

## The Role of Biological Anthropology in Easter Island Research

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### Introduction

Given the intense archaeological study of Easter Island over the past forty years, it is surprising that very little research has been conducted on the biological aspects of the prehistoric Rapanui. The lack of research is doubly surprising since the origins of the Rapanui have been debated since the earliest archaeologists visited the island. However, thanks to the large database assembled by George W. Gill and associates at the University of Wyoming as well as recent mtDNA research conducted by Erika Hagelberg, the field of biological anthropology is beginning to take a more prominent position in Easter Island research. This paper reviews previous bioanthropological studies and explores some current research directions.

The study of the prehistoric Rapanui is important for two primary reasons. First, by examining the prehistoric Rapanui a better understanding of Easter Island prehistory will be attained. The best indicators of Rapanui origins are the prehistoric Rapanui themselves. Second, Easter Island presents an ideal setting to gain a better understanding of the processes of human evolution, including drift, bottlenecks, selection, mutation and gene flow. This is due to the isolation of Easter Island, located approximately 1,400 miles from Pitcairn Island and 2,400 miles from Rapa in the west and 2,300 miles from the South American continent in the east. Assuming these distances restricted return voyaging, the isolation of Easter Island should have served to severely restrict gene flow from outside sources after initial colonization. In addition, relatively uniform environmental conditions throughout the island should have limited the effects of differential selection; the geography of the island ensures that no physical barriers exist to limit gene flow from one group on the island to another (Easter Island is only about 62 sq. miles and with a maximum elevation of 1,674 feet); and there is a relatively large database available for analysis. All theoretical expectations would suggest that the Rapanui should represent a homogeneous population, while any deviation from this would indicate that some cultural or biological differentiation or gene flow from outside sources occurred.

### Previous research

Previous bioanthropological studies can be divided into two general categories: genetic and osteological research. Results of blood group studies based on living Rapanui (Dausset 1982; Etcheverry 1967; Simmons 1962, 1965; Simmons and Graydon 1957; Simmons *et al.* 1955; Thorsby *et al.* 1972) indicate that the range of variation generally falls within the distribution for East Polynesians for all the blood groups examined. Of note, however, Simmons (1965) reported that within the ABO system, the frequency of A among the Rapanui is the highest in Polynesia. Leone and Caskey (1965) also examined blood group data based on the

skeletal remains of 32 individuals. While their study demonstrated a high B frequency (18.75%), the authors were quick to point out that problems existed with the methodology and the results were to be "considered presumptive" (Leone and Caskey 1965:331).

One other blood group study is worthy of note here. Blood samples of Rapanui with no known foreign admixture were examined for the highly polymorphic HLA system with results indicating that 36% (18 of 49) of the sample exhibited HLA type A29/B44 (12), most common among the Basques of Spain and France (see Dausset 1982; Thorsby *et al.* 1972). While Langdon (1994a,b, 1995a-d) uses this as evidence for prehistoric European gene flow via a mixed European/Polynesian population, the results can best be explained as the result of protohistoric gene flow with a Basque (or other European) sailor (see Bahn and Flenley 1992, 1995; and Hagelberg 1995 for an extensive rebuttal to Langdon, and Langdon 1995b for a reply).

Uncertainty concerning historic admixture with European and South American populations limits the use of genetic data in Easter Island research. This is especially evident considering the Rapanui population dropped to a minimum of 111 people late in the 19th century (Bahn and Flenley 1992). This severe bottleneck and the arrival of relatively large numbers of foreign immigrants has essentially ensured that the present Rapanui population is not genetically representative of the prehistoric Rapanui. Therefore, data derived from skeletal remains provide the most reliable source of genetic information on the prehistoric Rapanui.

Hagelberg (1995; *et al.* 1994) has examined mtDNA from the skeletal remains of 12 individuals from the sites of Ahu Tepeu on the west coast and Ahu Vinapu on the south coast of Easter Island. Mitochondrial DNA is gaining status as a valuable research tool since it evolves more rapidly than other types of DNA, does not undergo recombination, and is only inherited via the maternal line (Hagelberg 1995). All 12 of the individuals examined demonstrate the 9 base pair deletion and substitutions at three particular locations (16217, 16247, and 16261) indicating Polynesian ancestry (Hagelberg 1995). While the study is limited both in the number of individuals examined and the number and location of sites represented, it is in agreement with archaeological models which suggest a Polynesian origin for the Rapanui.

