography. Travel writing by nature, however, is descriptive, subsequently, the imagery of the indigenous population in this genre of literature is extraordinarily comprehensive. Every aspect of appearance, clothing, and physical characteristics of the indigenous population was described in detail. This genre of travel writers in the nineteenth century consistently portrayed the image of Indians through the use of derogatory language such as simple, lazy, slovenly, drunken, and stupid found in the writings of J. J. Von Tschudi, Count Francis Castelnau, W. Bridges Adams, and A. W. Buckland.

German travel writer Dr. J. J. Von Tschudi provided an intellectual map of the regions in which he traveled in the early nineteenth century. The published account of his expedition in 1847, *Travels in Peru During the Years 1838-1842. On the Coast, In the Sierra, Across the Cordillera and the Andes, Into the Primal Forests*, provided Western readers with images of an exotic, primordial region. By the use of the word 'primal' in the title of his book, Tschudi portrayed the region as both primitive and prehistoric, providing not only a physical map of the region, but also an intellectual map of the indigenous population. In conjunction with the primitive nature of the people he encountered, Tschudi observed: "By all varieties, the white skin is envied, and one thinks of disputing its superiority of rank. The Indian looks with abhorrence on the Negro; the

latter with scorn on the Indio."[57] Indigenous peoples and African Americans alike were culturally indoctrinated through common historical experiences to recognize the white man as superior in culture, education, and most importantly, in authority, contributing to the ascribed identity of the Indians.

Tschudi poignantly described the living conditions he encountered on his journey that contributed to the perception of the uncivilized nature of the indigenous population.

> Vermin everywhere, on the floor and walls, in the clothes of the Indian hag officiating as hostess, even in the caldron in which a vile mixture of potato water and Spanish pepper is prepared for supper. For sole bed there is the damp earth, upon which hosts, children and travellers [sic] stretch themselves.[58]

The choice of terminology clearly indicated Tschudi's perception of racial superiority. This excerpt is noteworthy, for it suggested the local Indian family took in travelers to earn money, providing respite in the form of a place to sleep and a meal. The household was obviously poor by Western standards, evidenced by the quality of food prepared and the lack of fresh vegetables. The portrayal of the hostess as an "Indian hag" endowed Tschudi with the capacity to judge the Indians as culturally inferior.

By contrast, the more dignified imagery of the noble savage of the nineteenth century was apparent in the accounts of some of travel writers. This imagery was particularly evident in a report by Count Castelnau to the French Minister of Public Instruction regarding a French Expedition into South America in 1846. Although consistent with this genre of travel writer by the use of descriptive terminology,

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[57] Dr. J. J. Von Tschudi, *Travels in Peru During the Years 1838-1842: On the Coast, In the Sierra, Across the Cordillera And the Andes, Into the Primal Forest* Translated from German by Thomasina Ross (London: David Bogue, 1847), 12.
[58] Dr. J. J. Von Tschudi, "The Mine, the Forest, and the Cordillera," *The Living Age* 10 (September 1846) 562.

Castelnau portrayed the indigenous population as "one of the finest races in the world," rather than as degraded savages. The Indians Castelnau encountered lived in Brazil approximately fifty miles from the village of San Joaquin where Machupo virus first emerged.[59]

> During this voyage we entered the country of the Guatos Indians, one of the most interesting tribes of the American aborigines. The features of these Indians are extremely interesting: - never in my life having seen finer, or any more widely differing from the ordinary type of the red man. Their large, well opened eyes, with long lashes, nose aquiline and admirably modelled [sic], and a long, black beard, would make them one of the finest races in the world, had not their habit of stooping in the canoe bowed the legs of the greater number. Their arms, consisting of very large bows, with arrows seven feet long, demand great bodily strength - and their address in the use of them passes imagination. These savages are timid, nevertheless, and of extreme mildness. By taking them for our guides, we were enabled to explore parts wholly unknown, of that vast net-work of rivers which they are constantly traversing.[60]

This excerpt demonstrates not only Castelnau's observation of the nature of the Indians, but also their instrumental role in exploration as guides for Western travelers, a role which later resulted in the transmission of Western disease. Count Castelnau described the Guatos Indians with the view of introducing them as valuable component to the French colony of Algeria. The image of mild-mannered savages with significant body strength suggests Castelnau anticipated the Guatos would provide an excellent source of slave labor for the French colony.[61] The concept of transporting Indians from the interior of South America across the ocean to the French colony of Algeria merits is

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[59] Refer to Chapter IV, Emergence of Machupo Virus, for a geographic presentation of the region.
[60] Count Francis de Castelnau, "South America," *Proceedings of the New York Historical Society for the Year 1846* (New York: Press of the Historical Society. 1847): 73-74. For a full account of his expedition, refer to *Expedition dans les parties centrales de l'Amerique du Su, de Rio de Janeiro a Lima au Peru. Histoire du voyage* Vol 3. (Paris, 1851).
[61] Castelnau, 73-74.

representative of the Western ideological construct regarding race in the nineteenth century.

The concept of transferring labor to meet the burgeoning economic requirements of the West dominated the history of the development of the Americas. Philip Curtin estimated that 9,566,100 African slaves were imported to the Americas and the Atlantic region between the years 1451-1870.[62] J. E. Inikori and J. D. Fage challenged Curtin's figures as underestimating the actual number of slaves exported to the Americas.[63] However, most scholars recognize the significant impact of racial determination in meeting the economic goals of the West.[64]

The region of the lowlands has historically been described as uninhabited. W. Bridges Adams referred to the region as "*desplobado*" which is translated as wild or deserted. Although sparsely populated according to Western standards, there was a significant indigenous population living in the savannas and forested lowlands, many of whom were relegated to missionary settlements under the Jesuits following the Spanish occupation. The Bolivian government regarded the Indians with indifference, a by-product of the colonial era. From the perspective of the Bolivian government and the West, however, the presence of Indian tribes in the lowlands was not considered to be equivalent to the presence of a population.

The images of indigenous peoples presented by travel writers contributed to the formation of an ascribed indigenous identity. These images ranged from the "noble

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[62] Philip Curtin, *The Atlantic Slave Trade: A Census* (Madison: University of Wisconsin Press, 1969), 268.
[63] J. E. Inikori, "Measuring the Atlantic Slave Trade: An Assessment of Curtin and Anstey," *Journal of African History* 22 (1976): 197-223 and J. D. Fage, "Slavery and the Slave Trade in the Context of West African History," *Journal of African History* 10 (1969): 393-407.
[64] Paul E. Lovejoy, "The Volume of the Atlantic Slave Trade: A Synthesis," *The Journal of African History* 23 (1982): 473.

savage" to disparaging images of "degenerated human beings," which ultimately influenced the developmental policies in the lowlands in disregarding the Indians as participants in colonization. The mid-twentieth century colonization programs of the Santa Cruz Area Development Plan and the Alto Beni Project in eastern lowlands following the Bolivian National Revolution in 1952 did little to incorporate the indigenous population.

The indigenous population of Bolivia was portrayed in the same manner as the Indians of the frontier of North America: as an impediment to development. Tschudi's publication in 1846 provided a description of the silver mines of Potosi, the virgin forests and the *cordilleras* of Bolivia with particular attention to the "countless riches" of the region. The use of descriptive terminology such as "desolation and disease" provided an impetus to improve the conditions of region, providing justification for Western directed economic development. The lowlands have a historical reputation for disease, which became problematic a century later when colonization began in earnest.

Assorted travel writers chose to address the nature of the indigenous populations and in these accounts, which provide contemporary scholars with definitive insight into the cultural perspective of the nineteenth century explorer. W. Bridges Adams is representative of the construct of cultural superiority, apparent in his description of an Indian he encountered in his travels. The title of his account published in 1853, *The Dwarfed Races of Mankind*, was indicative of a lower race, in both size and stature, which was supported in the text though the presentation of a condescending image of Indians. The vivid portrayal of this Indian is consistent with this genre of travel writers, with detail given to the shape of his face, height, and clothing. The language Adams

used assigned the social position of a subordinate lacking intelligence, which reinforced the culturally accepted norm of racial hierarchy.[65]

> Waking at the end of an hour, a strange vice greeted me: an indigenous Indian, clad in a brown round jacket and breeches of vicuna wool, and stockings of sheep's wool, a poncho on his shoulders, and a straw hat on his head. His total height was under five feet; he had scarcely any muscle to his legs; his eyes were black and elongated, his nose was aquiline, his cheeks drawn in, cheekbones high, and a forehead low and retreating, his mouth tending to muzzle, his hair black and wiry. He was sucking coca-leaf mixed with a little lime and potato-starch, and the green juice ran down his chin. This was a sample of the genus homo in those regions, following the universal occupation of spinning, and staving off hunger by a process analogous to chewing tobacco.[66]

Adams' description indicated this particular Indian was from the *altiplano*. The Quechua and Aymara Indians are the primary indigenous groups that inhabit the *altiplano*, where the cold, arid climate requires woolen clothing for survival. Chewing coca leaves is an intrinsic element of *altiplano* indigenous culture, and is used by lowland Indians for medicinal purposes.[67] The use of coca leaves was addressed by numerous nineteenth and twentieth century travel writers, many of them interested in the properties exhibited by the process, which included the ability to endure hardship with little sustenance. An English traveler in Tacna reported he traveled ninety miles in one day on a mule, accompanied by an Aymara Indian who traveled the entire distance with him on foot, without any other nourishment than coca leaves.[68]

Writing about the use of coca leaves further defined the image of Indians as a lower race, evident in A. W. Buckland's *Ethnological Hints Afforded by the Stimulants in*

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[65] A low forehead indicated a low level of intelligence. 'Vice' can mean secondary, subordinate, junior, or sub, as in below.
[66] W. Bridges Adams, "The Dwarfed Races of Mankind," *The Living Age* 38 (August, 1853): 595.
[67] Refer to Chapter V, Traditional Medicine.
[68] Anonymous, "Use of Coca Leaves," *The Scientific American* 18 (April 1863): 230.

Use Among Savages and Among the Ancients. Buckland's title imparts the capacity of an outsider to understand different ethnic groups by observation, as well as defining the Indians as savages. The following excerpt from Buckland's article clearly defined Indians as members of a lower race, comparing the process of chewing coca leaves to animal behavior:

> Then we get to the coca leaf of South America, eaten to increase strength and endurance…. The lower races do not appear to have gone beyond this, which is in truth only an animal instinct, since many animals resort to special plants for relief in case of sickness or wounds, which they do not habitually take as food.[69]

Buckland and Adams were representative of the ideological construct under which travel writers of this genre operated, which continued to undermine the character of the indigenous population in the course of defining their identity as members of the lower races for Western readership.

In addition to describing the appearance of the Indians encountered in his travels, Adams categorized them as 'degenerated human beings' and appealed to the Ethnological Society to incorporate them into civilized society as a productive source of labor, demonstrated by the following excerpt. The continued relegation of the indigenous population to the institution of slavery was representative of this genre of travel writer, and later contributed to the subjugation of the Indians in the development of the rubber tapping industry. The Western ideological construct of Christianizing Indians as a means of civilizing them was repeated in numerous travel writers' accounts and was used as justification for subjugating the indigenous population, reflective of this genre. Western

[69] A. W. Buckland, "Ethnological Hints Afforded by the Stimulants in Use Among Savages and Among the Ancients," *Journal of the Anthropological Institute of Great Britain and Ireland* 8 (1879): 240.

attitudes regarding Indians were influenced by belief in the concept of the "white man's burden."

> With all our self-applause for Christian virtues and active charity, it is not creditable to us that degenerated human beings should only be imported for shows to stimulate jaded curiosity; and if the Ethnological Society would set the example of naturalizing amongst us some of families of these harmless and docile people, for productive purposes, it might be the means of ultimately rescuing their race from degradation, and it would be quite as praiseworthy, and possibly quite profitable as a Zoological Society's operations with the lower animals.[70]

Rudyard Kipling's Poem, *The White Man's Burden*, provided explicit endorsement for the West to save savages from their heathen ways.[71] This intellectual map continued to guide the ascription of indigenous identity throughout the nineteenth century.

Franz Keller was representative of the same genre of travel writers shared by Humboldt, and Tschudi. Keller provided extensive descriptions of the territory he traveled in and the indigenous people he encountered. Unlike his predecessors, however, Keller described the population of the Mojos Indians he encountered in the lowlands of eastern Bolivia in 1875 and provided population figures. The title of Keller's book, like that of Humboldt, conveyed the image of an explorer speaking with the authority of an expert on the region. Keller observed a significant indigenous population, estimated to be at thirty thousand. [72]

> On the *campos* of Eastern Bolivia, between the Beni, the Matamore, the Itonama, and the Guapore, about 30,000 real unmixed Indians, the Mojos, still exist in the former Jesuit Missions, fifteen large regularly planned villages. Totally cut off from the outer world - on one side by the ice-covered Cordillera de los Andes; and on the other,

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[70] Adams, 596.
[71] Rudyard Kipling, *Collected Verse of Rudyard Kipling* (New York: Doubleday, Doran and Company, 1907), 371.
[72] Franz Keller. *The Amazon and Madeira Rivers. Sketches and Descriptions from the Note-Book of an Explorer* (Philadelphia: J. B. Lippincott and Co., 1875), 170.

> by pathless wastes of forest, together with scarcely explored rivers full of rapids and cataracts - and deprived, moreover, of their leaders and teachers, they live in a state of disheartening depression and bondage little removed from absolute slavery.[73]

Three points are evident in this excerpt from Keller's book. First, the identification of the Indians encountered as "real" Indians suggests a perception of *mestizos* as another distinct racial group, with different status. Second, the reference to "regularly planned villages" in the former Jesuit missions suggests Keller judged Indian villages as unplanned, imposing Western standards upon the delineation of native villages. Third, and most important, was the concept that the Indians lived in a state of "disheartening depression" since they were deprived of the leadership, presumably the Jesuits. This statement suggests Indians need leadership in order to live contented lives.

After the expulsion of the Jesuits in 1767, many of the Indians remained in the missions under the supervision of *correjidors*, appointed by the government and sent over from La Paz, Cochabamba, or Santa Cruz, and began the process of transculturation started by the Jesuits. Table II provides a list of the Jesuit missions that remained in the Department of Beni by the time of Keller's expediton in 1875, and the dates of their inception. [74]

Table II
Missions Located in the Department of Beni (1875)

Trinidad	1687
San Ignacio	1689
San Javier	1690
San Jose	1691
San Borja	1693
Exaltacion	1704

[73] Keller, 171.
[74] Keller, 170.

Explorers and travel writers identified the Mojos Indians of these six mission towns as sources of labor to work as guides, paddlers, porters, and cooks. Keller alleged that the governmental positions in Department of Beni were regarded as a sort of political exile, and since there were no applicants to the office, the government assigned the post to totally unfit individuals.

Keller claimed the Bolivian government would not have developed a line of communication between the Mamore and Amazon had pressure not been exerted from the West, condemning the Department of Beni to remain a "forlorn outpost, undeserving of any, even the least sacrifice." Keller argued that without foreign investment in development the products of the interior would be "left to decay and ruin, like its poor brown population."[75] Whether the interior of eastern Bolivia would have remained undeveloped without foreign aid is open to speculation. With the ideological mapping of the lowlands, travel writers defined indigenous identity for the West as savage, hostile, lazy and slovenly, and uncivilized. The assignation of this identity gave way to the physical mapping of the lowlands in preparation for development of an economic infrastructure for Western capital. Foreign investment in Bolivia was to have a significant effect on the development of the eastern lowlands. The United States took an active role in directing the colonization of the lowlands in return for loans, grants, and food aid in the twentieth century. With the marginalized role assigned to the indigenous population, this policy led to subsistence agriculture, and subsequently, the emergence of Machupo virus.

[75] Keller, 180-181.

The Physical Mapping of the Lowlands

The production of accurate maps was indispensable to the future development of the lowlands. The exploration of the extensive river network from the *Cordilleras* to the lowlands has traditionally been connected to economic interests. Most accounts of exploration of the South American continent were published in the journals of geographical societies, ostensibly intended to provide accurate maps and information on the physical and human geography of unknown lands. The members of these geographic societies were generally wealthy individuals, who used the information garnered from geographic publications to invest in economic ventures in South America. Two prime examples were Colonel George E. Church and H. Arnous de Riviere. Church was instrumental in the formation of the Bolivian Navigation Company in building the Madeira-Mamore Railway, and H. Arnous de Riviere was involved in the rubber tapping industry.

The physical mapping of the lowlands was necessary before economic development could occur. The early nineteenth-century travel writers investigated the transportation network that existed in the rivers of the region to generate maps. At the turn of the nineteenth century, a special commission was given to Thadeus Haenke by the King of Spain to explore beyond the mines of Peru. This exploration resulted in the publication of *Advantages to be derived from the Navigation of the Rivers which flow from the Cordilleras of Peru into the Maranon or Amazons* in 1799.[76] The title of Haenke's article is telling in itself, for it indicates an economic advantage to the

[76] Woodbine Parish, "Translation from a MS (1799) on the Advantages to be Derived from the Navigation of the Rivers Which Flow from the Cordilleras of Peru into the Maranon or Amazons," *Journal of the Royal Geographical Society of London* 5 (1835): 90-99.

navigation of the rivers into the Amazon basin. Haenke settled in what was to become the Department of Cochabamba, and acquired a vast body of information on the natural resources and physical geography of the region.[77] An incentive for future nineteenth-century explorers was established with the publication of Haenke's report, since it established the eastern lowlands contained a immense wealth in hardwoods, but could not be penetrated without navigation of the Beni River system.[78]

Although most of the nineteenth-century travel writers were from the West, the Bolivian government itself sponsored expeditions to map national territory in response to ongoing boundary disputes with Brazil. The former Jesuit Mission in the Province of Mojos formed the basis for the creation of the Department of Beni in 1842.[79] Subsequently, in 1844 the Bolivian government instructed Jose August Palacios to explore the river Beni and the falls on the Madeira-Mamore. Palacios traveled up the Beni River as far as its lowest fall, and provided the first detailed Bolivian report on the geography of the Department of Beni. Palacios' findings were published and provided the Bolivian government as well as the Royal Geographical Society with a rudimentary map of the eastern frontier.[80]

Two of the most influential travel writers of the nineteenth century were commissioned by the United States government to map the Amazon and its headwaters

[77] Haenke's papers were not published until 1835 due to the revolution that cut off his communication with Europe. After his death, they were translated by Woodbine Parish and subsequently published in the *Journal of the Royal Geographical Society of London*.
[78] Parish, 91.
[79] Alfred Metraux, *The Native Tribes of Eastern Bolivia and Western Matto Grosso* (Washington: U. S. Government Printing Office, 1942), 17.
[80] J. A. Palacios, *Exploracion de los Rios y Lagos del Departamento del Beni, y en especial el Madeira, practicada de orden del Supremo Gobierno de Bolivia* (La Paz, 1852).

with the objective of opening up the region for US trade.[81] Lieutenant Lardner Gibbon and Lieutenant W. L. Herndon of the United States Navy explored the eastern lowlands in 1852. Herndon followed the main Amazon route from Peru, while Gibbon traveled through Bolivia by way of La Paz, Cochabamba, and the Mamore and Madeira Rivers to reach the Amazon.[82] Both reports contained detailed observations of the physical and human geography of the region, as well as its economic potential. Herndon had great visions for the development of a trade route, evident in the following excerpt.

> I can imagine the waking up of the people on the event of the establishment of steamboat navigation on the Amazon. I fancy I can hear the crash of the forest falling to make room for the cultivation of cotton, cocoa, rice, and sugar, and the sharp shriek of the saw, cutting into boards the beautiful and valuable woods of the country; that I can see the gatherers of India-rubber and copaiba redoubling their efforts, to be enabled to purchase the new and convenient things that shall be presented at the doors of their huts in the wilderness.[83]

This quote is rife with imagery regarding Herndon's vision of the development of steamboat navigation on the Amazon. Herndon visualized the sounds of the forest being cleared to cultivate crops marketable to Western consumers. However, Herndon gave little recognition to the fact the region he envisioned for economic development was already occupied by Indians. The dismissal of the Indians as anything more than superfluous further contributed to his defining the Indians as insignificant.

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[81]William Lewis Herndon, *Exploration of the Valley of the Amazon, made under the direction of the Navy Department, by William Lewis Herndon and Lardner Gibbon, Lieutenants United States Navy. Part I.* (Washington: Robert Armstrong, Public Printer, 1853), 375. Also documented in: Lieutenant W.L. Herndon, U.S.N., *Exploration of the Valley of the Amazon,* Vol.1 (Washington: Robert Armstrong, Public Printer, 1853).

[82] Lieutenant Lardner Gibbon, "Exploration of the Valley of the Amazon," *The New Englander and Yale Review* 12, (August 1854): 380, and "Lieutenant Gibbon's Exploration of the Valley of the Amazon," *Harper's Weekly* 23 (January 1858): 54.

[83] Herndon, 375. A condensed account also published by Herndon in "The Valley of the Amazon," *Putnam's Monthly Magazine of American Literature, Science, and Art* 3 (March 1954): 233-344.

Herndon described the trade relationship he envisioned with the Indians in the same manner presented by Christopher Columbus in the fifteenth century. The free exchange of spices for useless trinkets contributed to defining the Indian as gullible and stupid.

> …and even the wild Indian finding the way from his pathless forests to the steamboat depot to exchange his collections of vanilla, spices, dyes, drugs, and gums, for the thing that would take his fancy - ribbons beads, bells, mirrors, and gay trinkets.[84]

Herndon reveals a great deal about the Western perception of the Indians in this passage. The suggestion of wild Indian is in comparison to the Western perception of civilized Indian, and subsequently does not acknowledge any type of social order or relationship among indigenous people.

Herndon's descriptions provided in *Exploration of the Valley of the Amazon* are indicative of the marginalized role of the indigenous population that perpetuated the Western world into the twentieth century. Acknowledgement of any form of civilization was relegated to what was familiar to the writer. Consequently, mission towns were credited as the only settlements that indicated any appearance of civilization. The following excerpt describes the Indians at one of the missions Herndon encountered.

> These are the most thorough-looking savages in their general appearance and costume though without anything savage in their expression of their countenances, which is vacant and stupid.[85]

Consistent with the contemporary genre of travel writer, the Indians described in this passage were "savage" and "stupid," firmly confirming the theoretical framework

[84] Herndon, 375.
[85] Ibid, 372.

that supported the frontier as uninhabited territory. Herndon's reduction of the indigenous population to sub-human status removes from them any capability of self-governance. By defining indigenous identity as insignificant, the groundwork was laid for the development of the eastern lowlands.

The role of slave labor as a source for economic development was anticipated in the frontier of eastern Bolivia. Herndon, in a commentary to his report on the *Exploration of the Valley of the Amazon*, equated the exploration of the Amazon to a dream of a great slave republic that would control the commerce and govern the opinions of the civilized world. [86]

> We would say, however, that there is a good opportunity for missionary operations, according to the new mode of Christianizing savages lately promulgated and recommended in South Carolina. Our propero[overseer] informs us that the infidels dwell near here, and the people of Tarapoto go a short distance up this river to capture the young Indians and take them home as slaves. This system is tolerated on the pleat that the infidel is christianized and his condition bettered by it. We believe that, according to the new school of South Carolina divines, Indians christianized in this way do not make so good Christians as African negroes; but then it would cost less to catch them, and less therefore to christianize them.[87]

The use of Christianity as a tool for the subjugation of the indigenous population in the middle of the nineteenth century remained consistent with the early Spanish explorers. Herndon was a native of South Carolina, a region of the United States that hosted a plantation economy heavily dependent upon slave labor in 1853. The population of South Carolina fought vigorously in the United States Civil War in order to maintain the institution of slavery, which presumably had a substantial cultural impact on Herndon's perceptions of the indigenous population encountered in his travels.

[86] Herndon, 362.
[87] Ibid, 369.

The greatest barrier to the opening of the *Norte* and *Oriente* to the Atlantic by steam and railway was the eighteen sets of rapids and falls on the Madeira and Mamore rivers between San Antonio and Guayamerin identified by Herndon. There were thirteen sets of rapids in the Brazilian territory, and five shared between Brazil and Bolivia. Together they presented an impediment to navigation out of Bolivia. The result was an almost total inability to reach the navigable waters of the Amazon that contributed to the isolation of the region.

The reports of Gibbon and Herndon stimulated the Treaty of Peace, Friendship, Commerce, and Navigation between Bolivia and the United States in 1858.[88] This treaty provided for reciprocal commerce and navigation upon the Bolivian tributaries of the Amazon. On May 26,1844, The Franco-Bolivian Company of the Mamore was established with the purpose of introducing Belgian immigrants into the Department of Beni.[89] The effort failed, however, since the Brazilian Amazon was closed to foreign navigation. Brazil feared that the establishment of the colony was an attempt to make the Amazon a southern boundary of French Guiana. After the failure of this program, no further attempts were made to promote foreign colonization within any part of the sector as long as the Amazon route through Brazil was closed.

The physical mapping of the territory of eastern Bolivia was instrumental to the development of the lowlands. The expeditions of J. A. Palacios, William Lewis Herndon, Lardner Gibbon, Colonel George E. Church, Dr. Edwin Heath, and Colonel Pando

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[88] Department of State, "Treaty of Peace, Friendship, Commerce, and Navigation," 13 May 1858 *Treaties, Conventions, International Acts and Agreements Between the United States of America and Other Powers 1776-1909*, Compiled by William M. Malloy, Under Resolution of the Senate of January 18, 1909. (Washington: Government Printing Office, 1910).

[89] Valerie Fifer, *Bolivia: Land, Location and Politics Since 1825* (Cambridge: University Press, 1972), 100.

provided requisite information on the system of rivers draining into the Amazon basin instrumental in developing physical maps of a viable transportation network for commerce. The future development of the eastern lowlands was dependent upon these efforts. The role of the United States was significant in sponsoring the expeditions of Lieutenants Herndon and Gibbon, indicating the direction of economic policy in the development of eastern Bolivia

The Madeira-Mamore Railroad

The closure of the Brazilian Amazon was an impediment to trade, colonization, and development of the lowlands. The ongoing territorial struggles of Brazil to maintain its borders led to the failure of the Belgian colony in the Department of Beni in 1844. The eastern plains had failed to attract settlers due to geographic barriers, disease, distance to marketing and urban centers in the altiplano, and governmental indifference.[90] The nineteenth-century travel writers began to eliminate the geographic barriers and marketing problems by physically mapping the lowlands to identify a river network to transport trade products to and from markets. The next phase of transportation development was the Madeira-Mamore Railroad.

A decree of Emperor Pedro II of Brazil in 1867 opened the navigation of the Amazon and its tributaries to merchant shipping of all nations. Article IX of the Munoz-Netto Treaty for the opening of an Amazon-Madeira-Mamore route allowed Bolivia to pursue a railway around the Madeira-Mamore falls. The concept of a mule road around the falls was proposed by Lieutenant Gibbon, which he estimated would reduce the time

[90] Robert C. Edit, *Pioneer Settlement in Northeastern Argentina* (Madison: 1971), 3.

needed to transport goods from Baltimore to La Paz from one hundred eighty days around Cape Horn to fifty-nine days by way of the Amazon-Madeira-Mamore route.[91] The passage of the rapids of the Madeira was a difficult task at the points where the canoes had to be unloaded and carried. With the treaty between Brazil and Bolivia in 1868 and the opening of the lower Amazon to all nationalities, a lucrative trade emerged. The amount of freight that passed the falls in the canoe trade exceeded one thousand tons in the year 1870.[92]

The Bolivian government secured the services of Colonel George Earl Church to open up the eastern frontier.[93] Church formed the National Bolivian Navigation Company in 1870, with the goal of exporting Peruvian bark for quinine, cocoa, coffee, llama and alpaca wools, copper, tin, silver and gold from Bolivia to the commercial trade centers in the United States.[94] Although Church was instrumental in exploration and mapping the eastern lowlands in order to develop the railway project around the Madeira Mamore falls, the reports of his travels in Bolivia contributed to the Royal Geographic Society's collection of material on South America in the late nineteenth and early twentieth centuries.

Great Britain dominated economic investment in South American commercial ventures in the nineteenth century, with significant assets in Argentina, Chile, Uruguay,

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[91] Gibbon, 302-313.
[92] Colonel George. E. Church, "Northern Bolivia and Its Amazon Outlet," *Harper's New Monthly Magazine* 44 (March 1872): 502.
[93] Isaiah Bowman, "Geographical Aspects of the New Madeira-Mamore Railroad," *Bulletin of the American Geographical Society* 45 (1913): 275.
[94] Congress, Senate, "A Bill to Incorporate the National Bolivian Navigation Company," 41st Cong., 2nd sess., (17 February 1870), S558.

Brazil, Peru, and Bolivia.[95] With the exception of a few engineers like Colonel Church, and assorted miners, a limited number of Americans invested in South America until the late nineteenth century. The bulk of U.S. investment followed the opening of the Amazon trade routes. In 1830, U.S. investments were limited to 10 million, however, by 1900, that figure expanded to 140 million.[96] It was not until after 1914 that the United States became the dominant economic force in South America. The report produced by Lieutenant William Herndon for the United States government had a significant impact on the US contribution to the development of eastern lowlands, which facilitated the emergence of Machupo virus decades later.

Church's observations concerning the Indians were less deprecating than the genre of travel writers previously examined. It is within the context of his writings at the end of the nineteenth century that a different approach in defining indigenous identity became apparent in travel writing. Unlike Lieutenants Herndon and Gibbon, Church was a Massachusetts railway engineer and American Civil War veteran from the northern United States. The ideological construct that influenced his writing was reflective of a society that did not support slavery, apparent in the descriptions of the Indians he encountered.

Church launched an extensive expedition that required the employment of Indians as guides, porters and paddlers. The language used in his descriptions provided a different ascribed identity of the indigenous population than that of earlier travel writers.

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[95] Clarence F. Jones, "The United States and Its Chief Competitors in South American Trade," *Economic Geography* 3 (October 1927): 409. Other scholarly articles on the role of the British in South America include: H. S. Ferns, "Beginnings of British Investment in Argentina," *The Economic History Review* n.s., 4 (1952): 341-352; Peter Winn, "British Informal empire in Uruguay in the Nineteenth Century," *Past and Present* 73 (November 1976): 100-126; and Charles W. Centner, "Great Britain and Chilean Mining 1830-1914," *The Economic History Review* 12 (1942): 76-82.

[96] Jones, 412.

Church moved from the pattern of imposing Western standards upon the Indians, and provided a more comprehensive level of observation. Church attributed the quality of "imitative powers" to the Indians of the Department of Beni, whom he claimed could copy an entire manuscript in any language without knowing a word of it.

> It is evident that these Indians only require a little friendly contact with traders and settlers to become of great use in the development of the district in the vicinity of the rapids. Their knowledge of the location of groves of rubber-trees, their peculiar ability in hunting and fishing, their cultivation of the mandioca root, of cocoa, corn, and sugar-cane, must become of great advantage to the important and rapidly increasing commerce now passing the line of rapids.[97]

Church attributed qualities of intelligence to the Indians in his description, a characteristic inconsistent with the image portrayed by earlier travel writers.[98]

With regard to daily life, Church recorded the mundane as well as the extraordinary, providing a wealth of knowledge concerning the indigenous population encountered. The following excerpt presents an image of the playfulness of the young boys Church observed playing in the streets.

> Occasionally an opportunity offered to hunt the *anta*, or tapir, in the course of the voyage. These amphibious animals are very numerous throughout the Madeira Valley, both in Bolivia and Brazil. In Bolivia, among the river towns, they are frequently tamed, and afford an infinite source of amusement to the boys, who mount them and drive them about the streets.[99]

Images of this nature defined the character of the indigenous population in a manner similar to Western images of youth, presenting another face of the savage Indians. It is important to remember, however, that the process of describing Indians, in whatever

[97] Church, 507.
[98] Ibid, 503.
[99] Ibid, 501.

light, was a process by which each of the Western travel writers imposed an identity upon indigenous population.

Mary Louise Pratt proposed the concept of transculturation in reference to colonial frontiers.[100] She defined the term transculturation as 'crossing the boundaries of cultures.' Pratt applied the meaning used by ethnographers, which was to define how subjugated populations selected which cultural characteristics to assimilate from a dominant culture. The predominance of Pratt's process of transculturation is particularly evident in the following excerpt from Church's publication:

> In each canoe were two men and one woman, the former entirely naked, the latter, according to custom, wearing nothing but a little apron. Our rowers, the Mojos Indians of the old 'missions' of the Mamore, who still preserve considerable of the bigotry which their Jesuit fathers implanted in their hearts, looked with an air of the greatest distrust at their poor cousins of the forests, whom they honored with the epithets which were not very flattering - as, for example, savages, heathens, etc.[101]

Church revealed the perception of Mojos Indians in a chance meeting with the Caripuna Indians, who historically had very little contact with the West. Over time, the Mojos Indians adopted the cultural perception of the Jesuits regarding uncivilized Indians, and through the process of transculturation, those perceptions became incorporated into their identity. Prior to exposure to the Jesuits, the Mojos lived much as the Caripunas, without clothing and outside of the Western perception of a civilized world.

Perhaps due to personal financial interest, Church was far more extensive in his exploration of the lowlands than other travel writers, and accordingly, identified more detailed information on the marketable commodities existent in the region. Among these commodities was presence of cattle production and pastureland. In conjunction with the

[100] Pratt, 6.
[101] Church, 505.

social strata that existed in Bolivia in the late nineteenth century, the herds of cattle Church encountered were owned by one of the Spanish *hacendados*.

> The expedition reached the vicinity of Crato early in July. Here there is a cattle estate, which was founded by Antonio de Barros Cardozo, a resident of the banks of the Mamore River, in Bolivia, where he is the owner of immense herds of cattle.[102]

The Machupo River, the source of the emergence of Machupo virus, is a tributary of the Mamore River. Following the Bolivian National Revolution, *haciendas* were abandoned by *hacendados* like Antonio de Barros Cardozo, leaving the marginalized indigenous population to resort to subsistence agriculture. The development of the lowlands in the middle of the twentieth century rested largely on the efforts of travel writers like Church who identified not only trade goods, but also an overland transportation network to facilitate moving products between the economic centers of the United States and Bolivia.

The Madeira-Mamore Railroad was one of the largest commercial enterprises in South America in the 1870s.[103] Church demonstrated unwaveringly support for the formation of a railroad to transport products across the Madeira falls through the Amazon Basin; nonetheless, physical geography and disease repeatedly interrupted the progress of the railway. Along with numerous employees, Thomas Collins, the senior member of the firm of P&T Collins of Philadelphia, succumbed to malaria while investigating the development of the railroad.[104]

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[102] Church, 501.
[103]Anonymous, "Colossal R. R. Enterprises in South America," *Manufacturer and Builder* 5 (June 1873): 132-133.
[104]Anonymous, "The Madeira and Mamore Railroad," *The Manufacturer and Builder* 10 (September 1878): 203-204.

Two travelers in the region in 1876, C. Barrington Brown and W. Lidstone, encountered the unsuccessful railway project and provided a report on the lack of progress on the railroad project:

> There is now nothing to show but a slight scratch in the ground – representing the first cutting – a house, a few rough sheds, some cleared land, two wrecks in San Antonio harbour and several great heaps of the cases of tinned meat and broken bottles."[105]

By 1877 only two miles of permanent track had been laid, subsequently, the project was abandoned after the contracting firm failed to make any progress on the railroad and declared bankruptcy.[106] The impediment of the geographical boundaries and disease prevented the completion of the Madeira-Mamore railroad.

Isaiah Bowman argued that the railroad was of vital importance to commerce since the only other means of transporting products from the region was through Santa Cruz where a six-week ox-cart journey and fifteen hundred miles of river navigation were still required to reach the sea.[107] Final construction of the railroad began in 1907, and was completed in July 1912. The Madeira-Mamore railroad traversed 202 miles of difficult terrain, providing an economically feasible transportation network for Western trade products. [108]

Most travel writers addressed the subject of diseases in the lowlands to some degree. George Chatworth Musters, on a mapping expedition for the Royal Geographic Society of London, introduced an image of Indians with regard to disease. Musters revealed the impact of infectious disease on his expedition in 1866, which decimated the

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[105] C. Barrington Brown and W. Lidstone, *Fifteen Thousand Miles on the Amazon and its Tributaries* (London: Edward Stanford, 1878), 344.
[106] Neville B. Craig, *Recollections of an Ill-Fated Expedition to the Headwaters of the Madeira River in Brazil* (Philadelphia: J. B. Lippincott, 1907),72.
[107] Bowman, 279.
[108] Ibid, 280.

indigenous population. Musters noted the members of the expedition were unaffected by the disease, although the Indians "used every possible means to convey the contagion to the whites."[109] Beyond the obvious suggestion the Indians succumbed to a disease to which whites were immune, Musters further defined Indians as devious and deceitful.

The significant impact of disease and physical geography on the failure of the Madeira-Mamore railroad project did not deter geographic and economic exploration in the region. Markham acknowledged the receipt of a letter from an Argentine geographer, Senor Moreno of Buenos Aires, who recently explored the Santa Cruz River in Patagonia. Markham informed the Royal Geographical Society of London the interests of geography were not neglected by South Americans, suggesting the Americans should continue with exploration.[110] An international competition to dominate the economic market of this region prevailed in the late nineteenth century, a competition, according to Herndon, the United States intended to secure. Herndon clearly stated the United States was interested in the opening of this region to navigation: "The trade of this region must pass by our doors, and mingle and exchange with the products of our Mississippi valley."[111]

Church employed a North American doctor, Edwin Heath, through the firm of P. & T. Collins, during the unsuccessful Madeira-Mamore Railway project of 1878-1879. When the company disbanded, Heath traveled down the Beni River from Reyes to its

[109] George Chatworth Musters, " Notes on Bolivia, to Accompany Original Maps," *Journal of the Royal Geographic Society of London* 47 (August, 1877): 212.
[110] Clements Markham, "The Still Unexplored Parts of South America," in *Proceedings of the Royal Geographical Society of London* 22 (1877-1878): 41.
[111] Herndon, 375.

confluence with the Mamore, and subsequently mapped the region. Publication of Heath's journey had a significant commercial effect on the eastern lowlands.

When Colonel Jose Pando of Bolivia explored the Madre de Dios River on behalf of the Bolivian government between 1892 and 1898, Church applauded the efforts since they "threw much-needed light on an attractive section of South America."[112] Pando relied upon the maps of the Beni River produced by Heath on his expedition, and subsequently named the River Heath in his honor.[113] The product of Pando's expedition was a more accurate map of the region than had previously existed; which was later published by then President Pando.[114]

Clements Markham explored the Beni River at the same time as Heath, and published the account in 1883. Markham identified an abundant source of quinine, the ingredient necessary to combat malarial disease present in the frontier, as well as a supply of India rubber. The ongoing battle with malaria was an impediment to economic development in the lowlands, making Markham's discovery particularly significant.

> …the streams flowing from the auriferous Andes are full of gold… This is the region of the chinchona bark richest in quinine, of the finest coffee and cacao in the world, of many kinds of rare and valuable cabinet woods, and of inexhaustible supplies of indiarubber. The Ynca expedition of the fifteenth century subdued the fierce tribes of Chuncho savages who inhabit the forests within 20 miles of the base of the Andes.[115]

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[112] Colonel George E. Church, "Northern Bolivia and President Pando's New Map," *The Geographic Journal* 18 (August 1901): 144.
[113] Edwin R. Heath, "The River Heath" *The Geographic Journal* 37 (June 1911): 681.
[114] Colonel Jose M. Pando, "A Map of Northern Bolivia, as corrected by Colonel Jose M. Pando From Explorations 1892-8," *Geographic Journal* 23 (1901): 248.
[114] E. R. Heath, "Exploration of the River Beni in 1880-1881," in *Proceedings of the Royal Geographic Society* 5 (1883) 327-341.
[115] Markham, "The Basins of the Amaru-Mayu and the Beni," 314.

The discovery of a source of quinine and India rubber had a significant impact on the nature of exploration in the twentieth century, but in conjunction with Heath's publication, had a momentous impact on the development of the rubber industry.

Prior to 1880, rubber production in eastern Bolivia remained limited due to the virtually unexplored and unknown Beni River system and its hostile Indians. Prior to Heath's mapping of the Beni, there were fewer than two hundred employed in harvesting rubber in the region of the Cavinas mission; within a matter of months it was estimated between 1000 to 2000 rubber tappers worked along the river.[116] Heath's exploration of the Lower Beni in 1880 marked the beginning of the Bolivian rubber boom and established precedence for the subsequent development of the eastern lowlands.[117]

Travel writers perpetuated the image of hostile Indians. The term 'hostile' in itself represents an anomaly, inconsistent with the position of the Indians whose territory was historically invaded and eventually controlled by European and Western interests. The following excerpt, written in 1877 by Henry Eckford in *From the Atlantic to the Andes*, described the hostile nature of the Caripuna Indians who had established a village on the riverbank.

> Here a horde of Caripuna Indians have settled down, whose reputation is not of the best, they having several bloody fights with white men. Either because of our number, or in consequence of small gifts presented to them, we were received in a very friendly way. It was a curious psychologic [sic] phenomenon to remark the mixture of fear and loathing with which our Moxos Indians regarded these entirely wild, naked relations. One was reminded of the relation to each other of wolf and shepherd's dog.[118]

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[116] For further information on the Bolivian Rubber Boom, refer to: Bradford L. Barham, "Reinterpreting the Amazon Rubber Boom: Investment, The State, and Dutch Disease," *Latin American Research Review* 29 (1994): 73-109; J. Valerie Fifer, "The Empire Builders: A History of the Bolivian Rubber Boom and the Rise of the House of Suarez," *Journal of Latin American Studies* 2 (November 1970): 113-146.
[117] Edwin Heath, "Bolivia as a Source of Rubber," *Manufacturer and Builder* 15 (January 1883): 10.
[118] Henry Eckford. "From the Atlantic to the Andes," *Scribner's Monthly, An Illustrated Magazine for the People* 15 (December 1877): 185.

Most illuminating is the metaphor Eckford provided comparing the Caripuna Indians to a wolf, and the Moxos Indians to a shepherd's dog. The Moxos, or Mojos Indians, were one of the indigenous groups relegated to the Jesuit missions, and who travel writers and explorers depended upon as workers. The Caripuna, on the other hand, had not been exposed to the missions, and subsequently continued traditional lives as *indios foresteros*. The comparison of the Caripuna Indians to a wolf presented an image of these Indians as untamed, and subsequently unwilling to follow its master's command. By contrast, the comparison of the Moxos Indians to a shepherd's dog, presented the image of obedience to its master in performance and an element of ownership.

There was a significant population of indigenous peoples in the lowlands of eastern Bolivia in the nineteenth century. Some of the groups migrated deeper into the Amazon basin as travel writers, explorers and settlers moved into the area, or were already extinct by the late nineteenth century. Heath referred to a tribe of Guarayo Indians he encountered on an earlier expedition, who had abandoned the high ground near a Cavinas Indian mission, and speculated they too might be extinct.[119] Eckford identified two other groups, the Parentintin and Araras, who had retreated from the banks of the Madeira deeper into the Amazon.[120] Others, like the Tacana, returned annually to fish and collect turtles on the sandbars, and then retreated to the further reaches of the forest.[121] Still others attacked the explorers and travel writers who invaded the territory where they hunted and fished, and subsequently were portrayed as hostile Indians.

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[119] Edwin R., Heath, MD. "Exploration of the River Beni in 1880-1,"in *Proceedings of the Royal Geographical Society and Monthly Record of Geography* 5 (June, 1883): 329.
[120] Eckford, 185-186
[121] Heath, 328.

Travel accounts were fundamentally about situations of contact. Travel writers provided a rich source of information concerning how the West saw itself in relation to the indigenous population. The nature of Indians encountered was presented in a summary manner, with the primary focus on mapping the physical geography. Travel writing by nature, however, is descriptive. Subsequently, the imagery of the indigenous population in this genre of literature is extraordinarily comprehensive. Every aspect of appearance, clothing, and physical characteristics of the indigenous population was described in detail. The ideological mapping of this genre of travel writers consistently portrayed the image of Indians through the use of derogatory language such as simple, lazy, slovenly, drunken, hostile and stupid, evident in the writings of J. J. Von Tschudi, Count Francis Castelnau, W. Bridges Adams, and A. W. Buckland.

Travel writers defined the cultural identity of the indigenous population of eastern Bolivia for the Western world through the images portrayed in published accounts. With this identity ascribed by Western travel writers, a vision of eastern Bolivia as an uninhabited region, rich in vast resources was ensconced in the Western mind. The ambition of the United States to strengthen its commercial ties in South America and open up Bolivia as a source of raw materials and tropical products for North American markets was linked to the development of a transportation network. It is in this context the physical mapping of Lieutenants Gardner and Herndon, Colonel Church, and Dr. Heath contributed to the future development of the eastern lowlands.

The Bolivian government lacked the financial resources to implement developmental policies, and subsequently succumbed to the influence of foreign capital in developing policies regarding the development of the lowlands. It was the

developmental policies of the lowlands that resulted from the land became in the emergence of Machupo virus into the human population.

CHAPTER II

THE DEVELOPMENT OF THE EASTERN LOWLANDS

The publication of nineteenth-century travel writers' accounts established the physical and ideological maps instrumental to foreign investment in Bolivia. Nineteenth-century travel writers defined indigenous identity for the West by ascribing an insignificant identity that prolonged the marginalized role of the indigenous population into the twentieth century. The publication of travel writers' accounts documenting the untapped economic resources in the eastern lowlands coupled with the development of a river transportation network through the Amazon basin provided the impetus for Western investment in the development of the eastern lowlands of Bolivia.

The international interests of the United Nations and the United States guided the developmental policies regarding of the eastern lowlands, in order to prevent Bolivia from submitting to the escalating communist threat that concerned the West at mid-century. The infusion of Western capital was welcomed by the MNR government due to the economic crisis extant in the country at mid-century. Kevin Healy recognized the role of international aid agencies in shaping the anti-indigenous policies of the elitist Bolivian government.[122] The indigenous population of Bolivia has a long history of experience dealing with colonial powers, from the time of the Spanish conquest, through the twentieth century Western economic conquest.

The Western perception of Bolivian Indians provided by travel writers led to the development of colonization plans that excluded the Indians as primary participants. Left

[122] Kevin Healy, *Llamas, Weavings, and Organic Chocolate: Multicultural Grassroots Development in the Andes and Amazon of Bolivia* (Notre Dame: Notre Dame University Press, 2001), 60.

out of the national developmental programs, the indigenous population cleared uncultivated land near the Machupo River, bringing *Calomys callosus*, the natural host of Machupo virus, into contact with the human population. The primary factor in the emergence of Machupo virus into the human population was the development of the eastern lowlands, brought about by Bolivia's National Revolution in 1952.

The Indigenous Population of the Lowlands

Bolivia has a diversity of indigenous cultures historically disregarded by the Bolivian government. The nineteenth-century travel writers acknowledged the presence of an indigenous population in the eastern lowlands; however, it was in the most summary manner. The ascribed identity of the Indians as uncivilized preceded the development of the eastern lowlands. The determination of the extent of the indigenous population of the lowlands has been problematic for scholars since few written records exist prior to the establishment of the Jesuit missions in the eighteenth century. The records from the missions provide figures of Indians incorporated into the mission system, and subsequently, do not incorporate the *indios foresteros* or the *indios selvaticos.*

Franz Keller collated data from the missions on his expedition in 1875 that suggested a significant presence of Indians, however, there was no comprehensive study conducted by either the Bolivian government or the international community until the twentieth century.[123] The economic interest of the United States in developing the

[123] Keller, 170.

eastern lowlands was a driving force in determining the future role of the indigenous population that occupied the region.

Alfred Metraux compiled a text identifying the Indian tribes of eastern Bolivia for the United States government in the early 1940s. The similarities between the accounts of travel writers and the text prepared by Metraux are striking. In addition to a Westernized interpretation of indigenous history, Metraux identified each of the Indian tribes by physical characteristics, territory, food products, types of housing, family structure, and rituals. The methodical approach used in the presentation of the information conveys a sense of expertise. Metraux, like the nineteenth-century travel writers, did not ask the Indians how they defined themselves, but based his descriptions on observations. This report is representative of the direction of development taken by the United States.

Thirty distinct groups representing eleven different language families are currently listed for the country.[124] Prior to the development of the lowlands, there were fifty different lowland indigenous tribes listed in the national census, with a total population of 43,050.[125] The Aymara and Quechua were the best known and most numerous throughout the country, but the real diversity was found in the lowland forests and savannas of eastern Bolivia. Today only a few *indios foresteros* and *selvaticos* remain and continue their traditional subsistence hunting and gathering lifestyle.

The varying length of contact with Western populations makes analysis of this impact upon indigenous groups challenging. Some of the Indians came into contact with

[124] Summer Institute of Linguistics, http://www.sil.org/linguistics.
[125] Instituto Nacional Estadistica (INE), "*Censo de Poblacion de la Republica de Bolivia"* (La Paz: *Ministerio de Hacienda y Censos*, 1951) 28-30.

the Spaniards during the first years of conquest, whereas others were subjected to more than seventy years of Jesuit rule and influence. Some Indians did not have any contact with whites until the early explorers and travel writers arrived; others remained unexposed until the rubber boom. In some cases, certain tribes, the *indios forestros*, have maintained their independence, and live as they did prior to the arrival of Westerners.

As early as 1696, the Jesuits estimated the population of Chiquitos Indians to be about 18,000. By 1766 the native population of Chiquitos had expanded to 23,788, distributed in the lowland mission villages as illustrated in Table III.[126]

Table III
Mission Population of the Lowlands (1766)

San Xavier	3,201
Concepcion	3,278
San Miguel	1,473
San Ignacio	2,734
San Rafael	2,746
Santa Ana	1,787
San Joseph	2,715
San Juan	1,953
Santiago	1,614
Santa Corazon	2,287
Total	23,788

The population was reduced significantly due to exposure to diseases of the Western world introduced by the Jesuits and Western explorers. The most significant of these diseases was smallpox, which resulted in an epidemic in 1828 that reduced the population of Chiquitos to fourteen by 1925. By 1900, the population of the Chiquitos was estimated to number only 2,017.[127]

[126] Alfred Metraux, *The Native Tribes of Eastern Bolivia and Western Matto Grosso* (Washington: U.S. Government Printing Office, 1942), 123.
[127] Metraux, 133.

The Indians who lived in missions of the lowlands were defined as "civilized" Indians by the travel writers of the nineteenth century, and subsequently were incorporated into population figures compiled by the Bolivian government in 1950. The population of the Indians living outside the missions, however, was calculated separately from the over-all population. This is indicative of the ethnocentric perspective of the Bolivian government, which regarded the indigenous population separately from the rest of the population. The mid-century population of the indigenous people of the lowlands estimated by the government in the Census of 1950 is presented in Table IV. The *Poblacion Selvicola de Bolivia* provided figures that identified the diverse tribes, the number of inhabitants, and the region occupied.[128] These figures represent only the lowland tribes, not the Quechua and Aymara who primarily resided in the altiplano at the time.

The record of the indigenous population in the jungle region of the Department of Beni was most relevant to the epidemic of Machupo virus that emerged nine years after the census. Similar statistical data was provided for the other lowland areas of Santa Cruz, Pando, Tarija, Chuquisaca, and Cochabamba. It should be noted that these census figures were for the *indios selvicolas,* who occupied the jungle region of the lowlands. The *indios foresteros* were the indigenous groups who occupied the forested lowlands, many of whom were remnants from the Jesuit missions in the seventeenth century.

[128]INE, "*Censo de Poblacion de la Republica de Bolivia"* (La Paz: *Ministerio de Hacienda y Censos,* 1951), 28-29.

Table IV
Indigenous Population of the Jungle of Bolivia (1950)

Province	Tribe	Number of Inhabitants	Total
Moxos	Sirionos	2,000	
	Mojenos	4,000	
	Yucareres	1,000	
	Sirineiris	1,50	7,150
Itenez	Itenez	4,000	
	San Simonianos	2,300	
	Pausernas	2,000	
	Baures	1,000	
	Paunacas	2,000	
	Sirionos	2,000	
	Canichanas	300	
	Joras	2,000	15,600
Mamore	Kuruguas	5,000	
	Canichanas	400	
	Sirionos	2,000	
	Gentios	1,200	8,600
Vaca Diez	Chacabos	1,000	
	Chamas	1,600	2,600
Ballivan	Tacanas	800	
	Chimanes	700	
	Movimas	2,900	4,400
Yacuma	Yari	200	
	Sinabos	800	
	Cayubabas	1,400	
	Itomas	1,700	4,100
Cercado	Casarabes	600	600
Total Lowland Indians in the Department of Beni			20,750

Whereas the indigenous population decreased in number by the middle of the twentieth century, the population taken as a whole experienced momentous growth, especially between 1900 and 1950. Preceding the Bolivian National Revolution in1952, Bolivia experienced its highest population growth since the beginning of the National Census. Table V illustrates the significant growth that occurred in the first half of the twentieth century through figures compiled during the first seven census reports of the *Censo de Poblacion de la Republica de Bolivia.* [129]

Table V
Population Growth in Bolivia (1831-1950)

Year	Population
1831	1,018,900
1835	992,700
1845	1,031,500
1854	1,544,300
1882	1,097,600
1900	1,696,400
1950	3,019,031

There was a significant decrease in the population in the 1835 census, which most likely can be attributed to the smallpox epidemic of 1828.[130] The only other decrease in population occurred in 1882. I can find no direct supportive data to correlate the relationship between disease and population decrease; however, travel writers acknowledged a noticeable decrease in the indigenous populations in the 1880s. Dr. Edwin Heath and Henry Eckford both documented the diminished population of the Indians encountered during their journeys of exploration, indicating that exposure to diseases may have been a contributing factor.

[129] INE, *Censo de Poblacion de la Republica de Bolivia* (La Paz: *Ministerio de Hacienda y Censos*, 1951) 10.
[130] Metraux, 123.

By 1950, the majority of Bolivia's population was crowded into the *altiplano* and highland *valles*, leaving the territory of the eastern provinces perceived as uninhabited. This region was populated by *indios foresteros*, the original inhabitants of the area, *mestizos*, *campesinos*, and a few adventurers who participated in the brief rubber boom at the turn of the century. Bolivia at mid-century was a predominately rural society, with the majority of the indigenous population lacking integration into the national economy. The *Movimiento Nacionalista Revolucion* (MNR) instituted radical social changes in Bolivia after gaining power in 1952, which led to the development of the eastern lowlands. Agricultural and economic development, the motivation for state-sponsored resettlement and immigration policies, was a significant factor contributing to the emergence of Machupo virus in the 1950s. Machupo virus emerged less than a decade after the Bolivian National Revolution of 1952.

Prior to 1952, a classic Latin American *hacienda* system existed, a system of forced labor of the indigenous population. The *pongo* system, which had colonial roots, required the Indians to work without pay, mostly as porters or doormen.[131] Under this system, ninety two per cent of the cultivated land was owned by six per cent of the landowners. These landowners, known as *hacendados*, allowed the *campesinos* to live on their land, with small plots to farm for themselves in exchange for labor. These *hacendados* required the *campesinos* to work three or four days each week, in addition to *pongo*, in return giving peasants access to land for their own use. The Indians were required to supply seeds, tools, and in some cases, even animals for this work, which left

[131] *Pongo* is derived from the Aymara word for door, *punca*, and refers to the obligatory household services required of *hacienda* Indians. *Pongo* was hated by all of the Indians, not only due to the demeaning nature of work, but also because it took away from the time needed to tend to their own crops.

the landowner with little capital expenditure. The MNR eliminated the system of *pongo*, resulting in the majority of *hacendados*' abandoning the land to the indigenous population as they retreated to the cities.

A Brazilian family enterprise, *Casa Suarez*, was the dominant employer in the epidemic area, owning the primary sources of income, including the land and the cattle. By 1908, the family controlled approximately 70,000 square miles of the eastern lowlands.[132] Valerie Fifer provided a detailed analysis of *Casa Suarez*, and determined that while the senior Suarez was occupied with cattle ranching in Beni, his son Nicholas Suarez dominated most of the output and trade in rubber. The company owned German meat processing facilities and a fleet of ships that transported both the rubber and beef down the Amazon River system and then shipped it to the Americas and Europe. The returning ships brought back rice, maize, beans, and fruit to feed not only the ranchers, but also the people of the Department of Beni.

The demographic distribution of the *hacienda* system that existed prior to the revolution can be interpreted through the figures provided in Table VI.[133] Close examination of these 1950 demographic figures for the Department of Beni clearly indicates the majority of the *campesino* population lived in homes with lacking bedrooms, or one-to-two bedroom dwellings that consisted of three to eight people. On the other extreme, there were only 142 homes with six or more bedrooms, which likely reflected the *haciendas*. Subsequently, it is not unreasonable to conjecture that a

[132] J. Valerie Fifer, "The Empire Builders: A History of the Bolivian Rubber Boom and the Rise of the House of Suarez" *Journal of Latin American Studies* 2 (November 1970): 137. Also, John Melby, "Rubber River: An Account of the Rise and Collapse of the Amazon Boom," *The Hispanic American Historical Review* 22 (August 1942): 452-469

[133] INE, "*Censo Demografico 1950"* (La Paz, *Ministerio De Hacienda Y Estadistica*, 1950) 97.

minimum of 142 out of the 27,663 occupants registered lived in *haciendas* that provided the main source of food and employment for the *campesino* population.

Table VI
Household Occupants and Bedrooms (1950)

Occupants	Total Occupants	Number of Bedrooms						
		0	1	2	3	4	5	6+
1	1,706	991	566	104	24	14	3	4
2	2,291	1,138	915	176	46	6	6	4
3	2,955	1,406	1,198	249	74	16	5	7
4	3,356	1,397	1,492	366	116	32	11	7
5	3,413	1,332	1,490	406	135	36	4	10
6	3,334	1,212	1,478	444	148	40	15	7
7	2,813	961	1,240	409	134	45	13	11
8+	7,785	2,817	3,163	1,429	584	236	94	92
Total	27,663	10,624	11,477	3,583	1,261	425	151	142

The marginalized existence of the population of the Department of Beni in 1950 is noticeable in the occupancy rate of dwellings. The census reported 10,624 people living in dwellings with no bedrooms. Out of that number, 2,817 dwellings housed eight or more people. In contrast, only 142 people occupied dwellings with six or more bedrooms, indicative of the status of the hacienda system prior at mid-century. The hacienda system began to deteriorate prior to the national revolution. Grieshaber examined figures for the Department of Cochabamba, and found an increasing number of vacant *haciendas* by the turn of the nineteenth century. The following figures in

Table VII represent the abandonment rate for *haciendas* in Cliza from 1838-1877.[134] The abandonment rate of *haciendas* increased from 0.6% in 1838 to 63% by 1877. The reason for the significant increase in desertion of the *haciendas* is a subject Grieshaber, Robert Edit, and other scholars have debated, however, the consensus was that the distance to marketing and urban centers in the uplands and disease were contributing factors.[135]

Table VII
Abandonment Rate of Haciendas (1838-1877)

Year	Occupied *Haciendas*	Vacant *Haciendas*
1838	166	1
1858	171	59
1877	172	108

Grieshaber argued the survival or failure of indigenous communities was dependent upon regional demographic and ecological conditions, not the *hacienda* system itself. Indians in the *altiplano* survived better than Indians of Cochabamba, due to the effects of disease in the lowlands.[136]

Declining living standards, rising population, and land fragmentation were contributing factors to migration from the heavily populated altiplano and valles to the lowlands. Bolivia's agricultural sector had been unable to produce sufficient food for the

[134] Erwin P. Grieshaber, "Survival of Indian Communities in Nineteenth-Century Bolivia: A regional Comparison," *Journal of Latin American Studies* 12 (November 1980): 246.
[135] Edit, 3. Also refer to Maario Hiraoka, *Pioneer Settlement in Eastern Bolivia* (Ph.D. diss., University of Wisconsin Milwaukee, 1974), 1.
[136] Grieshaber, 231.

nation since the early 1900s. Table VIII illustrates the rapid rise in the cost of living in the first half of the twentieth century. [137]

Table VIII
Cost of Living Index and Exchange Rates (1938-1952)

Year	Cost of Living Index	Exchange Rate of Bolivianos to US Dollar
1938	100-0	30-14
1939	140-7	42-97
1940	164-3	49-30
1941	221-8	61-60
1942	287-1	71-16
1943	311-3	71-76
1944	335-1	74-64
1945	361-2	77-94
1946	418-2	82-28
1947	493-7	87-40
1948	510-6	85-36
1949	561-3	93-52
1950	762-1	125-05
1951	967-2	147-90
1952	1,170-3	176-11

At the time of the revolution, the cost of living had escalated concomitantly with the devaluation of the *boliviano*. The resulting economic crisis was a motivating factor for migration from the urban areas in the highlands to the eastern lowlands to seek a subsistence lifestyle. Malthus suggested population would outrun food supplies unless checked by "moral restraint, vice and misery."[138] This theory was particularly applicable to Bolivia in the middle of the twentieth century.

[137] CEPAL, "Desarollo Economico de Bolivia," in Herbert Klein, *Bolivia: The Evolution of a Multi-Ethnic Society* 2nd ed. (New York: Oxford University Press, 1992), 298.
[138] T. R. Malthus, *An Essay on the Principles of Population* 2nd ed. (London, 1803), 16.

The rapid devaluation of the *boliviano* during the pre-revolutionary years 1950 to 1952 demonstrates the level of economic crisis extant in Bolivia following the revolution. The economic conditions preceding the revolution impacted the future direction of the development of the lowlands. The Bolivian government relied upon foreign aid to supplement its development programs, which allowed the West to direct the colonization programs. With the ascription of an uncivilized indigenous population by the nineteenth-century travel writers, Western immigration was perceived as the only method to insure successful colonization.

The Bolivian government experienced failed colonization attempts during the first half of the twentieth century in pursuit of a source of labor for the rubber tapping industry. The identification of vast quantities of indiarubber by travel writers in the late nineteenth century launched the lowlands into a short-lived rubber boom that relied heavily on the indigenous population for labor. The combined conditions of forced labor and disease resulted in a significant decrease in the indigenous population. By 1900, the rubber tapping industry experienced a noteworthy shortage of labor, which resulted in attempts to identify an alternative source of labor.

Baron de Riviere promoted Bolivia as a colonization zone for African Americans. In an advertisement placed by de Riviere, "Negroes for Bolivia," Bolivian employers contracted African American labor to harvest rubber for four consecutive years and in return agreed to pay all travel expenses involved in relocation. Each man received four acres of land for his house and garden, in addition to a wage of US$20 per month for each worker. The Baron clearly indicated the problem with labor was that Indians proved

to be unreliable and the experimental introduction of Japanese labor unsuccessful.[139] No evidence of a permanent colony of African Americans exists, which suggests that the proposed colony failed or was not established.

The pre-revolutionary conditions in Bolivia included a significant indigenous population unincorporated into the national economy, a period of economic decline, and a failing *hacienda* system. Each of these conditions was relevant to the impending development of the lowlands following the revolution. The presence of a marginalized indigenous population, defined as uncivilized by nineteenth-century travel writers, precipitated the need for European immigrants to colonize effectively the lowlands and stimulate agricultural production.

Herbert Klein identified three major reforms of the MNR during its twelve years in power: nationalization of the tin mines; granting universal suffrage to include the Quechua and Aymara Indians; and a massive land redistribution campaign.[140] Most significant for the emergence of Machupo virus was the issue of land redistribution. Bolivia redistributed approximately one-third of its agricultural land after 1952. The revolution left a crucial source of human inequality virtually untouched: education, language, and administrative skills. These are significant intangibles, which cannot be redistributed. In areas such as Beni, landless and land-poor *campesinos* were given both abandoned and virgin lands to farm, owning for the first time both the land and the food they produced upon it. As a by-product of centuries of living a marginalized existence,

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[139] Baron de Riviere, "Negroes for Bolivia" *Cleveland Gazette Newspaper*, 02 February 1901, 01.
[140] For additional sources on the revolution itself, refer to: Herbert Klein, *Bolivia, The Evolution of a Multi-Ethnic Society* (New York: Oxford University Press, 1982); Jonathan Kelley, Herbert S. Klein, *Revolution and the Rebirth of Inequality: A Theory Applied to the National Revolution in Bolivia* (Berkeley: University of California Press, 1981); James M. Malloy and Eduardo Gamarra, *Revolution and Reaction: Bolivia, 1964-1985* (New Brunswick, U.S.A.: Transaction Books, 1988); Christopher Mitchell, *The Legacy of Populism in Bolivia: From the MNR to Military Rule* (New York: Praeger, 1977).

they lacked the intangible assets necessary for successful integration into the national economy.

The lack of intangible assets such as education and economic opportunity had a significant influence on the outbreak of Machupo virus. Continuing a marginalized existence led the *campesinos* to resort to subsistence agriculture. In the clearing of uncultivated land to produce crops, the natural vector for Machupo virus was brought into contact with the human population, introducing an epidemic that would threaten the successful development of the eastern lowlands.

With the advent of the revolution, the remaining *haciendas* were abandoned, and boats no longer brought in food supplies. Consequently, the people of Beni were compelled to resort to subsistence agriculture. Left without the source of food provided by the *hacendados*, areas of forested land that had been previously untouched were cut down to plant crops of rice and corn. A rare species of field mouse, indigenous to the area, naturally subsisted on the seeds of the tall grasses that grew sporadically in their natural environment; however, the grasses proliferated in the cultivated cornfields. As the grasses multiplied, so too did the mice.

In clearing land to produce the rice and corn once imported by *Casa Suarez*, the *campesinos* unknowingly altered the ecology of the region. This ecological alteration resulted in a significant change in the habitat of an indigenous rodent, *Calomys callosus*. A favorable environment and the necessary food supplies encouraged its proliferation into a dominant species, a species that is the natural reservoir for Machupo virus. Paul Farmer attributed the factors of poverty and social inequality to the emergence of new diseases, arguing that tropical diseases predominantly affect the poor, and the groups at

risk for these diseases are generally "bounded more by socioeconomic status than by latitude."[141] This statement was particularly applicable to the people of San Joaquin at the time of the initial outbreak of Machupo virus.

Three factors influenced the developmental policies directed toward the eastern lowlands following the Bolivian National Revolution: national poverty, under-development, and fear of encroachment of its borders by Brazil. In a series of wars fought and lost over the late 19th and early 20th century, Bolivia lost much of its territory to neighboring countries. The first of these losses was the nitrate-rich Atacama Desert and the port of Antofagasta to Chile in 1884; followed by the Acre territory to Brazil in 1903, and soon afterward three quarters of the Chaco to Paraguay in 1935.

The MNR determined settlement of the eastern lowlands was the solution to these problems. With the proper economic incentives, colonization would stimulate agricultural and economic development, thus alleviating some of the problems associated with national poverty and under-development. The presence of a population integrated into the national economy would eliminate the threat of future encroachment by Brazil. Concomitantly, colonization would further stimulate agricultural production, one of the fundamental objectives of the Agrarian Reform Act initiated by the MNR following the Bolivian National Revolution. Limitations to development in the eastern lowlands at mid-century included the lack of a viable transportation network, a history of ineffective efforts at settlement and the proliferation of diseases. The role of disease was to have an unanticipated effect following the development of the lowlands.

[141] Paul Farmer, "Social Inequalities and Emerging Infectious Diseases," *Emerging Infectious Diseases* 1 (January-March 1999): 904.

Eastern Bolivia, in conjunction with the Bolivian National Revolution's agricultural development plan, was designated as a priority area of colonization. When the MNR came to power in 1952, the United States was concerned about the ideological orientation of the party, and about the strong Marxist influence that had the potential of controlling Bolivia. During the era of McCarthyism, the fear of communism had a significant impact on the policies of the United States with regard to Bolivia. Stephen Zunes suggested the National Security Council intended to "combat Communist agrarian reform by encouraging land development of our type." [142]

Victor Andrade stated that following the Bolivian National Revolution in 1952, the most urgent need for Bolivians was food, and he admitted that "only the assistance of the United States could avoid a repetition of the famine which had occurred in our country during the War of the Pacific."[143] The United States offered nine million dollars in famine relief, making Bolivia the largest recipient of food aid per capita in the world.[144] Coupled with loans and grants, the MNR government received sixteen million dollars in foreign aid from the United States in 1955.[145] Table IX represents economic aid from the United States to Bolivia in the form of food, loans, and grants between 1952 and 1962.

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[142] Stephen Zunes, "The United States and Bolivia: The Taming of a Revolution, 1952-1957," *Latin American Perspectives* 28, no. 5 Free Trade and Resistance (September 2001): 33-34.
[143] Victor Andrade, *My Missions for Revolutionary Bolivia, 1944-1962* (Pittsburgh: University of Pittsburgh Press, 1976), 161.
[144] James Dunkerly, *Rebellion in the Veins: Political Struggle in Bolivia, 1952-82* (Thetford: Thetford Press, 1984), 161.
[145] United States Agency for International Development, "*US Overseas Loans and Grants*" (Washington DC: Office of Development Evaluation and Information) HFM-C-00-01-000155-00.

Table IX
United States Food Aid, Loans, and Grants to Bolivia 1952-1962

Investment	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Economic Assistance Loans and Grants	1.5	1.3	15.8	27.0	28.1	27.3	22.4	24.9	15.0	30.7	36.6
Economic Assistance Loans	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	9.7	10.4
Economic Assistance Grants	1.5	1.3	15.8	27.0	28.1	27.3	22.4	20.9	15.0	21.0	26.2
USAID and Predecessor Loans and Grants	1.5	1.3	7.5	11.0	25.4	23.3	22.4	0.0	0.0	0.0	0.0
USAID and Predecessor Loans	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	7.3	7.9
USAID and Predecessor Grants	1.5	1.3	7.5	11.0	25.4	23.3	22.4	20.5	14.8	20.6	24.4

United States Agency for International Development, "*US Overseas Loans and Grants*" (Washington DC: Office of Development Evaluation and Information) HFM-C-00-01-000155-00

One of the objectives of the MNR government was the promotion of internal migration from the altiplano to the lowlands. The redistribution of land by the government was aimed at integrating the *campesinos* into the political and economic life of the country. Bolivia's high level of economic dependency on the United States made it possible for the United States to direct the course of the development of the eastern lowlands. Stephen Zunes argued the United States influenced the policies of the MNR party, taking advantage of the economic relationship between the two countries to achieve U. S. foreign policy goals.[146] Subsequently, the United States supervised aid distributed in the directed colonization efforts. Due to depressed economic conditions in Bolivia resulting from the collapse of the tin industry, the Bolivian government welcomed funding from the United States, and redirected its efforts at immigration rather than migration.

Human population movement resulting from migration and war is an important factor in disease emergence. Historically, economic conditions following wars in developed countries have forced mass movements of workers from rural areas to cities. The trend in undeveloped countries such as Bolivia is movement from the cities to rural areas. Due to societal changes implemented by the MNR, *campesinos* from the *altiplano* began migrating to the eastern lowlands following the Agrarian Reform Act in 1953, which led to agricultural adaptations instrumental to the emergence of Machupo virus.

There were two distinctly different approaches to the development of the lowlands: directed colonization and spontaneous settlement. Directed colonization involved extensive government support, and included the colonization programs in the

[146] Zunes, 46.

Alto-Beni and Santa Cruz regions. Spontaneous settlements, on the other hand, were unplanned and unsupervised resettlement programs that received no government support. The success of these two different approaches varied, determined by the presence of disease and the establishment of transportation networks.

Directed Colonization

Directed colonies were a significant part of the MNR government policies in the 1950s and 1960s because they controlled migration of the indigenous population and coordinated services as well as foreign aid. The MNR government initially intended to resettle the Quechua and Aymara from the overpopulated altiplano into the lowlands, to relieve the pressure of overpopulation. Bolivia's high level of economic dependency on the United States made it possible for the United States to direct the course of the development of the eastern lowlands.

There were two directed colonization programs in the eastern lowlands: the United Nations Andean Indian Programme (1954) and the Alto Beni Project (1961). Each of these colonization efforts included international aid in development, yet each took a different direction in organization. An impediment to colonization, however, was that in the early 1950s, no railroad or paved road existed from the political and economic center of La Paz into the Santa Cruz region.

In response to the alleviating the burdens of the overpopulated *altiplano,* the United Nations Andean Indian Programme was designed to integrate successfully the Indians from the high *altiplano* to the eastern lowlands by providing advanced solutions

to resettlement. The Bolivian government worked in concert with the United Nations to develop the planned and highly directed colony of Cotoca.

The Andean Indian Programme

The Andean Indian Programme was the first attempt under the MNR government at the resettlement of the indigenous population. The colony of Cotoca consisted of one hundred families resettled from Departments of Oruro and Potosi. Both Oruro and Potosi were located on the *altiplano*, with sizeable populations at mid-century. Potosi, the former silver mining region of Bolivia, was overcrowded in 1950. The rural population numbered 372,110, which when combined with the urban populace of 121,321, resulted in 493,431 inhabitants in a region incapable of supporting its populace due to the cold, arid climate. Although Oruro had a smaller population, it faced a similar problem, with 102,667 Indians residing in the rural region of the Department, and 90,592 inhabiting the urban areas, bringing the total population for the Department to 193,259.[147]

Each of the migrant families from the *altiplano* was allotted ten hectares of land, and provided housing, drinking water, sanitation, a community center, clinic, and a school. The United Nations supplied technical advisors, money, food rations, tools, equipment, seed, and animals for the colony. [148] J. Valerie Fifer referred to this frontier model of development as the "leave nothing to chance approach."[149] With everything planned in advance and provided for the colonists, the colony still failed. By 1960, thirty

[147] INE, "*Censo de Poblacion de la Republica de Bolivia,"* (La Paz: *Ministerio de Hacienda y Censos*, 1951), 31.
[148] J. Rens, "The Andean Programme," *International Labour Review* 134 (1961): 424, and 'The Development of the Andean Programme and its Future," *International Labour Review* 137 (1963): 547-63.
[149] J.V. Fifer, "The Search for a Series of Small Successes: Frontiers of Settlement in Eastern Bolivia," *Journal of Latin American Studies* 14, no.2 (November 1982): 407-432.

families had abandoned the colony, either to return to the *altiplano*, or to seek other land or jobs around Santa Cruz. The vocational training equipment donated by Belgium was removed by a representative of the United Nations in 1963, and transferred to Cochabamba along with the UN advisors.[150] The strategy of providing aid and withdrawing was a consistent feature of Western aid, repeated with the isolation of Machupo virus in this region in 1964.

The transportation of people and products in the lowlands was facilitated by the completion of the Cochabamba-Santa Cruz highway in late 1954. This paved highway extended 312 miles and linked two of the most significant areas of settlement, Cochabamba and Santa Cruz; however, it did not provide a connection to the planned colonies. In an analysis of the impact on social mobility, Fred Bergsten supported the colonization program as the primary means for the integration of the indigenous population into the national economy; however, he considered completion of the Cochabamba highway a contributing factor to the deterioration of the relationship between the *altiplano* and lowland Indians.[151] This relationship was an issue addressed by the Bolivian government in the formation of the Alto Beni Project.

Concomitant with the Andean Indian Programme was a study conducted by the Santa Cruz Development Survey Group for the Santa Cruz, Bolivia Area Development Group. The stated purpose of the Development Group was to consider the problem of Bolivia's known deficiency in foodstuff production and the possible effect of internal migration as well as immigration of people as a step in increasing production to

[150] M. J. Anstee, *Gate of the Sun: A Prospect of Bolivia* (London, 1970), 200.
[151] Fred Bergsten, "Social Mobility and Economic Development: The Vital Parameters of the Bolivian Revolution" *Journal of Inter-American Studies* 6, no. 3 (July 1954): 372.

overcome this deficiency. Over the course of seven weeks, the survey team reviewed government agricultural, economic, and background reports on the area, made personal visits to the region, and discussed the internal problems with local and national figures. The Santa Cruz Development Survey Team presented three general conclusions in their report.[152]

1) The region contained sufficient uncultivated land and acceptable climate and soil conditions to produce all the foods the country was importing, and could produce surplus for export.
2) The resettlement of 5,000 Southern European families with agricultural experience over a period of five years would be the most effective method to bring the land under cultivation.
3) Internal movement of Indian groups would be slow because of the social, economic, and climatic factors. In addition, transplanting the native Indian population would not materially contribute to the food shortage problem.

Recommendations for European immigrants were based on the survey teams' perception that Bolivia could be strengthened "in number, in culture, in productive capacity, in commercial enterprise, in the professions, crafts and sciences."[153] This recommendation reflected the perception of the cultural superiority of the West portrayed by the nineteenth-century travel writers. Furthermore, the team advised the Bolivian

[152] U.S. Foreign Operations Administration, *Report, Santa Cruz Area Development Group* (Washington D.C: Government Printing Office, 1954), 2.
[153] U. S. Foreign Operations Administration, 15-16.

government to locate the Indians in settlements to enable them to get training from the local or immigrant groups "by example, by employment, or by planned instructions."[154]

This approach towards colonization continued to support the marginalized role of the indigenous population. In the report, Bolivian officials acknowledged support for European immigration, and stated that their position was not due to "likes or dislikes of race, religion or national origin, but, rather, upon the specific and urgent needs of the country."[155] This policy demonstrated the government's willingness to capitulate to the United States in exchange for economic support.

The survey team was comprised of experts sent from the United States. Merwin Bohan, U.S. Ambassador to the Inter-American Economic and Social Council from 1951 to 1955, stated, "We had the Department of Agriculture that sent its best, its best men down…and we cooperated very, very closely with the ministries of agriculture."[156] Table X provides a list of the advisors on the Santa Cruz Development Survey Team.

Table X
The Santa Cruz Development Survey Team (1954)

Homer J. Henney	Special Consultant, Head of Survey
Matthew Drosdoff	Senior Soils Specialist, U.S. Department of Agriculture
Harold Mowry	Public Health Service
Clayton Schroeder	Agriculturist – USOM Panama
Ugo Carusi	Deputy Assistant Director for Refugees, Migration and Voluntary Assistance
Edward Maguire	Program Officer – Office for Refugees, Migration and Voluntary Assistance

[154] Ibid, 16.
[155] U. S. Foreign Operations Administration, 15-16.
[156] Richard D. McKenzie, *"Merwin L. Bohan, Oral History Interview"* (Dallas: Harry S. Truman Library, 1974), 68.

Close examination of the team members demonstrates a lack of Bolivian participation, clearly indicating the United States government directed the development of the Santa Cruz region. Both the United States Department of Agriculture and the Office for Refugees had representatives on the survey team. The placement of refugees in the post World War II era was of significant importance to the United States government. Colonists from Okinawa and Japan were subsidized by their own respective governments as well as by the United States government and their own respective governments in relocating to the frontier of the eastern lowlands.

The survey team addressed the problem of the three major diseases that presented an impediment to development in the region in the past: malaria; yellow fever; and plague. To eliminate the ongoing threat of malaria, the team suggested a program for residual spraying of all dwellings in the new areas to be colonized. Planned immunization of the new population resettling in the Santa Cruz area provided a solution to the problem of jungle yellow fever.[157] With regard to plague, the team recommended attention to rat control through the use of brick for new buildings, rat-proof food storage, and DDT dusting of areas where rats were present.[158] Thus in an effort to suppress the diseases recognized in the lowlands to promote colonization, another disease, Machupo virus, was unwittingly unleashed.

The Alto Beni Project

The *Corporacion Boliviana de Fomento* (CBF) was formed with the objectives of health eduction and agricultural development in the lowlands. Capital from Import-

[157] U. S. Foreign Operations Administration, 54-55.
[158] Ibid, 55.

Export Bank of Washington and the Bolivian government enabled the company to administer resettlement projects in the lowlands. Through legislation sponsored by the MNR government, the *Corporacion Boliviana de Fomento* was given the rights to 1,629,200 hectares of land within the three lowland regions. Three colonization programs were implemented by the CBF: the Alto Beni project in the Yungas, the Chimore project in the Chapare, and the Yapacani project in Santa Cruz.

Organized by the Bolivian Development Corporation (CBF) and financed by USAID, the Alto Beni Project was designed for the resettlement of 550 families in the *yungas* northeast of La Paz. As in the Andean Indian Programme, the development of the Alto Beni Project in 1961 represented the collective effort the Bolivian government and the international community in developing the agricultural potential of the lowlands, illustrated in Figure I. The MNR government promoted the Alto Beni Project as a beneficent "Promised Land," comparable to the Promised Land mentioned in the bible.[159]

> This low country is for many Bolivians a sort of "Promised Land" like about which we are told in the Bible. They identify it with the pre-Colonial myth of "El Dorado" which the Spanish conquistadors so eagerly sought in pursuit of gold and wealth.

The description of the lowlands of eastern Bolivia as a the mythical El Dorado provided imagery comparable to the nineteenth century travel writer, Clements Markham, who stated the "streams flowing from the auriferous Andes are full of gold."[160]

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[159] Fadrique Reyes Munoz, *Un Transplante humano: el proyecto de colonizacion Alto Beni de Bolivia* (La Paz: Una Publicacion de la Oficina de Proyectos Especiales del Ministerio de Economia Nacional de Bolivia 1965), 2. Loose translation provided by the Alto Beni Project.
[160] Markham, 314.

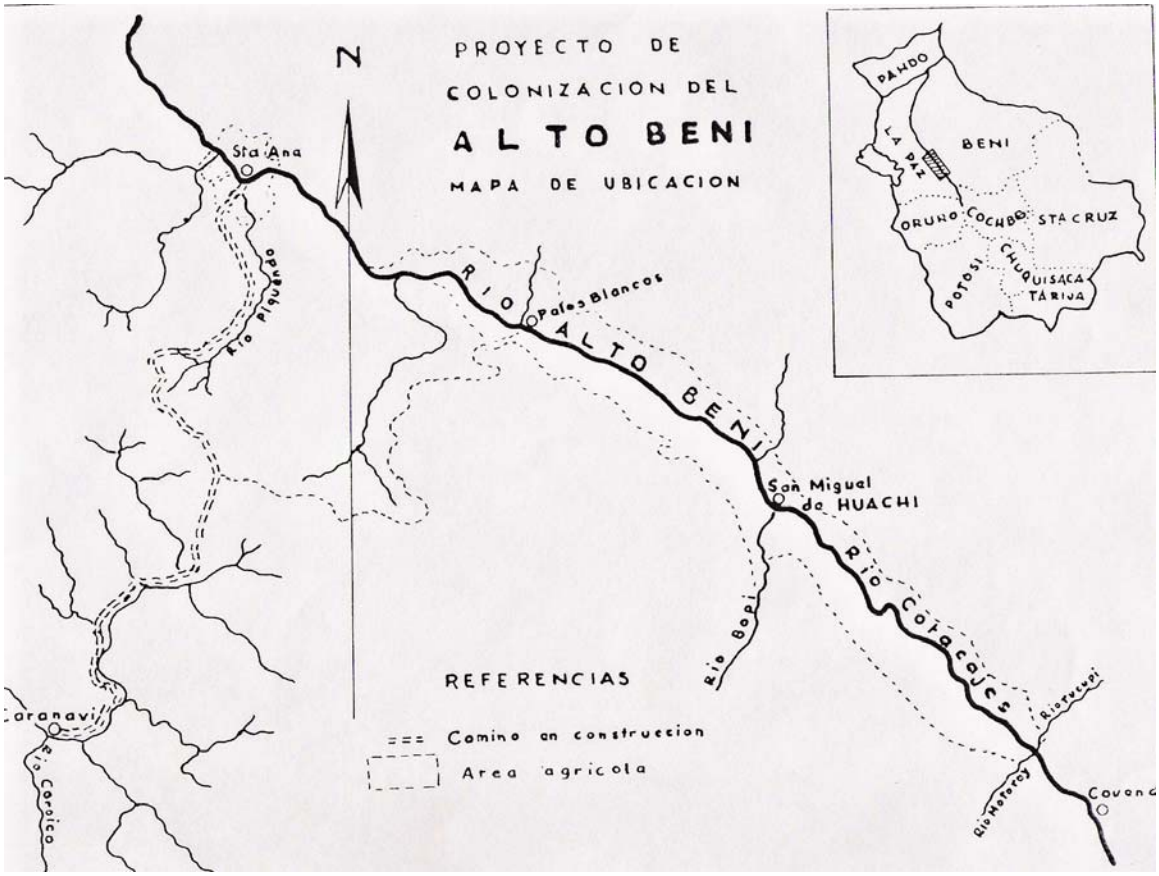

Figure I - Alto Beni Colonization Zone

The fundamental objectives of the Alto Beni Project were closely aligned with the goals of the MNR government: diversification of the national economy to include coffee, cacao, fruits, sugar, and corn; the geographic, social, political, and economic integration of national territory by the construction of roads; the redistribution of population; and to eliminate small farms in areas where demographic pressure was evident.[161]

The plans for colonization began with the cleaning of malaria zones, intrinsic to successful developmental efforts. The MNR government was aware that the principal obstacle to earlier attempts at colonization was the presence of malaria, which had resulted in the death or migration of earlier colonists. The government instituted

[161] Corporacion Bolivian de Fomento, *Resena Historica Del Proyecto Alto Beni*. (La Paz, 1965), 29.

significant policies to eradicate any reservations the indigenous population might interpret as a limitation to resettlement. This included the treatment of malarial mosquitoes, which were native to the lowlands and were responsible for the demise and flight of settlers in the past.

The MNR government acknowledged malaria was the principal obstacle to colonization in the past, one that the government was ready to address in the promotion of the Alto Beni Project.[162]

> Los planes de colonizacion, cuidadosa y anticipadamente estudios, se iniciaron con el sanamiento de las zonas malaricas. Este mal diezmo o hizo huir a los luganeros en buen porcentaje y fue el principal obstaculo para otros intentos de colonizacion.

Promotional photographs featured *campesinos* who had successfully resettled the lowlands, cleared land and erected housing, as well as images of the army spraying for mosquitoes. The admission of the presence of this disease, and the use of the army to eradicate malarial mosquitoes, was representative of the unified effort of the national government and the international community to eradicate malaria.

The MNR government estimated the eastern lowlands encompassed approximately eighty per cent of the country's potential wealth, although occupied by almost fifteen per cent of the population. The promotional booklet for the Alto Beni Project compared Bolivia to "a beggar on a throne of gold," since the wealth of the lowlands was located almost two hundred miles from the coast. [163]

> As always when production resources are remote from the highways of the world their development is more difficult and costly. Nearer the ocean (about 200 miles in a straight line) are the mines, which

[162] Munoz, 33. Most of the previous inhabitants of the area had either been killed off or forced to migrate because of this scourge, which constituted the principal obstacle to earlier attempts at colonization.
[163] Munoz, 3.

> are responsible for the country's monoproduction. The more distant and probably greater sources of wealth were neglected. Hence, the figure "a beggar on a throne of gold" is not merely a legend but a fact. Barely fifteen per cent of the population lives in the region that may contain eighty per cent of the country's potential wealth.

The Bolivian government promoted the cooperative effort of the Alliance for Progress in developing the eastern lowlands as a march towards the "Promised Land."[164] The administration of the diverse projects of this effort was to be shared jointly by administrators both from Bolivia and the United States. The primary focus was on health programs, construction of a transportation network and the development of new production resources.

> To the Bolivian and American plans of technical and economic cooperation the Alliance for Progress has been added, and the march towards the "Promised Land" is being realized by means of various projects under the direction of technicians of both countries: Health programs, the construction and maintenance of roads, the building of schools and training of teachers, the opening up of new production resources, and the supplying of credit for industry. In short, an entire range of dreams of the past are today becoming a reality.

Extensive pre-colonization efforts included collection of data on the physical environment, feasibility studies, survey and construction of a primary road and feeder roads, parceling of lots building of houses and community centers by special army units, the employment of soldiers or contractors to clear and plant land with staple crops prior to arrival of colonists.

The benefit to colonists included the cost of transportation to the colony, a cash subsidy for food during first eight months, limited medical and technical assistance, a supply of seed, and basic tools including a machete, axe, and hoe. Each family was initially allotted two hectares for personal farming and was guaranteed title to a twelve-

[164] Munoz, 3.

hectare plot within three years. The colonist's obligation included contribution of personal labor for community activities, to work their parcel of land according to instructions of technical staff associated with the program, not to exchange or modify the plot or to leave the colony without permission, and to repay the loans and administrative costs incurred on his behalf by the CBF within ten years. Failure to comply with any of the rules led to loss of all rights to the land.

Spontaneous Colonization

Although the government and the Bolivian Development Corporation promoted the Alto Beni Project, many *altiplano campesinos* were unaware of the resettlement program, and subsequently spontaneous colonization occurred. Hernan Zeballos-Hurtado conducted extensive research and interviews regarding migration, and presented a case study of spontaneous development in the San Lorenzo colony.[165]

The *campesinos* heard about the availability of land late in 1959 from truck drivers who brought oranges, bananas and rice to the local market from the lowlands. A group from Pacejas selected representatives to travel down to Caranavi with one of the truck drivers to gather information. They returned a week later, and reported a suitable site for colonization. Although the *campesinos* reported the heat and humidity were unpleasant, and insects a nuisance, the presence of other *altiplano* families encouraged their interest. Following this visit, the *campesinos* from Pacejas made their first formal approach to the Bolivian Development Corporation to settle along the San Lorenzo River, a part of the Beni headwater system. In September 1960, they were granted a

[165] H. Zeballos-Hurtado, *From the Uplands to the Lowlands: An Economic Analysis of Bolivian Rural-Rural Migration* (Ph.D. Dissertation, University of Wisconsin-Madison, 1975), 178-81.

Memorandum with a map showing them the location of the zone assigned to them with the authorization to occupy one thousand hectares. [166]

The same limitation that affected other colonization projects, the lack of a road connecting the colony to the highway, led to losses in the first three years. The *campesinos* had to carry agricultural products on their backs five kilometers to reach the Caranavi Road. The case of the San Lorenzo colony demonstrates two significant considerations in the examination of the resettlement programs developed by the MNR. First, the promotion of land for settlement was successful when the indigenous population instituted spontaneous colonization. Second, knowledge of the redistribution of land in the eastern lowlands did not reach the entire population. The cost of settlement to the CBF was US$2500 per family in first phase of the Alto Beni project. In 1963, the need for foreign capital to invest in the lowlands prompted the CBF to place a full-page advertisement in the *New York Times* promoting its efforts in assisting in the development of the Bolivian Economy.

Scholars have criticized the efforts of the MNR land redistribution program and the administrators apparent anti-indignous policies. Katherine Barnes de Marschall, of the *Servicio Nacional de Reforma Agraria* revealed harsh criticisms of the judges assigned to administering loans and government assistance to the indigenous population. Marschall condemned the corruption she found while investigating the administration of the land redistribution program. The following excerpt from her report demonstrates some of the obstacles faced by the Indians seeking assistance from government officials.

[166] Zeballos-Hurtado, 179.

> Together with the *Banco Agricola*, the extension Service is attempting large loans to townspeople interested in sheep and cattle ranching – a potential addition, townspeople want to begin dairies and undertake potato farming. They seem to be the only ones able to get big loans and assistance, and there is bribery involved most suggest. The agrarian judges viewed at close hand for seven months during the Yungas fieldwork are corrupt and nearly criminal in their abuses and fines of the peasantry. In Community Cuchunpaya, for instance, in three loans received officials were bribed. On six additional ex-haciendas canvassed in Sud Yungas, only three peasants among hundreds had received loans for citrus cultivation, and most had been unable to repay them. The judge in Chulumani was involved in scandal along with other town officials concerning the selling of State lands in Ana Maria de Siguilini. The judge has allied himself with the extreme right, withholding titles from peasants who do not pay him a substantial fee, and refusing to go to the ex-haciendas unless paid a minimum of $25.00.[167]

Marschall provided incalculable insight into the process of land redistribution from the local level representative of the continued marginalization of the indigenous community by both the national and international community.

Sponsored Colonization

In contrast to the directed and spontaneous colonies promoted in the development of the eastern lowlands, sponsored colonization was directed specifically toward immigrant populations. This type of colonization was indicative of goals of the United States, as indicated by Merwin Bohan. Sponsored colonization involved the displacement of the *indios foresteros*, who remained marginalized following the Bolivian National Revolution.

The following document in Figure II represents an attempt by the Bolivian government to recruit white settlers to the Department of Santa Cruz in conjunction with

[167] Katherine Barnes de Marschall, *Revolution and Land Reform in the Bolivian Yungas of La Paz.* (La Paz: Servicio Nacional de Reforma Agraria, 1970), 230-31.

agricultural and economic development. The advertisement, placed in *Natural History Magazine*, offers homesteading opportunities compared to the Western frontier of the United States.[168] Norman Lewis questioned Bolivian Under Secretary Guido Strauss about the land offered in this advertisement. According to Lewis, "forty-one Indian tribes, with a total population of about 120,000, are recorded as living in the nominal emptiness of eastern Bolivia. Some of them occupy precisely those areas shown on Dr. Strauss's map as designated for development."[169] Dr. Strauss, in an interview with Norman Lewis explained national poverty and under-development forced the Bolivian government to settle remote areas to prevent future encroachment by Brazil. The Bolivian government, Lewis stated, also received a 150 million dollar credit from the Federal German Republic to allow the entry of 150,000 white immigrants from South Africa, Namibia and Rhodesia.[170]

The relocation of the Indians occupying the land designated for immigrant occupation was relegated to missionaries, who were working to move the Indians into mission towns. There were three problems inherent in this process. First, the government had a history of failing to integrate the indigenous population into the national economy, condemning them to a marginalized existence. Second, the culture of these Indians was compromised in the process of integrating them into mission towns.

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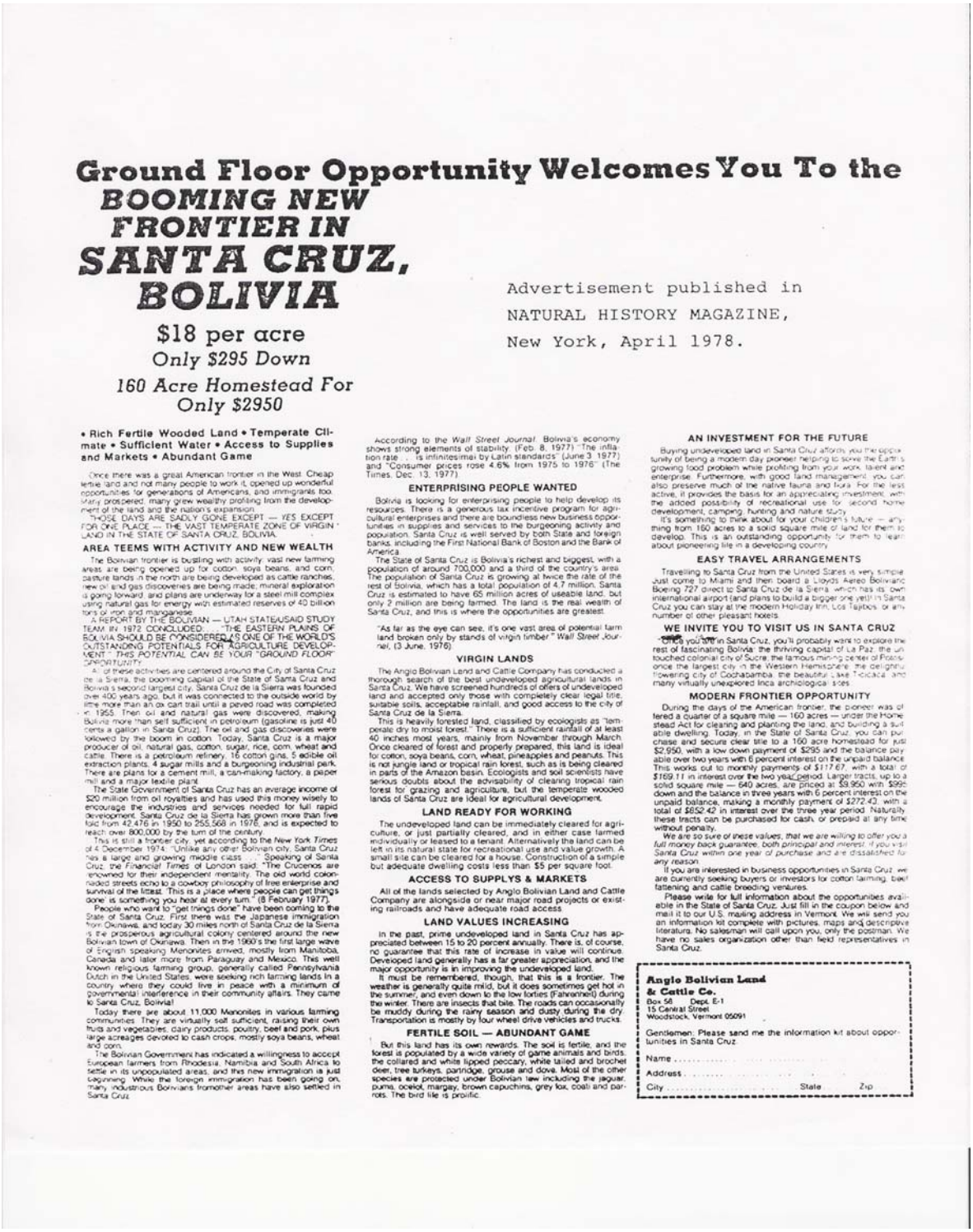
[168]Advertisement, *Natural History Magazine* (New York, 1978).
[168] Norman Lewis, *Eastern Bolivia: The White Promised Land* (Copenhagen: International Work Group for Indigenous Affairs, 1978), 14.
[168] Norman Lewis, 14.

Figure II
Advertisement for Immigrants to the Eastern Lowlands



Ground Floor Opportunity Welcomes You To the BOOMING NEW FRONTIER IN SANTA CRUZ, BOLIVIA

Advertisement published in
NATURAL HISTORY MAGAZINE,
New York, April 1978.

$18 per acre
Only $295 Down
160 Acre Homestead For Only $2950

• Rich Fertile Wooded Land • Temperate Climate • Sufficient Water • Access to Supplies and Markets • Abundant Game

Once there was a great American frontier in the West. Cheap fertile land and not many people to work it, opened up wonderful opportunities for generations of Americans, and immigrants too. Many prospered, many grew wealthy profiting from the development of the land and the nation's expansion.

"THOSE DAYS ARE SADLY GONE EXCEPT — YES EXCEPT FOR ONE PLACE — THE VAST TEMPERATE ZONE OF VIRGIN LAND IN THE STATE OF SANTA CRUZ, BOLIVIA.

AREA TEEMS WITH ACTIVITY AND NEW WEALTH

The Bolivian frontier is bustling with activity: vast new farming areas are being opened up for cotton, soya beans, and corn, pasture lands in the north are being developed as cattle ranches, new oil and gas discoveries are being made, mineral exploration is going forward, and plans are underway for a steel mill complex using natural gas for energy with estimated reserves of 40 billion tons of iron and manganese.

A REPORT BY THE BOLIVIAN — UTAH STATE/USAID STUDY TEAM IN 1972 CONCLUDED: "THE EASTERN PLAINS OF BOLIVIA SHOULD BE CONSIDERED AS ONE OF THE WORLD'S OUTSTANDING POTENTIALS FOR AGRICULTURE DEVELOPMENT." *THIS POTENTIAL CAN BE YOUR "GROUND FLOOR" OPPORTUNITY.*

All of these activities are centered around the City of Santa Cruz de la Sierra, the booming capital of the State of Santa Cruz and Bolivia's second largest city. Santa Cruz de la Sierra was founded over 400 years ago, but it was connected to the outside world by little more than an ox cart trail until a paved road was completed in 1955. Then oil and natural gas were discovered, making Bolivia more than self sufficient in petroleum (gasoline is just 40 cents a gallon in Santa Cruz). The oil and gas discoveries were followed by the boom in cotton. Today, Santa Cruz is a major producer of oil, natural gas, cotton, sugar, rice, corn, wheat and cattle. There is a petroleum refinery, 16 cotton gins, 5 edible oil extraction plants, 4 sugar mills and a burgeoning industrial park. There are plans for a cement mill, a can-making factory, a paper mill and a major textile plant.

The State Government of Santa Cruz has an average income of $20 million from oil royalties and has used this money wisely to encourage the industries and services needed for full rapid development. Santa Cruz de la Sierra has grown more than five fold from 42,476 in 1950 to 255,568 in 1976, and is expected to reach over 800,000 by the turn of the century.

This is still a frontier city, yet according to the *New York Times* of 4 December 1974, "Unlike any other Bolivian city, Santa Cruz has a large and growing middle class . . . Speaking of Santa Cruz, the *Financial Times* of London said, "The Cruceños are renowned for their independent mentality. The old world colonnaded streets echo to a cowboy philosophy of free enterprise and survival of the fittest. This is a place where people can get things done' is something you hear at every turn." (8 February 1977).

People who want to "get things done" have been coming to the State of Santa Cruz. First there was the Japanese immigration from Okinawa, and today 30 miles north of Santa Cruz de la Sierra is the prosperous agricultural colony centered around the new Bolivian town of Okinawa. Then in the 1960's the first large wave of English speaking Mennonites arrived, mostly from Manitoba, Canada and later more from Paraguay and Mexico. This well known religious farming group, generally called Pennsylvania Dutch in the United States, were seeking rich farming lands in a country where they could live in peace with a minimum of governmental interference in their community affairs. They came to Santa Cruz, Bolivia!

Today there are about 11,000 Mennonites in various farming communities. They are virtually self sufficient, raising their own fruits and vegetables, dairy products, poultry, beef and pork, plus large acreages devoted to cash crops, mostly soya beans, wheat and corn.

The Bolivian Government has indicated a willingness to accept European farmers from Rhodesia, Namibia and South Africa to settle in its unpopulated areas, and this new immigration is just beginning. While the foreign immigration has been going on, many industrious Bolivians fromother areas have also settled in Santa Cruz.

According to the *Wall Street Journal*, Bolivia's economy shows strong elements of stability. (Feb. 8, 1977) "The inflation rate . . . is infinitesimal by Latin standards" (June 3, 1977) and "Consumer prices rose 4.6% from 1975 to 1976" (The Times, Dec. 13, 1977).

ENTERPRISING PEOPLE WANTED

Bolivia is looking for enterprising people to help develop its resources. There is a generous tax incentive program for agricultural enterprises and there are boundless new business opportunities in supplies and services to the burgeoning activity and population. Santa Cruz is well served by both State and foreign banks, including the First National Bank of Boston and the Bank of America.

The State of Santa Cruz is Bolivia's richest and biggest, with a population of around 700,000 and a third of the country's area. The population of Santa Cruz is growing at twice the rate of the rest of Bolivia, which has a total population of 4.7 million. Santa Cruz is estimated to have 65 million acres of useable land, but only 2 million are being farmed. The land is the real wealth of Santa Cruz, and this is where the opportunities are greatest.

"As far as the eye can see, it's one vast area of potential farm land broken only by stands of virgin timber." *Wall Street Journal*, (3 June, 1976).

VIRGIN LANDS

The Anglo Bolivian Land and Cattle Company has conducted a thorough search of the best undeveloped agricultural lands in Santa Cruz. We have screened hundreds of offers of undeveloped land and accepted only those with completely clear legal title, suitable soils, acceptable rainfall, and good access to the city of Santa Cruz de la Sierra.

This is heavily forested land, classified by ecologists as "temperate dry to moist forest." There is a sufficient rainfall of at least 40 inches most years, mainly from November through March. Once cleared of forest and properly prepared, this land is ideal for cotton, soya beans, corn, wheat, pineapples and peanuts. This is not jungle land or tropical rain forest, such as is being cleared in parts of the Amazon basin. Ecologists and soil scientists have serious doubts about the advisability of clearing tropical rain forest for grazing and agriculture, but the temperate wooded lands of Santa Cruz are ideal for agricultural development.

LAND READY FOR WORKING

The undeveloped land can be immediately cleared for agriculture, or just partially cleared, and in either case farmed individually or leased to a tenant. Alternatively the land can be left in its natural state for recreational use and value growth. A small site can be cleared for a house. Construction of a simple but adequate dwelling costs less than $5 per square foot.

ACCESS TO SUPPLYS & MARKETS

All of the lands selected by Anglo Bolivian Land and Cattle Company are alongside or near major road projects or existing railroads and have adequate road access.

LAND VALUES INCREASING

In the past, prime undeveloped land in Santa Cruz has appreciated between 15 to 20 percent annually. There is, of course, no guarantee that this rate of increase in value will continue. Developed land generally has a far greater appreciation, and the major opportunity is in improving the undeveloped land.

It must be remembered, though, that this is a frontier. The weather is generally quite mild, but it does sometimes get hot in the summer, and even down to the low forties (Fahrenheit) during the winter. There are insects that bite. The roads can occasionally be muddy during the rainy season and dusty during the dry. Transportation is mostly by four wheel drive vehicles and trucks.

FERTILE SOIL — ABUNDANT GAME

But this land has its own rewards. The soil is fertile, and the forest is populated by a wide variety of game animals and birds: the collared and white lipped peccary, white tailed and brocket deer, tree turkeys, partridge, grouse and dove. Most of the other species are protected under Bolivian law including the jaguar, puma, ocelot, margay, brown capuchins, grey fox, coati and parrots. The bird life is prolific.

AN INVESTMENT FOR THE FUTURE

Buying undeveloped land in Santa Cruz affords you the opportunity of being a modern day pioneer helping to solve the Earth's growing food problem while profiting from your work, talent and enterprise. Furthermore, with good land management, you can also preserve much of the native fauna and flora. For the less active, it provides the basis for an appreciating investment, with the added possibility of recreational use for second home development, camping, hunting and nature study.

It's something to think about for your children's future — anything from 160 acres to a solid square mile of land for them to develop. This is an outstanding opportunity for them to learn about pioneering life in a developing country.

EASY TRAVEL ARRANGEMENTS

Travelling to Santa Cruz from the United States is very simple. Just come to Miami and then board a Lloyds Aereo Boliviano Boeing 727 direct to Santa Cruz de la Sierra, which has its own international airport (and plans to build a bigger one yet!) In Santa Cruz you can stay at the modern Holiday Inn, Los Tajibos, or any number of other pleasant hotels.

WE INVITE YOU TO VISIT US IN SANTA CRUZ

While you are in Santa Cruz, you'll probably want to explore the rest of fascinating Bolivia: the thriving capital of La Paz, the untouched colonial city of Sucre, the famous mining center of Potosi, once the largest city in the Western Hemisphere, the delightful flowering city of Cochabamba, the beautiful Lake Titicaca, and many virtually unexplored Inca archiological sites.

MODERN FRONTIER OPPORTUNITY

During the days of the American frontier, the pioneer was offered a quarter of a square mile — 160 acres — under the Homestead Act for clearing and planting the land, and building a suitable dwelling. Today, in the State of Santa Cruz, you can purchase and secure clear title to a 160 acre homestead for just $2,950, with a low down payment of $295 and the balance payable over two years with 6 percent interest on the unpaid balance. This works out to monthly payments of *$117.67*, with a total of *$169.11* in interest over the two year period. Larger tracts, up to a solid square mile — 640 acres, are priced at $9,950 with $995 down and the balance in three years with 6 percent interest on the unpaid balance, making a monthly payment of *$272.42*, with a total of *$852.42* in interest over the three year period. Naturally these tracts can be purchased for cash, or prepaid at any time without penalty.

We are so sure of these values, that we are willing to offer you a full money back guarantee, both principal and interest, if you visit Santa Cruz within one year of purchase and are dissatisfied for any reason.

If you are interested in business opportunities in Santa Cruz, we are currently seeking buyers or investors for cotton farming, beef fattening and cattle breeding ventures.

Please write for full information about the opportunities available in the State of Santa Cruz. Just fill in the coupon below and mail it to our U.S. mailing address in Vermont. We will send you an information kit complete with pictures, maps and descriptive literature. No salesman will call upon you, only the postman. We have no sales organization other than field representatives in Santa Cruz.

Anglo Bolivian Land & Cattle Co.
Box 58 Dept. E-1
15 Central Street
Woodstock, Vermont 05091

Gentlemen: Please send me the information kit about opportunities in Santa Cruz.

Name .....
Address .....
City ..... State Zip

Third, without proper integration into the economy, the Indians would likely follow in the footsteps of past *indios foresteros* and clear land for subsistence living, increasing the opportunities for diseases to emerge into the human population. The government attempted to relocate the Indian tribes in order to accommodate immigration policies aimed at economic and agricultural development of the lowlands. The social, economic, and environmental impact of the increased population brought about by immigration and relocation was to have a significant impact on the emergence of Machupo virus due to subsistence agriculture.

After an extensive assessment of the impact of foreign colonists, Kelso Lee Wessel agreed that the foreign colonists had contributed to an increase in agricultural production for the eastern lowlands.[171] Wessel doubted that those colonists introduced any new techniques of agricultural production to the indigenous population, because they tended to remain closed societies. Wessel identified four colonies of foreign nationalists in the Santa Cruz area: Japanese, Okinawan, Mennonite, and Italian. These foreign colonies are representative of sponsored colonization, since the government provided them with land grants, and they received international financial aid in the development of the respective colonies.

Settlement of a Japanese colony began in 1955 with the arrival of sixteen families, approximately 129 kilometers from the city of Santa Cruz. The colony was located twelve kilometers from the principal road connecting Santa Cruz with an initial land grant of 15,288 hectares.[172] As in the case of the Mennonites and Okinawans, the

[171] Kelso Lee Wessel, *An Economic Assessment of Pioneer Settlement in the Bolivian Lowlands* (Ph.D. diss.: Cornell University, 1968,) 206.
[172] Wessel, 71.

colonists and the Japanese government absorbed almost all the cost of developing the colony. Of the land possessed by the colonists, sixty per cent was cleared by 1960, within the first four years of residency in the Department of Santa Cruz.[173]

The Okinawan colony began in August of 1954 as a result of Okinawan merchants in Riberalta wanting to help compatriots suffering from the effects of WWII by obtaining land grants for them. Concurrently, the United States Civil Administration of the Ryukyu Islands and the Eisenhower administration passed Supreme Resolution Number 57,311 to be signed by President Victor Paz Estenssoro on June 11, 1953. This legislation permitted three thousand Ryukyuan families to emigrate to eastern Bolivia over a ten-year period. Subsequently, the Bolivian government authorized a grant of 10,000 hectares of national territory for the colony and a ten-year plan of immigration was formulated.[174] The Ministry of Agriculture was authorized to issue land grants of 50,000 hectares, and title plots of fifty hectares were granted to each settler within eight years.[175]

Sickness and many deaths through November 1954 led to the evacuation of the colony by April 1955. Although disease outbreaks were the primary cause of the evacuation, there were three additional contributing factors to the relocation of the colony:

1) A lack of roads to transport produce to markets.
2) The land was sandy.
3) The area was subject to seasonal flooding.

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[173] Wessel, 70.
[174] Ibid, 62.
[175] James Lawrence Tigner, "The Ryukyuans in Bolivia," *Hispanic American Historical Review* 43, no. 2 (May 1963): 206-229.

The colony was re-established twice, and landed in its final location in March 1956. Although the colonists bore the expense of settlement, they received international aid from the United Nations, the United States, and the government of Okinawa in the form of construction equipment and agricultural machinery.[176] A total of 628 families arrived in the colony between 1954 and 1965; the annual abandonment rate was eighteen per cent.[177] The land grant for the colony was 48,110 hectares, of which forty eight per cent was cleared by 1962 when Machupo virus was epidemic in the region.

The first Mennonites arrived in Bolivia in 1954 and purchased land from the *Compania Algodonera Boliviana.* Within a period of twelve years, the colony expanded from the original six individuals who purchased the land to include 101 families, each of which occupied seven villages in the Santa Cruz area.[178] An Italian colony in nearby Warnes also formed in 1954, but failed almost immediately due to the impact of disease, and was abandoned.[179]

The MNR programs of migration and immigration were successful in increasing the population of the eastern lowlands. The estimated number of colonists living in each of the three colonization zones in 1966 was 19,870, which were distributed throughout the eastern lowlands as illustrated in Table XI.[180] Statistical data demonstrates that spontaneous colonization accounted for almost seventy five per cent of the new colonists living in the eastern lowlands in 1966.

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[176] Wessel, 68-69.
[177] Ibid, 65.
[178] Ibid, 62. *Compania Algodonera Boliviana* is the Bolivian Cotton Company.
[179] Ibid, 53.
[180] Jorge Valencia, La Situacion Agropecuaria Nacional: *Estudios Sociao-Economicos Refionales y Planes de Produccion Agropecuaria de las Zonas de Colonizacion* (La Paz: *Corporacion Boliviano Fomento,* 1965), 1.

Table XI
Distribution of Colonists (1966)

Area	Sponsored	Spontaneous
Yungas	754	3,400
Chapare	400	6,900
Santa Cruz		
Bolivian	2,570	5,000
Foreign	854	
Total	4,578	15,300

In conjunction with the resettlement programs, the MNR supported the development of the cattle industry to meet the burgeoning food requirements of the simultaneously growing *altiplano* population. Commercial ranching in the Department of Beni grew out of a United States economic mission to Bolivia in the 1942. The Bohan Commission recommended improving pasture, upgrading sheep and cattle stock though importation of seed and livestock from the United States, and established the *Servicio Agricola Interamericano* (SAI). The mission, formulated in conjunction with President Truman's Point IV program, planned to develop the different regions of the country according to the resources of each.[181]

The Reyes Project, named after the small town of Reyes on the western edge of the plains, was the first development effort in the department in 1948.[182] With assistance from the United States, an airstrip was constructed and surplus U.S. military planes were secured to fly beef carcasses to La Paz. The commercialization of beef through the airlift changed the relationship of the Department of Beni to the highlands, as it became

[181]Merwin Bohan, 62-63.

integrated into the national economy as a supplier of beef to the highlands. Table XII represents the status of the cattle industry in 1958.[183]

Table XII
Cattle in the Department of Beni (1958)

Department	No.of Head
Cercado	92,000
Yacuma	136,000
Vaca Diez	4,500
Ballivan	112,000
Moxos	70,000
Itenes	30,000
Mamore	45,000
Marban	60,000
Total	550,000

Fifteen hundred head of cattle were counted in the Estacion Experimental Ganadera de Reyes in 1956.[184] By the end of 1958, the cattle in the Department of Beni numbered 550,00. The creation of pastureland was considered indispensable to the development of the cattle industry in the lowlands of Beni. The Ministry of Agriculture supported the construction of wire fences to subdivide the country and further develop the cattle industry.[185]

The effect of the development of the cattle industry would not be complete without reference to the effect of introduced livestock. George Lovell attributed the introduction of Old world animals was partially responsible for the depopulation and disease in the lowlands. Lovell asserted cattle were approximately nine times more

[182] William M. Denevan, "Cattle Ranching in the Mojos Savannas of Northeastern Bolivia," *Yearbook of the Association of Pacific Coast Geographers* (1963), 37-44.
[183] Jose Taboada Calderon de la Barca, *Plan Economico Para el Departamento de Beni* (La Paz,1959).
[184] Otto Braun, *Cultivo de Pastos en el Alto Beni, Servicio Agricola Interamericano. Boletin Experimental* 14 (La Paz: *Ministerio de Agricultura,* 1960),11.
[185] Braun, 11.

numerous than Indians by the seventeenth century.[186] As the Indians experienced depopulation, herds of cattle, sheep and goats became a prominent feature of the landscape of the lowlands.

Reports on the status of Bolivia and its economic development regularly appeared in the Western press, and the development of livestock was no exception. The *New York Times* ran a half page article from La Paz 1963, with a photograph of U.S. and Bolivian officials inspecting cattle in Santa Cruz with MNR President Victor Paz Estenssoro, praising the economic development that occurred.[187] The success of the Reyes Project led to the Beni Livestock Development Project, and the subsequent Development Credit Agreement between the Bolivia and the International Development Association.[188] The project, described as the first stage of a livestock development program, consisted of three parts:

1) long-term loans for investment in ranch development;
2) related technical services; and
3) short-term loans for working capital, exclusively from *Banco Agricola de Bolivia's* own resources.

The success of the MNR in developing the eastern lowlands of Bolivia was based on migration and immigration programs, economic programs in the form of agricultural and livestock development, and the development of a transportation network to deliver

[186] W. George Lovell, "Heavy Shadows and Black Nights: Disease and Depopulation in Colonial Spanish America," *Annals of the Association of American Geographers* 82 (September, 1992): 431.
[187] Anonymous, "Bolivia Moves to Tap Her Latent Resources. Agriculture Showing Improvement But Mining Falters," La Paz, Bolivia - Special to the *New York Times*, 15 October 1963, 28.
[188] International Development Association, " Development Credit Agreement," *(Beni Livestock Development Project) Between the Republic of Bolivia and the International Development Association* Credit No. 107BO, 26 May 1967, 13.

people and products to the markets in La Paz.[189] One of the long-term results of the development program was substantial increase in the over-all population of the lowlands. The figures in Table XIII demonstrate the rapid growth of population in Bolivia from 1900 to1976. [190] The Departments of Cochabamba, Santa Cruz and Beni, all areas endemic to Machupo virus, experienced massive population growth in the post-revolutionary years between 1950 and 1988.

The Effect of Development on the Indigenous Population

The colonization projects in the Department of Santa Cruz and the Department of Beni resulted in exponential population growth. The population of Santa Cruz increased from 286,145 in 1950, to 715,072 in 1976. The population density is evident in the growth of the city of Santa Cruz, which grew from 42,746 to 256,946, suggesting that the colonization programs of the MNR in conjunction with the United States led to the economic development of the city, leaving vast regions of the lowland populated by marginalized indigenous communities. The population of the lowlands increased significantly following the colonization programs initiated by the MNR. The effect, however, was a marked decrease in the indigenous population of the lowlands. A comprehensive study conducted by the Summer Institute of Linguistics in 1980, identified the remaining Indian Tribes in the lowlands and their populations at the time.[191]

[189] International Development Association, 13.
[190] INE, "*Censo de* 1900, 1950, 1976. *Resultados Finales,*" *Resultados del Censo Nacional de Poblacion y Vievienda 1976* (La Paz: *Ministerio de Planamiento y Coordinacion,* 1976), 34-56.
[191] Summer Institute of Linguistics. Language families are dilineated in caps.

Table XIII

Population of Bolivia for the Principal Departments and Capital Cities (1900-1976)

Department	Capital	1900	1950	1976
La Paz		426,930	948,446	1,484,152
	La Paz	52,697	321,073	654,713
Cochabamba		326,163	490,475	730,358
	Cochabamba	21,881	80,795	205,002
Oruro		86,081	210,260	311,245
	Oruro	13,575	62,975	124,121
Potosi		325,615	534,399	658,713
	Potosi	20,910	45,758	77,334
Chiquisaca		196,434	282,980	357,244
	Sucre	20,907	40,128	62,207
Santa Cruz		171,592	286,145	715,072
	Santa Cruz	15,874	42,746	256,946
Tarija		67,887	126,752	188,655
	Tarija	6,980	16,869	39,087
Beni		25,680	119,770	167,969
	Trinidad	2,556	10,759	27,583
Total Population		1,633,610	2,999,227	4,613,407

Comparison of the 1980 figures with the data provided by the National Census in 1950 demonstrates a considerable decline in the indigenous population following the implementation of development programs insititued by the MNR government. There was a population of 6,000 Siriono Indians at mid-century, distributed in the provinces of Moxos, Itenez, and Mamore of the Department of Beni. By 1980, the number of Siriono Indians was reduced to fifty-five. The combined effects of disease and the development were instrumental in the decimation of the indigenous population of the eastern lowlands.

Table XIV
Eastern Indian Tribes and Populations (1980)

Language Family	Population	Language Family	Population
ARAWAKAN		TUPI-GUARANIAN	
Baure	4004	Guarani	
Ignaciano	4000	Guarayu	5000
Trinitario	5000	Pausema	60
Siriono	55	Yuqui	150
CHAPACURAN		MACRO-MAYAN	
Itenez (More)	150	Chipaya	750
MATACO-MACA		YURACAREAN	
Mataco (Vejoz)	500	Yuracare (Yura)	2500
PANOAN		ZAMUCOAN (SAMUKU)	
Chacobo	260	Ayoreo (Ayore, Morotoco)	1500
QUECHUAMARAN		NOT CLASSIFIED	
Aymara (no estimate)		Callawalla	50
Quechua (no estimate)		Cayubaba	25
TACANAN		Chiquitano	20,000
Araona	55	Itonama (Sararno)	110
Cavinena	500	Leco	200
Ese Eja	1000	Movima	1000
Reyesano	1000		
Tacana	3500	MOSETENA	
		Tsimane (Moseten)	4500

The juxtaposition of the agricultural and economic development of the eastern lowlands and the emergence of Machupo virus is significant. Agricultural development is one of the most common ways people interfere with the environment. Ecological factors frequently precede the emergence of diseases by placing people into contact with a natural reservoir or host for an infection unfamiliar but usually already present in the environment. *Calomys callosus*, the natural host for Machupo virus, already existed in the eastern lowlands, but was relatively scarce and limited to isolated parts of the environment. The local indigenous population altered environmental conditions when

they cleared land for planting corn to favor an increased population of the natural host to Machupo virus. Ecological changes, including those due to agricultural or economic development, are the most frequently identified factors in the emergence of new diseases.

CHAPTER III

HISTORICAL EPIDEMIOLOGY OF BOLIVIA

The primary factor in the emergence of Machupo virus into the human population was the colonization of the eastern lowlands, brought about by the *Movimiento Nacionalista Revolucionario* (MNR) government following the 1952 revolution. Even the most severe critics of the MNR government admitted that its policies led to the development of a new, tropical Bolivia.[192] Tropical it was, with all of the problems inherent to a tropical environment, including diseases the new government needed to eradicate in order to promote successful development in the eastern lowlands.

The history of Latin America from the time of the Spanish conquest can be defined as a history of disease emergence and its effects on indigenous populations. William McNeill asserted the indigenous population of the Americas was free of major diseases prior to the Spanish conquest; however, eastern Bolivia has a long history of disease, including plague, malaria, yellow fever, and typhus.[193] Due to the political isolation of the region, records of outbreaks prior to the twentieth century are sparse.

There has been a great deal of scholarly debate regarding the effect of Western diseases on pre-contact indigenous populations of Latin America. Based on disease mortality models for the series of smallpox epidemics from 1520-1620, Cook calculated the pre-contact indigenous population of Peru at a maximum of 8,090,421, with the post-

[192] Cornelius Zondag, *La Economia Boliviana 1952-1965: La Revolucion y sus Consequencias* (La Paz: Editorial Los Amigos del Libro, 1968), 193.
[193] McNeill, *Plagues and Peoples*, 58.

contact population reduced to 671,505 by 1620.[194] Henry F. Dobyns, on the other hand, estimated the population of the Andean countries substantially higher at 37.5 million. Although scholars have not agreed upon an exact figure for pre-contact indigenous population of Latin America, they have agreed disease significantly depopulated the Americas.

The distance between the lowlands and the political center of La Paz, the lack of a transportation network, and the marginalization of the indigenous population all contributed to the lack of reliable data regarding disease in the eastern lowlands. The sources available for this chapter are limited, and largely rest upon Pan American Health Organization reports, the Final Epidemiological Report prepared by the Peace Corps for the Research Institute for the Study of Man in 1967, and the Public Health Department in La Paz. Although this chapter is brief, it establishes the fundamental epidemiological framework in which Machupo virus emerged. Subsequently, an explanation of viral hemorrhagic fevers is provided in order to understand the nature of the epidemic that faced the indigenous population of eastern Bolivia.

Lowland Diseases

The identification of diseases in Bolivia has been largely relegated to the West, in conjunction with international capital investments for development. By the mid-twentieth century, plague, smallpox, yellow fever and typhus, each present in the lowlands of eastern Bolivia, were considered infectious diseases requiring international quarantine. The Peace Corp conducted a study financed by the Research Institute for the

[194] Cook, 108-110. Bolivia was Upper Peru in the 16th century.

Study of Man (RISM) in the spring of 1964, which compiled a detailed report of the diseases present in the region, each of which was an impediment to the development of the eastern lowlands.

In endemic regions such as eastern Bolivia, the vector for plague is rats and rodents. An unpublished government report by the Director of Planning for the Ministry of Public Health in La Paz, recorded the first epidemic of plague in the 20th century in 1921 in Padacaya, Department of Tarija, where 1900 cases resulted in 942 deaths.[195] Table XV illustrates the reported cases of plague in Bolivia between the years 1921 and 1938.[196] The decline in the rubber tapping industry in the 1930s may have had a significant impact on the decrease in plague outbreaks due to the limited interaction of humans in the endemic zones.

Table XV
Reported Plague Cases (1921-1938)

Year	Reported Cases	Deaths	Department
1921	1,900	942	Tarija
1928	300	88	Santa Cruz
1938	151	63	Santa Cruz

Smallpox presented a significant health problem for Bolivia in the first half of the twentieth century. Between 1946 and 1958, epidemics occurred on an annual basis, making it a deterrent to development. The Bolivian government instituted one of the first wide-scale mass vaccinations for smallpox in 1957, resulting in a substantial reduction in

[195] Abdel R. Orman, MD, William J. McEwen, Ph.D., Mahout H. Zaki, M.D., Ph.D., *Epidemiological Studies in Bolivia. Final Epidemiological Report for the Peace Corps RISM Bolivia Project.* (New York: Research Institute for the Study of Man, 1967), 192.
[196] Orman, 192.

reported cases after 1958.[197] The yearly totals for smallpox between 1949 and 1964 are provided in Table XVI.

Both typhus and yellow fever were prevalent in eastern Bolivia in the early twentieth century, and presented a significant impediment to development of the lowlands.[198] There are two types of yellow fever: urban yellow fever, which is transmitted from man to man by the domestic mosquito *Aedes aegypti,* and jungle yellow fever, which affects monkeys in endemic forest regions and is transmitted to man by forest mosquitoes of the genus *Haemagogus*. Reports of yellow fever drew international attention in May of 1903 when physicians from the Pasteur Institute of Paris in Bolivia determined the fever was due to mosquitoes.[199] With the knowledge of the vector for yellow fever isolated, reports of outbreaks continued to appear in Western newspapers.

Images of eastern Bolivia as a frontier laden with diseases were published regularly in the *New York Times*. An outbreak of yellow fever among the troops in Santa Cruz during the Chaco wars against Paraguay precipitated foreign intervention. Since medical facilities were non-existent, the Bolivian government sent cargo planes with physicians to the affected region in April 1932.[200]

By June 1932, the government of Bolivia signed a contract with the Rockefeller Foundation to conduct a fight against yellow fever. The contract required the Bolivian government to pay 75,000 *bolivianos,* and the foundation provided 18,000 bolivianos, for a period of 18 months, payable in installments every three months.[201] International

[197] Orman, 92.
[198] Anonymous, "In Bolivia to Fight Fever." *New York Times* 15 June 1932, 16.
[199] Anonymous, "Latin American Notes," *New York Times* 9 August 1903, 7.
[200] Ibid.
[201]Anonymous, " In Bolivia to Fight Fever," *New York Times* 15 June 1932, 16.

cooperation led to the development of a continental effort by the Pan American Medical Congress of South American physicians to stop the spread of yellow fever throughout the continent in 1933.[202] The by-product of the national and international attempts at disease eradication is evident in the figures provided in Table XVI.

Table XVI
Selected Diseases in Bolivia (1949-1964)

Year	Plague	Smallpox	Yellow Fever
1949	3	805	156
1950	22	594	354
1951	10	728	3
1952	55	432	1
1953	---	429	18
1954	9	624	---
1955	45	373	4
1956	3	499	6
1957	---	1310	19
1958	---	183	2
1959	---	7	1
1960	---	1	14
1961	20	---	2
1962	---	---	---
1963	53	---	---
1964	49	---	---

Plague, smallpox, and yellow fever were identified as impediments to development by the MNR government, the Santa Cruz Area Development Group, and the Alto Beni Project. Programs designed to control these diseases were implemented in conjunction with the colonization programs, resulting in a significant decrease in reports. Both yellow fever and smallpox were virtually nonexistent after 1961, evident in the

[202] Anonymous, "Ask Yellow Fever Fight. Pan American Doctors Urge Work to Prevent Spread," *New York Times* 26 March 1933, 7.

examination of Table XVI.[203] Plague reports, however, increased between 1961 and 1964. There is a direct correlation between the dates of reported plague outbreaks and the reported outbreaks of Machupo virus prior to its isolation, suggesting the actual source of the infection reported as plague was indeed a viral hemorrhagic fever.

Malaria was the leading cause of death in the lowlands during the twentieth century, and recognized as a contributing factor to the low level of development in eastern Bolivia. In response, President Hernan Siles Zuazo declared the eradication of malaria a national emergency.[204]

> We declare the Campaign to Eradicate Malaria, a problem of national emergency, one we must participate in, for it is necessary to the life of the country.[205]

Table XVII illustrates the rising budgeted cost of the Ministry of Pubic Health for the anti-malaria campaign instituted between the years of 1942-1950, demonstrating the significance of the eradication of malaria mosquitoes to the pre-revolutionary

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[203] Pan American Sanitary Bureau, *Report of the Director, 1954-1957* (Washington, DC: 1958) No. 25; Pan American Sanitary Bureau, *Summary of Four-Year Reports on Health Conditions in the Americas*, (Washington, DC: 1958) No. 40; Pan American Health Organization (PAHO), *Summary of Four Year Reports on Health Conditions in the Americas 1957-1960* (Washington, DC: 1962); Pan American Sanitary Bureau, *Scientific Publication* No 64; Pan American Sanitary Bureau, *Quadrennial Report of the Director 1958-1961* (Washington, DC: 1962) Doc. 43; PAHO, *Health Conditions in the Americas 1961-1962* (Washington, DC: 1964); Pan American Sanitary Bureau, *Scientific Publication* No.104; PAHO, *Annual Report of the Director 1964* (Washington, DC: 1965) No 63; PAHO, *Health Conditions in the Americas 1961-1964* (Washington, DC: 1966); Pan American Sanitary Bureau, *Scientific Publication* No. 138; PAHO, *Annual Report of the Director, 1962* (Washington, DC: 1963) Doc. No. 50; PAHO, *Reported Cases of Notifiable Diseases in the Americas 1946-1955* (Washington, DC: 1958); Pan American Sanitary Bureau *Scientific Publication* No. 38; PAHO, *Reported Cases of Notifiable Diseases in the Americas 1949-1958* (Washington, DC: 1960); Pan American Sanitary Bureau, *Scientific Publication* No. 48; PAHO, *Reported Cases of Notifiable Diseases in the Americas 1959-1960* (Washington, DC: 1962); PAHO, *Reported Cases of Notifiable Diseases in the Americas 1961* (Washington, DC: 1963); Pan American Sanitary Bureau *Scientific Publication* No. 86; PAHO, *Reported Cases of Notifiable Diseases in the Americas 1962* (Washington, DC: 1964) Pan American Sanitary Bureau *Scientific Publication* No. 102; PAHO, *Reported Cases of Notifiable Diseases in the Americas 1963* (Washington, DC: 1965;) Pan American Sanitary Bureau *Scientific Publication* No. 114; PAHO, *Reported Cases of Notifiable Diseases in the Americas 1964* Washington, DC: 1966); Pan American Sanitary Bureau *Scientific Publication* No. 135.

[204] Cesar Moscoso Carrasco, *Bolivia Elimina Malaria* (La Paz: Ministerio Salud Publica, 1963), 100

[205] INE, Hernan Siles Zuazo, *Descreto #04571* Articulo 67 (1963), 3.

government.[206] The program was implemented in designated parts of the Departments of Cochabamba and Beni, and all of the Department of Tarija. The malarial region of Bolivia comprises almost seventy five per cent of the country, including all the lowlands.

Table XVII
Cost of Anti-Malaria Campaign (1942-1950)

Year	Cost (in bolivianos)
1942	959.414
1943	2.225.601
1944	2.222.447
1945	2.401.634
1946	2.294.567
1947	2.191.598
1948	3.252.000
1949	4.008.000
1950	4.008.000

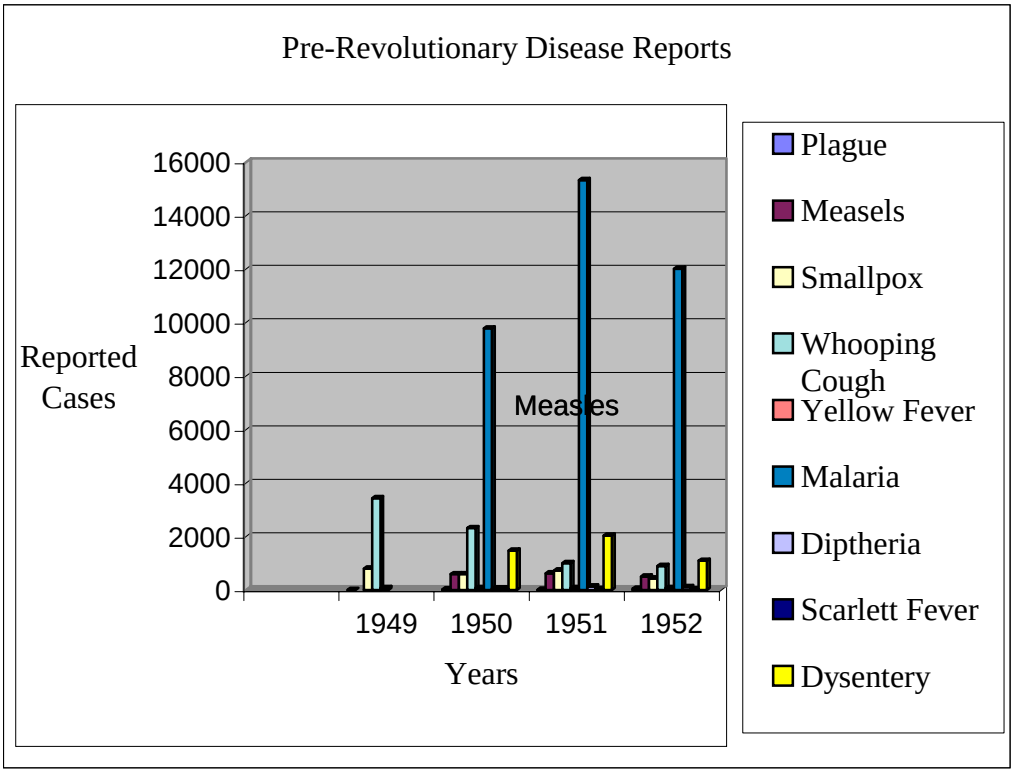
The cost of the anti-malaria campaign escalated in 1949 and 1950, two years prior to the success of the MNR revolution. It is likely that statistical data is incomplete for the pre-revolutionary years, since reporting systems were interrupted by revolutionary activity, or simply non-existent. Regardless of a breakdown in reporting systems, there remained a significant increase in reported cases of malaria between 1949-1952 represented in Table XVIII.

The rise in reported cases suggests malaria was particularly virulent in those years, possibly fueling national discontent within the indigenous population. Although scholars have acknowledged the minimal participation by the indigenous population during the early days of the revolution from April 9 to11, 1952, there was an uprising in the Department of Cochabamba in 1951, where organized syndicates of

[206] Carrasco, 37.

campesinos seized the land of *patrones*.[207] The combined effects of a history relegated to a marginalized role in society and the experience of a disease outbreak on the indigenous population merit consideration.

Table XVIII



The inhospitable climate and poor health conditions due to disease and malnutrition resulted in a high mortality rate in the lowlands. The *Direccion General de Estadistica* evaluated the available data on the total number of births and deaths reported

[207] Cornelius Zondag, *The Bolivian Economy, 1952-1965: The Revolution and its Aftermath* (New York: Praeger, 1966), 114. Other sources include Eldon Landing, "Government Capabilities in a Revolutionary Setting: The MNR in Bolivia," *Inter-American Economic Affairs* 23 (Autumn 1969); and James M. Malloy, *Bolivia's MNR: A Study of National Popular Movement in Latin America* (Buffalo: Council on International Studies, State University of New York at Buffalo, 1971).

in the capital cities between 1950-1951, represented in Table XIX.[208] No figures were compiled in this report to indicate the cause of death; however, the figures provided represent a significant mortality rate outside of the political center of La Paz. There was no data available for the city Trinidad, also located in the lowlands, and subsequently no figures were recorded.

Table XIX
Births and Deaths in the Capital Cities of Bolivia (1950-1951)

Capital	Births		Deaths	
	1950	1951	1950	1951
Sucre	1,936	1,849	854	1,060
La Paz	10,428	10,594	4,604	6,480
Cochabamba	4,386	3,828	1,976	1,990
Potosi	2,695	2,439	1,114	1,565
Oruro	2,902	2,482	1,543	1,471
Santa Cruz	1,851	2,205	336	481
Tarija	805	686	191	271
Trinidad	----	----	----	----
Cobija	74	98	48	26

Statistical figures such as were reported for these pre-revolutionary years clearly indicate a disparity between births and deaths, indicating a high mortality ratio, suggestive of the impact of malaria. Reported deaths rose in each of the capital cities, with the exception of Oruro and Cobija, indigenous cities located on the *altiplano*, which experienced a decrease in deaths from 1950 to 1951. Of particular significance are the lowland cities: Cochabamba, Santa Cruz, Tarija, and Trinidad. Both Cochabamba and Tarija experienced a decrease in births, yet an increase in deaths, suggesting the presence

[208] Juan Manuel Balcazar, *Historia de la Medicina en Bolivia* (La Paz: *Ministerio de Salud*, 1956), 203.

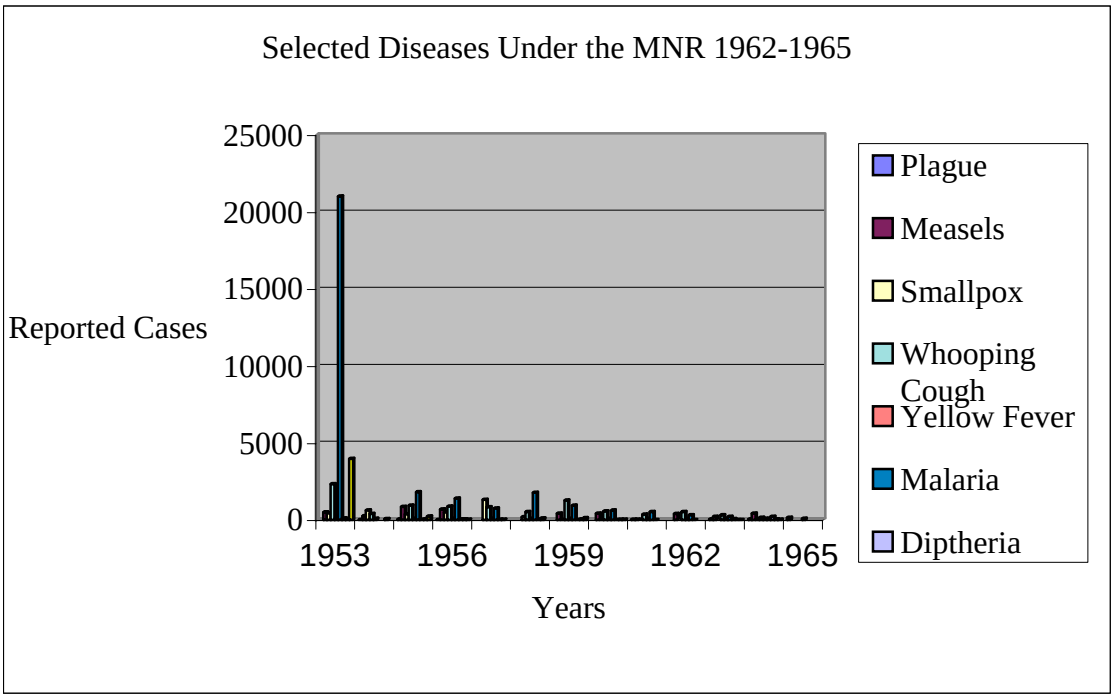
of disease as a factor. Santa Cruz experienced a significant increase in both births and deaths, which could be an indicator of either infant mortality or the presence of malaria.

Post Revolutionary Disease Conditions

Following the 1952 Revolution, there was a significant decline in the number of cases of malaria reported. It is likely that reporting systems were interrupted during the early years of the revolution, and therefore, the statistics may not be completely reliable. Subsequently, the number of additional cases may have been substantial. The continuous decline in reports of disease outbreaks in Table XX demonstrates the decrease in reported diseases between 1962 and 1965. The successful developmental policy of the MNR was dependent on the eradication of disease threats in the lowlands, requiring diligent vector control.

This policy was supplemented by a global plan to eradicate malaria in 1955, jointly funded by the United States, the Pan American Health Organization (PAHO), United Nations International Children's Education Fund (UNICEF), and the World Health Organization (WHO). In conjunction with this plan, the MNR government sprayed all the areas endemic to malarial mosquitoes, including the village of San Joaquin, with heavy doses of DDT. Shortly after the spraying, the cats of San Joaquin died, eliminating the natural predator for rodents in the region of the eastern lowlands. Concomitant with these ecological alterations, the rodent population swelled during the 1950s and 1960s, which had a significant impact on the emergence of a new disease the MNR government of Bolivia was unprepared to address.

Table XX



Epidemiological Studies in Bolivia, Final Epidemiological Report for the Peace Corps RISM Bolivia Project. New York: Research Institute for the Study of Man, 1967.[209]

During the middle of the twentieth century, four diseases resulted in international quarantines: plague, smallpox, typhus, and yellow fever. The changing social and environmental conditions of the twentieth century, however, led to the emergence of a new host of diseases. Among the most lethal of these were the viral hemorrhagic fevers. Karl M. Johnson, the virologist credited with isolating Machupo virus, expressed the relationship between the emergence of diseases and environmental changes when he stated that most of the new hemorrhagic fevers emerged only because of accelerating ecological changes made by a growing human race.[210]

[209] Orman, Abdel, et al, 122.
[210] Karl M. Johnson, "Emerging Viruses in Context: On Overview of Viral Hemorrhagic Fevers," *Emerging Viruses* (Oxford: Oxford University Press, 1993): 52.

The primary factor in the emergence of Machupo virus into the human population was the colonization of the eastern lowlands. Eastern Bolivia, in conjunction with the revolution's agricultural development plan, was designated as a priority area for colonization. The distribution of uncultivated land to the marginalized indigenous population resulted in clearing the dense jungle areas of the alturas and bandas to plant corn. In doing so, they brought Calomys callosus, the vector for Machupo virus, into contact with the human population. Machupo virus is one of the four Latin American viral hemorrhagic fevers. Figure V represents the endemic region of Machupo virus.

Viral Hemorrhagic Fevers

Viral hemorrhagic fevers are caused by four distinct families of viruses: arenaviruses, filoviruses, bunyaviruses, and flaviviruses.[211] All viral hemorrhagic fevers share certain features: their survival is dependent upon an animal or insect host; they are geographically restricted to the area where the host species lives; humans are not the natural reservoir; outbreaks are sporadic and cannot easily be predicted; and with few exceptions, there is no established treatment or cure. Of the known viral hemorrhagic fevers, there are four South American hemorrhagic fevers, all of which are arenaviruses: Argentina-Junin Virus; Bolivia-Machupo Virus; Venezuela-Guanarito Virus; and Brazil-Sabia Virus.[212] The endemic regions for the South American viral hemorrhagic fevers are illustrated in Figure III. Some viral hemorrhagic fevers, such as yellow fever, have

[211] World Health Organization (WHO), "Technical Report Series 721,"*Viral Haemorrhagic Fevers. Report of a WHO Expert Committee*, (1985), 6.
[212] Bernardo Vainrub and Rosalba Salas, "Latin American Hemorrhagic Fevers," *Infectious Disease Clinics of North America* 8, no. 4 (March 1994): 56.

been known for centuries, whereas the majority of them emerged in the last half of the twentieth century as newly recognized diseases.

Figure III - Endemic Regions for the South American Viral Hemorrhagic Fevers

These viruses can cause severe life-threatening disease. The initial symptoms include fever, fatigue, dizziness, muscle aches, loss of strength, and exhaustion, and can be followed by signs of bleeding under the skin, in internal organs, or from body orifices like the mouth, eyes or ears.[213] Severely ill patients often exhibit signs of shock, nervous system malfunction, coma, delirium, and seizures. The incubation period varies between one and two weeks. Hemorrhagic manifestations can occur not only in the mouth and nose, but also in the gastrointestinal system, kidneys, bladder, penis, urethra, and bronchopulmonary tracts.[214] One of the most frightening aspects of these viruses is that to date there is no established cure for infection. Supportive therapy, however, is available in developed nations to make the patient more comfortable.

Rodent-borne hemorrhagic fevers are among the most dramatic of emerging diseases, and are caused by two distinct groups of negative stranded RNA viruses: the arenaviruses, and the hantaviruses.[215] Arenaviruses are the cause of the South American hemorrhagic fevers, which infect hundreds of people annually and have a case fatality ratio as high as 33%.[216] Arenaviruses are transmitted by rodents and are spread from man-to-man.

Rodents are the natural host of all the arenaviruses with the exception of Tacaribe virus, which does not affect humans. The diseases caused by these viruses have devastating effects upon the people infected. These viruses are zoonotic, which means

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[213] WHO, 6.
[214] Bernardo Vainrub and Rosalba Salas, "Latin American Hemorrhagic Fevers," *Infectious Disease Clinics of North America* 8, no. 4 (March 1994): 56.
[215] James N. Mills and James E. Childs, "Ecologic Studies of Rodent Reservoirs: Their Relevance for Human Health," *Emerging Infectious Diseases* 4, no.4 (October-December 1998): 6.
[216] Stephen S. Morse, "Factors in the Emergence of Infectious Diseases," *Emerging Infectious Diseases* 1, no. 1 (January-March 1999): 904.

they naturally live in an animal or insect.[217] That animal or insect is referred to as the natural reservoir or host. The survival and reproduction of these viruses are entirely dependent upon the animal or insect host. In the host, the virus establishes a prolonged infection, which does not cause disease in the host itself. Consequently, healthy mice, rats, ticks, and mosquitoes can be hosts for these deadly viruses. In the case of animals, the infected host sheds the virus into the environment through urine, feces, and saliva.[218] Scientists speculate that fighting and biting between the adult male mice is the common method of disease transmission among the host species.[219] Even though these viruses live in nature, not in humans, they do occasionally break into human populations.

Infection emerges when the virus reaches a new population. Factors in the emergence of viruses from nature into human populations include: microbial (evolution, mutation, recombination); environmental (weather, land use, water); social (economic, warfare, population, urbanization); health care (antibiotics, immunosuppression); and food (production and distribution).[220] Three of these five factors were present in Bolivia following the revolution: the environment was altered though cultivation of previously unused lands; population increased due to resettlement and colonization programs; increased and food production.

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[217] Vainrub and Salas, 51.
[218] Robert Berkow, *The Merck Manual of Diagnosis and Therapy*, 13th ed. (Rahway: Merck, Sharp and Dohme Research Laboratories, 1977), 1430.
[219] Mills and Childs, 55.
[220] Clarence J. Peters, "Biosafety and Emerging Infections: Key Issues in the Prevention and Control of Viral Hemorrhagic Fevers," from the Proceedings of the 4th National Symposium on Biosafety, in *Emerging Infectious Diseases* (1999): 6.

CHAPTER IV

THE EMERGENCE OF MACHUPO VIRUS

One of the four Latin American Hemorrhagic Fevers, Bolivian Hemorrhagic Fever (BHF), more commonly called Machupo virus, emerged in 1959 as a sporadic hemorrhagic illness in rural areas of the Department of Beni in eastern Bolivia. From 1959 to 1962, Bolivian health officials reported 470 cases of BHF, at that time unidentified, resulting in 142 deaths, making for a 30% case fatality rate.[221] During the colonial era, epidemics of grippe, plague, fever and smallpox were regarded as visitations from heaven.[222] Bolivian officials were conscious of the fact they had a serious epidemic on their hands, one the country was unprepared to address in its post-revolutionary condition.

One of the major long-term accomplishments of the Bolivian National Revolution in 1952 was the stimulation of agricultural and economic development of the eastern part of the country. The MNR was responsible for three major reforms during its 12 years in power: nationalization of the tin mines; granting universal suffrage to include the Quechua and Aymara Indians; and the institution of a massive land redistribution campaign.[223] Most significant for the emergence of Machupo virus was the issue of land redistribution. Prior to the revolution ninety per cent of Bolivia's arable land was

[221] Morse, 226.
[222] Gustavo Adofo Otero, *La Vida Social Del Coloniaje. Esquema de la Historia del Alto Peru, hoy Bolivia* (New York: Lewis Bertrand, 1955), 41.
[223] Herbert Klein, *Bolivia, The Evolution of a Multi-Ethnic Society* (New York: Oxford University Press, 1982), 38.

controlled by five per cent of the elite population under the *hacienda* system. Bolivia redistributed approximately one-third of its agricultural land after 1953.[224]

The distribution of uncultivated land following the Bolivian National Revolution was a significant factor in the emergence of Machupo virus. *Campesinos* migrated to the lowlands seeking land distributed by the Agrarian Reform Act. By the end of 1959, the MNR had distributed over 400,000 parcels of uncultivated land to *campesinos* under the Agrarian Reform Act. By the time Machupo virus emerged, the population of the Department of Beni had grown from 32,200 in 1900 to 119,800 in 1950, which contributed to a significant increase in agricultural activity in the region.[225]

Calomys callosus, the natural host for Machupo virus, already existed in the eastern lowlands, but was relatively scarce and limited to isolated parts of the environment.[226] The indigenous population altered environmental conditions when land was cleared for planting corn, which resulted an increased population of the natural host to Machupo virus. Ecological changes, including those due to agriculture or economic development, are the most frequently identified factors in the emergence of new diseases. Employment in the agricultural and cattle industries dominated the largest portion of the economic activity in the Department of Beni at mid-century, as demonstrated in Table XXI.[227]

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[224] Herbert Klein and Jonathan Kelley, *Revolution and the Rebirth of Inequality*: *A Theory Applied to the National Revolution in Bolivia* (Berkeley: University of California Press, 1981), 12.
[225] INE, *(Distribucion le la Republica de Bolivia por Departamentos) Censo Demografico 1950 (La Paz: Ministerio de Hacienda y Estadistica*, 1950), 6.
[226] WHO, *"Report of a WHO Expert Committee, World Health Organization, Viral Haemorrhagic Fevers"* Technical Report Series no. 721 (Geneva: World Health Organization, 1985), 64.
[227] INE, (*Poblacion Economicament Activa*) *Censo Demografico 1950* (La Paz: *Ministerio de Hacienda y Estadistica*, 1950), 70.

Table XXI
Economic Activity in the Department of Beni (1950)

Professionals, Technicians	1,898
Managers, Administrators	184
Office Employees	992
Shopkeepers, Vendors	1,512
Agriculture, Cattle Workers	23,626
Craftsmen,Workers	1,698
Other Craftsmen and Workers	4,590
Laboreres	1,178
Service Personnel	2,890

The development of health care in the lowlands has been slow compared to the growth of the region. According to the 1976 census, there were only 706 medical doctors registered in Bolivia, primarily in the capital of La Paz, leaving the population of the lowlands underserved.[228] By 2000, the Department of Beni Ministry of Health reported a total of 170 medical facilities in the Department of Beni, which included a total of 477 hospital beds.[229] The quality of the health facilities, however, is another matter altogether. The photograph in Figure IV represents a medical hospital on the Beni River in 2003. This hospital facility was situated on a boat in the village of Rurrenabaque.[230]

San Joaquin, the capital of the Province of Mamore in the Department of Beni, is located approximately 350 miles northeast of the political and economic center of La Paz, and only thirty miles from the Brazilian border. The Province of Mamore in 1950 was

[228] INE, Resultados del Censo Nacional de Poblacion y Vivienda, 1976, 231.
[229] Ibid, 3, 6.
[230] Over the course of a two-week period, I never observed anyone enter or leave this hospital boat. Although a plank from the shore to the boat remained in place, and the doors remained open, no one was on the boat to answer questions or service patients.

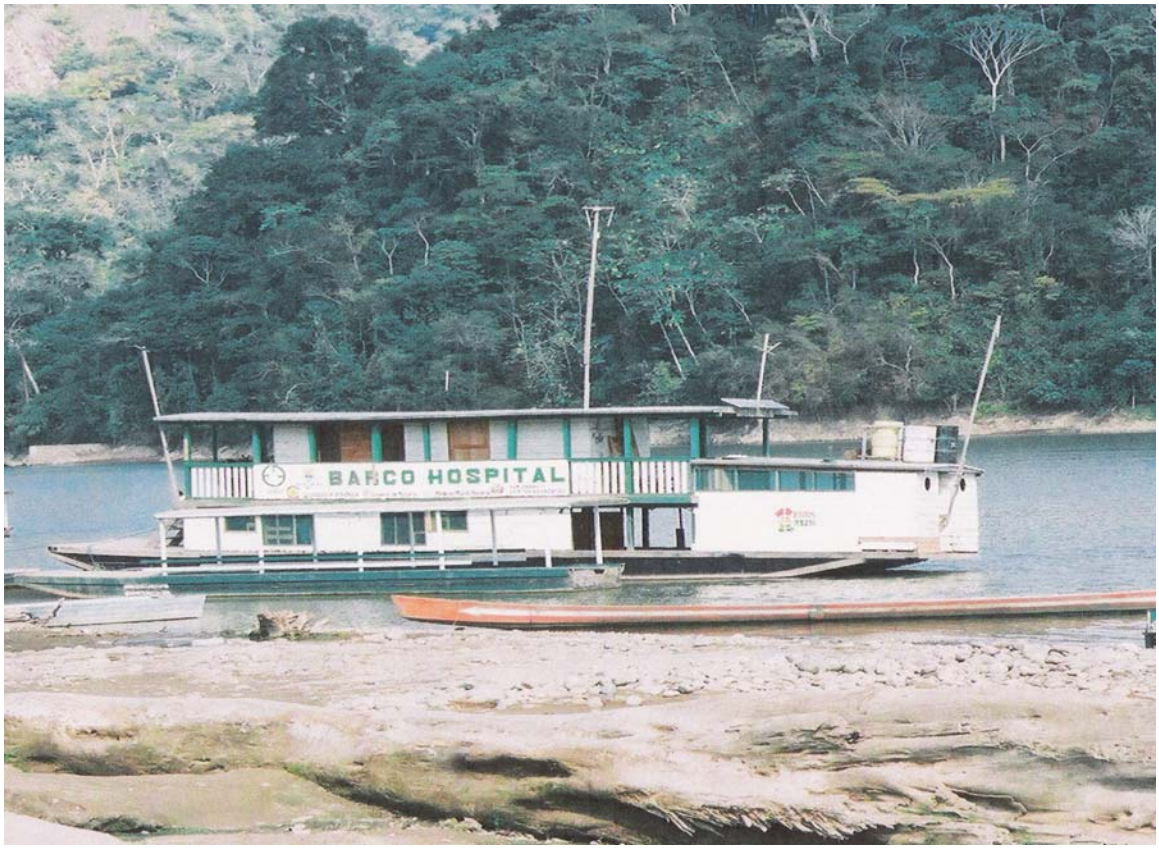

Figure IV – Hospital Boat on the Beni River (2003)

home to a widely dispersed population of 5,452.[231] The Machupo River, a small tributary of the Madeira-Amazon River system lies one mile west of the village. This river system was the focal point for the nineteenth-century travel writers who sought a transportation network to the Amazon River. Many of the indigenous people the travel writers encountered and described lived in and around the village where Machupo virus emerged.

[231] INE, "*Resultados Provisionales Comparados con la Poblacion Censada," Resultados Provisionales, Departamento De Beni (La Paz: Ministerio de Planeamiento y Coordinacion*, 1977), 5.

The Department of Beni encompasses 80,302 square miles of primarily flat topography, with a total population of 71,636 in 1950.[232] Northeastern Bolivia has a distinct dry season from April through September, and a rainy season from October through March. As a result of the extended dry season, the vegetation in the vicinity of San Joaquin is characterized by savanna and very dry forest. The dry forests are located in patches on the highest area called *alturas*, which increase according to their proximity to the Amazon rainforest fifty miles to the north.

Figure V – Department of Beni

[232] Ibid.

The village of San Joaquin in 1964 included 342 houses that radiated outward from a central plaza, consistent with the design of most Latin American towns. Edwin Tyson was in San Joaquin doing research on bats during the epidemic of Machupo virus, and described the design of the village centered on a traditional Latin American plaza. The wealthier homes near the plaza were constructed of sun-baked adobe bricks with tile roofs, whereas the homes outward from the plaza were constructed of adobe plastered over cane or woody poles with thatched roofs. Most of the yards consisted of numerous species of fruit trees, such as citrus and banana. Tyson reported throughout the town was evidence of trees that had been cut, and the abundance of brushy areas.[233]

Tyson made no reference to the population of San Joaquin, which merits consideration. Unlike nineteenth-century travel writers who described the indigenous people encountered on their expeditions as well as the physical geography, the Western scientists did little to acknowledge the nature of the indigenous population. Scientific reports, reflective of this genre of writing, provided methodological descriptions of the process of isolating the source of Machupo virus.

Published interviews by journalists with Ronald MacKenzie and Karl Johnson, and Edwin Tyson's dissertation have provided the framework for a narrative of the case history of the emergence of Machupo virus. I have identified two useful sources of interviews: Trevor Armbrister, Bureau Manager in Washington for *The Saturday Evening Post;* and Laurie Garrett, author of *The Coming Plague*. Armbrister's interview was conducted after MacKenzie's return to the United States in 1966, and was current

[233] Edwin Louis Tyson, "Ecology of Bats in Relation to Bolivian Hemorrhagic Fever" (Ph. D. diss., Florida State University, 1964), 8.

with the time of the epidemic, whereas Garrett's interview with was with Karl Johnson during the early 1990s.

Case History of Emergence

Machupo virus emerged in 1959 in the forested lowlands of the Amazon Basin, in the village of Orobayaya. The residents of the village either died or abandoned their homes due to the effects of the epidemic.[234] The disease waned after Orobayaya was abandoned, but re-emerged in San Joaquin, eighty miles west, three years later. By 1962, all that the scientific team found in the village were two families and cows, chickens and pigs that freely roamed the streets.[235]

In January 1962, Julio Anes, a migrant farmer who lived in the remote village of San Joaquin village died from a mysterious illness following a celebration at the end of the yucca harvest.[236] Anes slaughtered a cow and invited his friends to share in the feast. Within a few days, he experienced a light fever, followed by a headache and severe back pain. Blood leaked out of his gums, and within seven days he slipped into a coma and died. Three other people who attended the celebration died the same way. Within the next four months, three hundred of the villagers in San Joaquin (1/8th of the population) became ill with the same symptoms, and over one hundred of the villagers died.[237]

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[234] Anonymous, "Calms Fears of Epidemic. Argentine Mission Sees No Danger From Bolivian Yellow Fever." *New York Times* 14 May 1962, 33.
[235] Trevor Arbrister. "The Search for the Invisible Killer," in *The Saturday Evening Post* (Dec. 6, 1966), 285.
[236] Trevor Arbrister of the Saturday Evening Post reported the best-documented case history of the initial emergence. His interview with Ron MacKenzie, the epidemiologist responsible for isolating Machupo virus, formed the basis for this narrative. Also refer to Frank Ryan, *Virus X: Tracking the New Killer Plagues* (Boston: Little, Brown, and Company, 1997), 225-230.
[237] Arbrister, 286.

A continuous flow of travelers passed through the town of San Joaquin on their way from distant areas in the savannas to larger Bolivian settlements, and the disease spread quickly throughout the Department of Beni, resulting in an epidemic within a year of emergence. Richard Krause, who stated epidemics occur due to changes in patterns of human behavior, development, and agriculture, recognized the most important factor in the spread of microbes from points of origin are the results of migration and travel.[238] A steady stream of travelers passed through the town of San Joaquin on their way from even more remote areas in the savannas to large Bolivian towns, producing an epidemic within a few years.

Over a time span of four years, two unsuccessful attempts were made by the Bolivian government to halt this epidemic. The Bolivian government initially suspected smallpox, which has historically appeared in the region and exhibits similar hemorrhagic symptoms, and vaccinated against it. Two Bolivian physicians from the Bolivian Ministry of Public Health tentatively diagnosed the disease as typhus, but patients failed to respond to treatment.[239] This diagnosis is difficult to understand, since the symptoms manifested by typhus are not similar to the symptoms exhibited by the people exposed to the epidemic.

Typhus typically has an incubation period of 2-30 days, starts with a high fever and severe headache, and can include chills, muscle aches, joint pain and loss of appetite.[240] Less than forty per cent of patients with typhus develop a rash with small pinpoint hemorrhages. Although these symptoms are similar to hemorrhagic smallpox,

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[238] Richard M. Krause, "The Origin of Plagues: Old and New," *Science* 257 (August 1992): 1074.
[239] Tyson, 1.
[240] Patrick R. Murray, Ken S. Rosenthal, George S. Kobayashi, and Michael A. Pfaller, *Medical Microbiology* (St. Louis: Mosby, 1998), 355.

they do not apply to the symptoms of viral hemorrhagic fevers. The government disinfected the villages in the event it was typhus, but this effort failed to halt the spread of the disease. The 125,000 residents of the Department of Beni had to be in a state of panic over this epidemic that neither traditional medicine nor their government could stop. The severity of the epidemic necessitated immediate action.

Western Aid in the Isolation of Machupo Virus

Machupo virus was epidemic for four years before international assistance was received. The United States Department of Defense sent a team from the Middle America Research Unit (MARU) in the Panama Canal Zone to conduct a nutritional survey in La Paz, Bolivia in 1962.[241] Upon arrival in La Paz, the Bolivian Minister of Health, Dr. Luis Chinel Valverde, required the team to investigate the epidemic in the eastern part of the country that two La Paz physicians had dubbed "*El Typho Negro*" before authorization for the nutritional survey was confirmed.[242]

I have found two reports of this initial encounter: both are personal interviews conducted by journalists with MacKenzie and Johnson. Garrett, who interviewed Karl Johnson in 1990, stated the investigation of the epidemic was necessary in order for the Department of Defense to receive authorization to conduct the nutritional survey. Arbrister, on the other hand, reported that the Bolivian Minister of Health literally begged MacKenzie to investigate the epidemic. Arbrister interviewed MacKenzie upon his return to the United States in 1966.

[241] Tyson, 1
[242] Anonymous, "U. S. Scientist to Lead Expedition to Trace Lethal Virus in Bolivia," *New York Times* 22 October 1963, 8.

If Garret's report is correct, two fundamental questions arise. First, did the DOD fail to obtain permission from the Bolivian government to conduct the nutritional survey in La Paz prior to sending a team of physicians? The United States and Bolivia developed a kind of symbiotic relationship in the concomitant development of the eastern lowlands, and subsequently US technical advisors, staff and medical personnel had an established presence in the country.[243] Alternatively, if the US government did obtain permission to conduct the survey, was this the only way the Bolivian government could receive assistance?

Accompanied by Bolivian physician Hugo Garron, microbiologist Luis Valverde Chinel, and a local politician, the team boarded an old B-52 bomber that had been stripped of seats to act as a cargo plane for meat, and headed to the town of Magdalena in the province of Beni.[244] At the landing strip outside the town of Magdalena, nearly two hundred people awaited the arrival of the experts they hoped would end the epidemic. The fact that news of the arrival of these "disease cowboys" had crossed the Andes to this remote region without benefit of telecommunication illustrates the magnitude of this epidemic. The atmosphere of the community was evident by the attire of the people awaiting the physicians. Johnson stated: "The women were all dressed in mourning, the men were wearing black armbands."[245]

The community, described by Tyson as typical of Bolivian villages, was comprised of thatched-roofed adobe houses, and a central square occupied by both people and oxcarts. The physicians found the small adobe hospital, which had enough electricity

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[243] Healy, 61.
[244] Anonymous, "U. S. Aids Bolivia in Fever Battle," *New York Times* 7 July 1963, 29.
[245] Laurie Garrett, "Machupo," *The Coming Plague. Newly Emerging Diseases in a World Out of Balance* (New York: Penguin Books, 1995), 16.

to light it for two or three hours a night, crowded beyond capacity, with sick villagers lying on the dirt floor.[246] MacKenzie, through an interpreter, learned that most of the sick patients were from the outlying village of Orobayaya near the Brazilian border.

The research team traveled to Orobayaya to identify anything associated with the epidemic. The remoteness of this village is apparent when examining their journey, much like the journeys of the nineteenth-century travel writers. Both Garrett and Arbrister provided accounts of this journey in the content of their interviews with MacKenzie and Johnson. In order to reach the village to investigate the origin of this epidemic, MacKenzie, Garron, and Chinel traveled by dugout canoe, with only moonlight to guide them, down a river infested with alligators.[247] The next day the team rode forty kilometers on horseback across a series of *alturas* set amid the pampas. Guiding horses over foot-thick snakes, they made their way to the *altura* of Orobayaya.[248]

Upon their arrival, the team discovered that the six hundred residents of Orobayaya either had died or had abandoned their homes due to the effects of the epidemic, with the exception of two families.[249] The team visited surrounding villages, interviewed people and collected blood samples and particles for further study when they had access to laboratory equipment. The physicians then returned to Magdalena and collected blood samples from local patients. When MacKenzie examined the Department of Beni's clinical records, he discovered that seventy five per cent of the people became ill during the dry season, which was between April and October. Regarding the generational and sexual distribution of the disease, he discovered that twice as many

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[246] Ibid, 18.
[247] Arbrister, 286.
[248] Anaconda are prevalent in the pampas of Eastern Bolivia.
[249] Arbrister, 287.

adults became ill as children, and that the men were infected only slightly more than the women.[250]

The team returned to MARU with the blood samples, packed in sawdust, since there was no dry ice available in Bolivia. Once back in Panama, MacKenzie recruited virologist Karl Johnson to assist in research to identify the source of the epidemic. After testing the samples, MacKenzie and Johnson concluded the epidemic, as they suspected, was not typhus. The villager's symptoms resembled those brought on by a Latin American virus discovered in 1953 near the Junin River in Argentina.[251] In sparsely populated agricultural areas of Argentina's vast pampas, Junin appeared among men working to bring in the corn harvest. Junin also disrupted capillaries, causing people to bleed to death.[252]

MacKenzie met with the Infectious Diseases Division of the NIH in Bethesda in January of 1963, and requested funding to investigate the epidemic.[253] Johnson reported that the NIH was reluctant to fund MacKenzie, since he lacked experience in identifying new viruses. MacKenzie persuaded the NIH to fund an investigative expedition, and recruited MARU ecologist, Merl Kuns, to undertake a scouting mission to assess the extent of the epidemic, collect blood samples, and define the nature of the local ecology. The team made the journey back to Bolivia in March 1963, and Kuns noted the presence of thousands of bats living in the thatched roofs of Magdalena. There was no evidence of

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[250] Vainrub and Salas, 51.
[251] R. B. McKenzie, P.A. Webb, and K. M. Johnson, "Detection of Complement-Fixing Antibody After Bolivian Hemorrhagic Fever, Employing Machupo, Junin and Tacaribe Virus Antigens," *American Journal of Tropical Medicine and Hygiene* 14 (1965): 1079.
[252] K. M. Johnson, N.H. Wiebenga, R. B. McKenzie, N. M. Tauraso, A. Shelokov, P. A. Webb, G. Justines and H. K. Beye. "Virus Isolation from Human Cases of Hemorrhagic Fever in Bolivia," *American Journal of Tropical Medicine and Hygiene* 32 (1965): 113.
[253] Anonymous, "Ask Yellow Fever Fight. Pan American Doctors Urge Work to Prevent Spread," *New York Times* 26 March 1933, 7.

other rodents in the town of Magdalena.[254] The scientists determined that the infection was not originating in Magdalena, but in the village of San Joaquin, some fifty miles away. The team returned to the NIH a week later with adequate evidence to gain approval for further investigation.

In May 1963 the "disease cowboys" traveled in a United States Air Force B-17 bomber to the eastern Andean foothills to the Itenez River, and from there to the tributary of the Machupo River. They eventually landed in a field outside San Joaquin. The research team used mules to carry 10,000 pounds of scientific equipment into the village to set up a functioning laboratory.[255]

> Since virus isolation was to be attempted within the confines of a small town where the disease was epidemic, and since it was suspected that the infectious agent might have a natural cycle involving infection of rodents and arthropods which were abundant in the town, all feasible measures were taken to exclude the inadvertent introduction of such agents into the laboratory, and to protect workers from potential infection by aerosols.

The presence of rodents and arthropods in the town suggested a correlation with the spread of the epidemic. Accordingly, the buildings had brick floors, tight roofs and were fitted with screens on the windows and doors. The floors, walls, and ceilings were treated with DDT to ensure the safety of the workers.[256]

The village of San Joaquin, the center of the epidemic, sits upon a sloping hill just above the flood line of the Machupo River. In Garrett's interview with Johnson, he expressed that nothing in his scientific career had prepared him for conditions so

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[254] Anonymous, "Bolivian Hemorrhagic Fever – El Beni Department, Bolivia," *Morbidity and Mortality Weekly Report. International Notes* (1999), 944.
[255] McKenzie, et al, "Virus Isolations from Human Cases of Hemorrhagic Fever in Bolivia," 113.
[256] Ibid.

primitive: no roads, no health facilities, no fences, no electricity, no telephones, and no running water. Johnson described San Joaquin as "the last frontier of the New World."[257]

Cows outnumbered people two to one, and roamed freely about the town. Contact with the outside world was limited to traffic on the Machupo River, which drained into the Amazon Basin. The wealthier citizens lived in tile-roofed adobe houses, while the rest of the population lived in mud-stick houses with thatch roofs. Six thin strips of marsh formed the roads of San Joaquin, which converged into a modest central plaza. The people subsisted almost entirely upon local crops of rice and corn, and the cattle they slaughtered.

The team of "disease cowboys" began their investigation of all possible hosts in order to isolate the disease. The MARU team mapped the town and interviewed every family. Half the people had been infected, and of those, nearly half had died of the disease. In the quest to isolate the virus, the scientists normally would have started by performing autopsies on the bodies of victims. MacKenzie and Johnson were reluctant to take this a crucial step due to the cultural boundaries that existed within San Joaquin. An appeal to the villagers from the church enabled the Western scientist to proceed with the requisite research. According to Valverde, "Since I spoke from the pulpit, they assumed I was a priest with the authority of God behind me, and I did nothing to dissuade them." Consequently, the villagers agreed to the autopsies.

Once the villagers acceded to the concept of autopsies, the physicians proceeded to isolate the cause of the epidemic. Since most of the hair fell off the victims' heads before they died, autopsies were performed on the brain. After the initial autopsies were

[257] Garrett, 19.

completed, extensive damage to the disease victims' brains was noted. Where clear cerebral fluid should have been, there was blood, and all the protective layers of membranes around the brain were blood-soaked. The initial autopsies yielded no conclusive information regarding the nature of the disease.

In May, MacKenzie and Johnson performed an autopsy on the body of a three-year-old boy, Oscar Carvallo, which provided them with the organ that contained the virus.[258] Most viruses cling to a specific human organ. Some favor the brain, others the heart, liver, kidney or spleen. In the case of this virus, there was no indication as to which was the characteristic organ. According to a report written by the team, "Hamsters and mice were inoculated intracerebrally …and observed daily for signs of illness or death for a period of 21 days."[259]

Sections were removed from each of the essential organs, and hamsters were inoculated with the tissue. The child's spleen produced the virus in hamsters that subsequently died. MacKenzie and Johnson suspected they had isolated the virus, and sent the specimens to MARU in Panama for confirmation. Subsequently, as MacKenzie, Webb, and Johnson later published, the causative agent of Bolivian Hemorrhagic Fever was isolated from this fatal case in San Joaquin, Bolivia.[260]

Although this was a significant step toward halting the epidemic, the team needed to determine where it came from and how it was transmitted to humans. Kuns collected

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[258] Patrick R. Murray, Ken S. Rosenthal, George S. Kobayashi, and Michael A. Pfaller, *Medical Microbiology* (St. Louis: Mosby, 1998), 43.
[259] P. A. Webb, K. M. Johnson, R. B. McKenzie, and M. L. Kuns, "Some Characteristics of Machupo Virus, Causative Agent of Bolivian Hemorrhagic Fever," *The American Journal of Tropical Medicine and Hygiene* 18 (1965): 531.
[260] R. B. MacKenzie, P. A. Webb, and K. M. Johnson, "Detection of Complement –Fixing Antibody After Bolivian Hemorrhagic Fever, Employing Machupo, Junin, and Tacaribe Virus Antigens," *American Journal of Tropical Medicine and Hygiene* 14 (1965): 1079.

and examined parasites looking for a connection between parasites and the virus. He collected more than 30,000 insects, including fourteen types of mosquitoes, nine kinds of horseflies, and four insect species never before cataloged. Extracting parasites from the skins of mice, he inoculated the tissues into litters of hamsters, yet none of the animals ever got sick. Next to mice, the most prevalent mammals in the village were bats. There were approximately fifteen times as many bats as people, ranging from fruit, fish, and insect eaters to vampire bats with sixteen-inch wingspans. Edwin Tyson conducted studies to reveal any relationship of bats in the epidemiology of Machupo virus.[261]

1. Determining the species of bats present in San Joaquin and the surrounding forests.
2. The types of roosting sites used by bats in the village.
3. The movement of bats between houses.
4. The abundance of bats.
5. The relationship of bats to the roosting sites and to the houses of known Machupo virus activity.
6. The spatial relationships of the bats in the community when it is viewed as an entity.

As Tyson studied bat ecology, Kuns caught bats from the thatched roofs of the village huts and examined the parasites on the bats. Thousands of animals were trapped and their bodies subsequently dissected for evidence of the disease.

The townsfolk gathered for a celebration near the end of June to celebrate the progress in isolating the virus. Johnson, MacKenzie, and others from the research team joined the festivities, eating and drinking the local specialties served. Within a week of the celebration, while out collecting samples, MARU lab technician Angel Munoz and

[261] Tyson, 3.

MacKenzie became ill with symptoms they recognized from the villagers. They had both developed the same disease they were working to isolate. There were two ways the virus could kill them: they would either develop neurological symptoms, contract tremors and lose muscular control, have a grand mal seizure and die; or the quantity of blood hemorrhaging from their capillaries would become so voluminous that their bodies would go into shock and they would die of cardiac arrest. Either way, they could die in a matter of days.

After they contacted Panama by radio, a United States Air Force C-130 flew in to evacuate the researchers.[262] They were flown to Gorgas Memorial Hospital in Panama, where they received supportive therapy from an army doctor brought in from Washington DC. Although he had no experience with this particular virus, he had treated another viral hemorrhagic disease called Seoul Hantaan, which first came to the attention of the U.S. Army during the Korean War. With Hantaan, as with all hemorrhaging diseases, the capillaries leaked out fluids and proteins, and the chemical balances of vital organs such as kidneys, hearts, livers, and spleens were severely disrupted. Long before the immune system had an opportunity to respond to the virus, the organs cease functioning and the patient either convulses or goes into shock. Although he knew there was no cure or antitoxin for this type of virus, he had found that patients' chances of recovery were greatly enhanced by careful supervision of electrolytes and fluids. He employed these same methods of supportive therapy with MacKenzie and Munoz.[263]

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[262] Anonymous, "Stricken U. S. Gains After Flight From Bolivia." *New York Times* 9 July 1963, 4.
[263] R. Gordon Douglas, Jr., Ned H. Wiebenga, and Robert B. Couch, "Bolivian Hemorrhagic Fever Probably Transmitted By Personal Contact," *American Journal of Epidemiology* 82 (1965): 81.

Shortly after the departure of McKenzie and Munoz, Johnson came down with the same symptoms.[264] Since there was no possibility of timely evacuation, Johnson had to make the difficult journey, while ill, flying across Bolivia, Peru, and Columbia. When he reached the hospital in Panama, he joined MacKenzie and Munoz at Gorgas Memorial Hospital. Supportive therapy aimed at maintaining the vital respiratory, cardiovascular, and a renal function was implemented. Johnson's fiancée, Patricia Webb, a physician trained in both medicine and virology, flew from Washington DC to Panama to visit him while he was receiving treatment. Since isolation procedures were not required, Webb was allowed to embrace and kiss him, and was in close contact for several hours a day. Sera from each of them were studied, and showed development of complement-fixing antibodies to Junin virus.[265]

Johnson, Munoz, and Mackenzie reviewed all the possible ways the three of them could have become infected simultaneously. The only experience the three of them had shared was the town celebration. MacKenzie, Webb, and Johnson later reported, "While it is possible that some humans might be infected by Machupo virus and fail to develop CF antibody, we have no data to this effect, and such might be difficult to obtain especially if infections were sub-clinical."[266] Subsequently, since each of them had already been exposed to the virus, they were certain that they had developed immunity to it, and returned to San Joaquin to complete their research.

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[264] Anonymous, "Third U. S. Doctor in Bolivia Ill." *New York Times* 11 July 1963, 16.
[265] K. M. Johnson, M. L. Kuns, R. B. MacKenzie, P. A. Webb, and C. E. Yunker, "Isolation of Machupo Virus From Wild Rodent Calomys Callosus," *American Journal of Tropical Medicine and Hygiene* 16 (1966):103.
[266] MacKenzie, et al. R. B. MacKenzie, P. A. Webb, and K. M. Johnson, "Detection of Complement – Fixing Antibody After Bolivian Hemorrhagic Fever, Employing Machupo, Junin, and Tacaribe Virus Antigens," 1083.

A week after their departure, Webb became ill with the same symptoms exhibited by Johnson. Gorgas Memorial Hospital is screened, rodent-free and maintained to a high standard of cleanliness, and Webb did not empty bedpans, urinals or share in his meals. Webb's development of the disease suggested a nosocomial infection, which means that it is hospital-based. This nosocomial outbreak indicated that person-to-person transmission might occur by airborne routes, such as sneezing or coughing, or kissing. This was significant since it became evident that the virus could be transmitted person-to-person, a turn of events the physicians had not anticipated, making the virus even more threatening. Henceforth, Biosafety Level Four practices were recommended for all activities utilizing Machupo virus.[267]

Upon their return to San Joaquin, the team studied both vertebrate and invertebrate fauna in and around San Joaquin in an effort to identify the host of the virus. In addition, they offered a monetary reward to anyone who brought them sick animals.[268] Over the course of the next ten months, only five sick animals were brought in, all large gray mice of a wild *Calomys* species normally found in the bush. Three of the animals died, suffering symptoms similar to those seen among the villagers, the other two recovered and became virus carriers. The success of this discovery was published, and the team determined "The majority of isolation attempts were made with spleen pools from 3 to 6 animals."[269] The virus was found in the blood, spleens, or brains of these five animals.

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[267] Centers for Disease Control and Prevention, "Arboviruses, Arenaviruses, and Filoviruses Assigned to Biosafety Level 4," (Atlanta: Office of Health and Safety, 1977) 1.
[268] Johnson, et al, "Isolation of Machupo Virus From Wild Rodent *Calomys Callosus,*" 103.
[269] Ibid,104.

The team hypothesized that the disease was spread the same way as the bubonic plague, by insects that inhabited the fur of the rodents. The team returned to MARU and conducted experiments on hamsters with the virus, and found that adult hamsters that had recovered from the virus somehow passed the virus onto previously disease-free hamsters. According to an article published by Johnson, MacKenzie, Kuns, and Webb, the neurological symptoms exhibited in the hamsters were identical to those observed in the cases of human strains of Machupo virus. Johnson and Webb studied the virus samples, and discovered that the adult hamsters shed the virus in their urine. The baby hamsters became infected because they were caged in an atmosphere of wood chips and sawdust drenched in Machupo virus. The virus could be eaten, inhaled, or could gain entry through cuts in the skin. They had not only isolated the virus, but also believed they had determined its method of transmission.

During the evening hours, while the residents of San Joaquin slept, the mice scampered about the village, searching for food, and spreading the virus through their urine, feces and saliva. A ritual common to every household in the village was for the women to rise in the early morning hours, before the men and children, and prepare breakfast. While the food was cooking, they swept the dirt and clay floors. Karl Johnson explained the significance of this ritual: "Each time they sweep that broom, they're sending mouse urine infected dust and crumbs drifting all about in the air. And each time the families gathered for breakfast, they shared virus-contaminated air."[270] After breakfast, the men of the village went out to the fields to work, exposing themselves once again to the contaminated mouse-urine-infected air as they harvested their crops.

[270] Garrett, 29.

Consequently, the men had more exposure to the virus than women, explaining why more men had developed the virus. Women and children were exposed to the virus through the common household morning ritual, and eating mouse-urine-infected food.

MacKenzie noticed that although there were a large number of mice in the village homes, there was an absence of cats in the villages of San Joaquin, Orobayaya, and Magdalena. The villagers explained that all the cats had died a couple of years earlier. The death of the cats coincided with the beginning of the epidemic as well as with the spraying of the villages by the government to eliminate malaria. MacKenzie had two theories concerning the lack of felines in this part of Bolivia. He concluded that either the cats died from eating the infected mice, or they died due to exposure to the DDT sprayed in the village during the anti-malaria program. The villagers reported that there was a chemical residue left in the village after it was sprayed, suggesting a direct correlation between the feline decline and DDT.

The team returned to MARU and conducted experiments to determine whether the infection in a house cat would produce results similar to the virus. The results of their research stated: "The apparent inability to infect cats by feeding virus-containing baby hamsters, and the failure to detect virus in organs and urine several weeks after direct inoculation provided information of pertinent, if negative, epidemiological significance."[271] That, with poisoning from DDT, proved that cats died from exposure to the DDT, not from the virus. As a result, Dr. Valverde went on national radio in La Paz to issue a call for donated cats. They airlifted hundreds of cats into San Joaquin, which

[271] Karl M. Johnson, R. B. Mackenzie, P. A. Webb, M. L Kuns, "Chronic Infection of Rodents by Machupo Virus," Science 150 (December 1965): 1619.

coincided with an end to the epidemic. Whether or not this is due to effective control of rodent reservoir populations, or the epidemic had run its course, is open to speculation.

Kuns was not convinced of the results achieved and believed further research was needed to confirm the direct route of transmission. He informed NIH that he wanted to put fluorescent chemicals in mouse food and then use ultraviolet lights to follow the animals' urine trails in San Joaquin. This procedure would clearly illustrate where the urine came into contact with villager's noses, mouths, and inhalations. In June of 1964, The NIH withdrew all research funds, since the epidemic was halted. Kuns reflected the opinion of the all of the physicians when he expressed his profound disappointment with the actions of the NIH, "Hardly anything has ever disappointed me more in all my thirty-nine years than having to pull out of here without finishing the job."[272] When Machupo virus re-emerged in San Joaquin a year later, Kuns stated, "You might compare us to firemen, we've discovered the location of the blaze and we've put it out. But we still don't know where or when it could start again."[273]

Traditional Medicine

Machupo virus was a determining factor in the introduction of the Western approach toward medicine to the indigenous population of the Department of Beni. The concept of medical treatment familiar to the West was either nonexistent or culturally rejected in most rural parts of Bolivia in mid-century. In 1960, the population per physician was 3,660 to 1, and subsequently, access to modern medical care was limited.

[272] Peters, 78.
[273] Arbrister, 288.

Edmundo Morales, a historian of indigenous descent from nearby Peru, explained it took two weeks to walk to the nearest hospital from his village.[274]

While following one of the Inca trails in neighboring Cochabamba in the early 1990s, I myself encountered numerous indigenous villages, each in total isolation from the outside world, lacking running water, plumbing, electricity, and telephones. The only access to the world outside of these villages was a stone and dirt trail that involved a walk of three to four days to access the nearest dirt road. The *campesinos* I encountered spoke little Spanish, limiting my ability to communicate effectively with them. The Indian woman I stayed with tended to my daughter who was suffering from an intestinal disorder. She brought her coca tea to drink, and rubbed herbs across her forehead while chanting a phrase in her language. It did little, if anything, to relieve her nausea and vomiting, but perhaps a belief in the process had to be present first. I relate this story to illustrate not only the isolation of rural villages at the time, but also how indigenous identities have been maintained through household medicine practiced in the late twentieth century.

Indigenous people, who tend to rely upon traditional household medicine intrinsic to their culture, heavily populate the rural areas of Beni. There were obvious cultural conflicts that arose between the physicians and the *campesinos* due to the cultural gap that existed between them. The research team was accustomed to modern medical approaches, which involved basic scientific procedures including blood tests and autopsies. The notion of an autopsy is disturbing to family members in Western culture, although the benefit is recognized in determining the nature of an unexplained death.

[274] Edmundo Morales, "The Cuy in Andean Medicine," *The Guinea Pig. Healing, Food, and Ritual in the Andes* (Tucson: University of Arizona Press, 1995), 75.

The cultural attitudes of the indigenous population of San Joaquin regarding health must be examined in order to understand the impact of Western scientific techniques upon the community. The concept of an autopsy was a foreign, frightening, and sacrilegious concept to *campesinos*. The reluctance of the villagers to concede to autopsies impeded the process of scientific investigation instrumental in the isolation of the virus. Bolivia's Dr. Valverde, with the cooperation of the local priest, convinced the villagers of the necessity of autopsies from the pulpit of the village church. The emotional atmosphere within the community was one of despondency. Virtually every family in the community had been affected by the epidemic over the course of four years. The sense of profound grief in the village was compounded when faced with the desecration of the bodies of beloved family members. Ultimately, it was an autopsy on the body of a three-year-old child that produced the evidence essential to isolating the virus.

Edmundo Morales, a native of an indigenous community in rural Peru, extensively researched traditional methods of healing throughout the Andean countries. Morales published his findings, which provided detailed descriptions of indigenous traditional medicine. Although medicine may not be practiced in this exact manner in San Joaquin, his account provides requisite contextual information. According to Morales, ill health is considered to be attributed to one of several possible causes: food classified as cold or hot, draft, fright, witchery, spells cast by spirits of ancestors and earth, or by God.[275]

[275] Morales, 85.

Twenty five per cent of the people in communities in the Bolivia, Peru, and Ecuador rely on traditional methods of healing.[276] This figure includes the inhabitants of both cities and rural areas. Considering the traditional nature of rural communities, it would not be unreasonable to speculate that reliance on traditional medicine was significantly higher in San Joaquin than in major population centers. It is probable the villagers had already exhausted traditional methods before accepting conventional Western medical approaches such as autopsies.

There are certain cultural and environmental limitations, which must be addressed in order to place the proper emphasis on indigenous society and its link with medical care. Modern medical facilities were virtually nonexistent at mid-century in Beni. Even today, access to roads and buses often involves a walk of eight hours or more. At the time of the epidemic, the lack of an established infrastructure linking the major cities to the remote Beni province, travel to a modern hospital involved a trip of a week or more.

The limitations of access to Western medicine, the marginalized role of the indigenous population, and the isolated environment in which they lived at mid-century suggest that the indigenous population would have exhausted traditional medical resources before accepting the foreign practice of Western medicine. The reliance on household medicine evolved over a period of centuries in relation to indigenous culture. If traditional household medicine proved ineffective, the patient is taken to a native folk healer. Traditional medicine is connected to rituals, metaphors, and symbols familiar to indigenous people. Consequently, modern methods of diagnosis and treatment of illness are in direct confrontation with practices that have deep cultural roots.

[276] Ibid.

Both the guinea pig and coca play an important role in traditional medicine. The guinea pig, called the *cuy* in Aymara, is the primary tool used for diagnosis and treatment. Rubbing with *cuy*, *Jaca shoqpi*, or cleaning with *cuy*, *cucpichay*, are considered the indigenous version of the x-ray. Either the healer or another woman will chew coca during the healing session to reinforce the healing power of the *cuy*. The healer rubs the patient with a live *cuy*. It is supposed to squeal when it encounters the part of the body where there is pain or illness. After rubbing the patient with the live *cuy*, the traditional healer slits its throat, and skins it from the neck down to the bottom of the animal. The healer then examines the inner organs of the *cuy* and proclaims a diagnosis and treatment for the illness. Following this ritual, the carcass of the *cuy* is wrapped with flowers in paper, and disposed of properly. Traditional wisdom dictates that upon burying the carcass, one must not be observed or look back, or the illness will return.

The Aymara use *cuy* to cure both diseases initially suspected as the origins of the epidemic that plagued San Joaquin: smallpox and typhus. Consequently, a brief discussion of the methodology Morales suggests is employed in traditional medicine to heal these diseases is presented. To end an epidemic disease such as smallpox, the best available *cuy* is placed under the patient's armpit for a few hours to give the *cuy* enough time to absorb the illness from the patient. The sick animal is then taken to a faraway location and dropped with the belief that it will take the epidemic away with it.

To cure Typhus, two *cuys* are killed, and the bodies opened to show the internal organs. Incense and herbs are sprinkled on the exposed organs, followed by placing one *cuy* on each foot. The feet are then wrapped with rags. Immediately after wrapping, a hot brick is placed upon both feet. This application stays on the patient's feet until rotten

odors emerge. Following the removal of the application, the patient is bedfast for one day. Patients must follow special instructions regarding behavior and diet for three days following treatment, and are not allowed to shake hands with anyone, nor shower for those three days.[277] Table XXII provides a list of the diagnostic capabilities attributed to skinned cuy in traditional medicine. [278]

Table XXII
List of Some Diagnostic Signs Manifest in Skinned Cuy

Illness in the Patient	Signs in the Cuy
Cold	A white, thin film covers the back
Bronchitis	A thin white film covers the back and there are fine lines of blood, like broken veins
Sore throat	Clotted blood in the neck
Diarrhea/cold and colic	Intestines have air bubbles and feces are sparse
Diarrhea/irritation	Intestines are dark red or purple
Intestinal fever	Red, bloody intestines
Fright (*Susto*)	The carcass trembles when put in fresh water
Witchery	Yellowish eruptions in the neck that looks like pus when poked

Another factor to be examined is the synthesis of Christian ideology imposed on the indigenous population not only by the Jesuits, but also by contemporary missionaries. In reference to this particular situation, the presence of an altar with a crucifix as well as saying prayers gives the healing method a sense of sacrifice, where the cuy is a medium through which the patient is diagnosed and cured supernaturally by God. The influence of the church was culturally significant, considering the fact that the physicians had to

[277] Morales, 74.
[278] Morales, 75.

appeal to the religious dedication of the community in order to gain permission to perform a autopsies on victims of the epidemic.

Although the primary use of coca is to provide energy for work, the second most important use is medicinal, and this use is inextricable from the indigenous belief that coca is a protector and preserver of health. Most of the population of rural communities uses the coca leaf for some forty health remedies. The most widely acknowledged medicinal use of coca is for gastrointestinal ailments such as stomachache, dysentery, indigestion, cramps, diarrhea, and stomach ulcers. Coca is also commonly used for toothaches, rheumatism, hangovers, and numerous other ailments, taken internally, or applied as a plaster or poultice.

The indigenous population of Bolivia succumbed to the influence of Western culture; there is no disputing that point. Even so, after centuries of Western influence, the Indians still adhere to many elements of their cultural identity. This is particularly evident in the approach to medical care existing within the indigenous population. As recently as the advent of the twenty-first century, evidence of indigenous medicine and belief systems are apparent in the traditional indigenous markets. Coca is the most common indigenous medicinal product found in the markets, where one can still observe men and women with coca leaves pasted on their foreheads to relieve headache symptoms.

Although these practices were foreign to Western culture, they are still deeply imbedded in indigenous culture. Within the context of two contrasting cultural approaches to medicine the physicians from MARU attempted to isolate Machupo virus. Not only did they have to contend with the predictable difficulties working in an

undeveloped frontier, but also they were doing so in an environment where they were forced to address the obvious cultural differences of the local population in order to proceed with their research.

EPILOGUE

Thirty years after Machupo virus was isolated, shifts from agricultural production to coca plants for cocaine in the Department of Beni warranted coverage on U.S. evening news. As Kuns had predicted, Machupo re-emerged in the summer of 1993 near San Joaquin. The American media, in conjunction with the U.S. war against drugs, was covering cocaine production in South America. Ronald MacKenzie saw the program and called Karl Johnson at his home in Montana to schedule a trip back to San Joaquin.

Upon their arrival, both Johnson and MacKenzie were greeted with a reception and ceremony in La Paz, each receiving medals representing their welcome into the Decorated Order of the Condor from the Bolivian government.[279] Following their welcome in urban La Paz, they traveled on to San Joaquin. What they found upon their arrival illustrates the relationship that had developed between the scientists and the community during their efforts to identify and isolate the disease that had plagued Beni. Garrett poignantly described their arrival in San Joaquin: "And that was why for more than forty eight hours the people of San Joaquin had waited patiently through the intermittent rain, standing on the landing strip and staring hopefully into the western sky." Accompanied by a marching band, more than three hundred *campesinos* comprised of cowboys, children, and farmers greeted them upon their arrival.

The significance of their contribution to the indigenous population was evident by the honor bestowed upon them, for even though the children were not alive when the "disease cowboys" were searching for the origins of Machupo virus, they were aware of

[279] Anonymous, "Doctors Receive Decorated Order of the Condor," *New York Times.*26 July 1964, 3.

their reputation. Freddie Bruckner Mendez, an architect in the frontier village of Rurrenabaque, recalled meeting MacKenzie when he was a small child. In an interview in 2003, Mendez recounted stories of MacKenzie as a guest of his father, and described him as a hero, remembered by everyone in the village.[280] The Mendez family was among the European colonists who immigrated to the lowlands from Germany in the 1950s, and owned large cattle and banana farms. Mendez reported that people still got sick and died from Machupo virus, but the government had a program in place to check on the virus, so it was no longer perceived as a problem.

Johnson expressed how nothing in his scientific career had prepared him for conditions as primitive as he found San Joaquin: no roads, no health facilities, no fences, no electricity, no telephones, and no running water. Johnson described San Joaquin as "the last frontier of the New World."[281] Just as the cowboy of the American West, who aided in the fight against Indians so that Western civilization could develop the interior of the United States, these "disease cowboys" aided in the fight against Machupo virus, which enable the West to prevail in the development of the interior of Bolivia, securing the economic and political goals of the West. The value of their contribution is undeniable, but so was their ignorance of the impact of their actions on the indigenous population.

The "disease cowboys" were emblematic of the relationship between the West and Third World countries, which has been shaped by the West pouring in capital, and then withdrawing and cutting off funding. The West was focused on itself, not what was best for the indigenous population. When the NIH cut off funding for research, the

[280] Personal Interview, Rurrenabaque, Bolivia (July 24, 2003).
[281] Garrett, 19.

scientists were forced to leave and let the indigenous population face future outbreaks of Machupo virus.

Machupo virus, which emerged in 1959 as a sporadic hemorrhagic illness in rural areas of the Department of Beni in eastern Bolivia, was the by-product of the development of the interior of Bolivia in conjunction with the economic goals of the MNR government and the international objectives of the United States. Mutual developmental policies disregarded the indigenous population of the eastern lowlands, condemning them to a marginalized role within Bolivia's social, economic, and political structure.

The scientific team from MARU, the "disease cowboys," however, had a significant impact on the intercultural relationship between Western physicians and the indigenous population. The severity of the epidemic forced the people of San Joaquin to rely on assistance from the West, a policy that in the past contributed to the subjugation of the indigenous population. In an era guided by ethnocentric policies, the "disease cowboys" bridged the gap between the Western policy makers and the local population. In a way, Machupo virus was responsible for instilling a sense of trust in Western medicine, which could do little else but improve the dismal situation of the marginalized indigenous population of eastern Bolivia.

The social and environmental conditions that occurred within Beni province during the middle of the twentieth century were significant factors contributing to the emergence of Machupo virus. The Revolution of 1952 was instrumental in launching these changes, since it put the population of eastern Bolivia in a position where ecological alterations were the only means of survival available to them. Coupled with

an increased population through highland migration and European immigration, sufficient factors existed for the emergence to become epidemic.

Three factors influenced the developmental policies directed toward the eastern lowlands following the Bolivian National Revolution: national poverty, under-development, and fear of encroachment of its borders by Brazil. In a series of wars fought and lost over the late 19th and early 20th century, Bolivia lost much of its territory to neighboring countries. The first of these losses was the nitrate-rich Atacama Desert and the port of Antofagasta to Chile in 1884; followed by the Acre territory to Brazil in 1903, and soon afterward three quarters of the Chaco to Paraguay in 1935.

The MNR determined settlement of the eastern lowlands was the solution to these problems. With the proper economic incentives, colonization would stimulate agricultural and economic development, thus alleviating some of the problems associated with national poverty and under-development. The presence of a population integrated into the national economy would eliminate the threat of future encroachment by Brazil. Concomitantly, colonization would further stimulate agricultural production, one of the fundamental objectives of the Agrarian Reform Act initiated by the MNR following the Bolivian National Revolution.

The international interests of the United Nations and the United States guided the developmental policies regarding of the eastern lowlands, in order to prevent Bolivia from submitting to the escalating communist threat that concerned the West at mid-century. The infusion of Western capital was welcomed by the MNR government due to the economic crisis existent in the country at mid-century. Awareness of the vast

economic resources provided the impetus for foreign investment to aid Bolivia in the development of an infrastructure to transport trade products to Western markets

Nineteenth-century travel writers provided the impetus for Western interests in the development of the eastern lowlands of Bolivia. The publication of travel writers accounts in both British and American geographic journals established the physical and ideological maps instrumental to foreign investment in Bolivia. Nineteenth-century travel writers defined indigenous identity for the West by ascribing an insignificant identity that led to the marginalized role of the indigenous population in the twentieth century. This Western perception of Bolivian Indians led to the development of colonization plans that excluded the Indians as primary participants. Left out of the national developmental programs, the indigenous population cleared uncultivated land near the Machupo River, bringing *Calomys callosus*, the natural host of Machupo virus, into contact with the human population, resulting in an epidemic in a matter of a few years.

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