In comparison to the paucity of genetic studies of the Rapanui there is a relative abundance of osteological studies. The primary focus of many of the pre-1970 osteological studies is a determination of the racial composition of the prehistoric Rapanui (de Quatrefages and Hamy 1882; Dixon 1923; Henckel 1939; Imbelloni 1951; Meyer and Jablonowski 1901; Murrill 1965, 1968; Petri 1936; Shapiro 1940; Volz 1895; Von Bonin 1931). The data used in these studies are of limited use, however, since provenience is generally lacking

(with the exception of Murrill's studies) preventing intra-island comparisons. Comment should also be paid to Pietrusewsky who, in a number of publications (eg. 1973, 1977, 1984, 1990), has compared the Rapanui to other Pacific populations using both metric and nonmetric cranial data with the Rapanui usually forming a loose cluster with one or another East Polynesian population.

In addition to the studies by Murrill (1965, 1968) on the excavated material from the Norwegian Archaeological Expedition of 1955-56, the primary source of recent osteological studies is from George W. Gill and associates at the University of Wyoming where an extensive database representing over 400 Rapanui individuals has been assembled. Unfortunately, most of the reports are preliminary in nature and many remain unpublished (Chapman and Gill 1993, n.d.; Gill *et al.* 1983; Gill *et al.* 1993; Orefici and Drusini 1993; Tigner and Gill 1986; Zimpel and Gill 1986). Published reports include studies on the high frequency of caries (Owsley *et al.* 1983, 1985) and the relatively low frequency of rocker mandible among prehistoric Rapanui (Gill 1990); an examination of pathology as well as intra-island variation for a variety of nonmetric traits and pathological conditions (Gill and Owsley 1993); and an investigation of the influence of European contact from osteological material (see Gill and Owsley 1993). An unpublished reanalysis of Murrill's craniometric data (Baker and Gill 1993) indicates close similarities between the Rapanui and Marquesans.

In addition to the above studies is an MA thesis (Chapman 1993) examining cranial nonmetric traits of the Rapanui with comparisons to Peruvian Indians. Cranial nonmetric traits were chosen as the data type since they are not affected by artificial cranial deformation, as practiced in prehistoric Peru, whereas metric data are significantly affected (Konigsberg *et al.* 1993). Preliminary results based on the nonmetric traits (Chapman 1993) indicate the possibility of a small contribution to the Rapanui gene pool from a South American source concentrated in the eastern half of the island. Evidence for a possible genetic contribution from South America is based on nonmetric similarities between the Rapanui and a Peruvian sample. Regional samples based on culturally defined tribal boundaries demonstrate that considerable regional variation is also evident on the island. Of particular note are two samples from the north coast of Easter Island. First, the sample representing the Anakena region differs markedly from the other regions in that trait frequencies closely parallel those from other Polynesian islands while another sample represented by individuals from Hekii and Mahatua along the north coast to the east of Anakena demonstrate a number of similarities to a Peruvian sample. The other regions examined represent to varying degrees a "middle ground" between the two north coast extremes. The possible South American contribution is believed to be minor and does not represent an American Indian colonization of the island as Heyerdahl (1961, 1989, 1993) and Langdon (1994a,b, 1995a) would argue. Gill and Owsley (1993) have demonstrated a social division on the island which may have served to restrict gene flow between groups in the east and west of the island. This may help explain why no South American mtDNA was found

by Hagelberg (1995, *et al.* 1994) since the sample she used came solely from the western part of the island. I encourage caution when examining the results of Chapman (1993) since it is preliminary in nature with only a select number of comparative samples used. However, I am inclined to believe that further studies will demonstrate the apparent lack of homogeneity for the prehistoric Rapanui based on cranial nonmetric traits.

#### Current Research

Previous bioanthropological research has assumed that cultural or social divisions equate with biological validity. This methodological approach applies not only to research based on Easter Island but to many Polynesian archipelagoes as well. My current research is focusing upon whether local Easter Island regional variation is verified using biologically defined groups. Specifically, are the variations found for the culturally defined groups (i.e., groups based on traditional tribal boundaries) biologically valid? If so, can the different groups be isolated, allowing for comparison with other Pacific populations and thus identifying possible homelands for each group? (or for the Rapanui as a whole if no biologically valid distinction is evident). Particular attention will be paid to a possible South American contribution to the Rapanui gene pool. This will require additional Polynesian samples to ensure that similarities with South American Indians are not due to a common Asiatic origin for both Polynesians and American Indians.

If the preliminary cranial nonmetric results (Chapman 1993) are validated through further studies, the practice of comparing culturally defined samples to other culturally defined samples, as is commonly practiced (eg., Howells 1973, Pietrusewsky 1990, etc.), will certainly be called into question. Instead, a test for homogeneity will be needed to determine within-island or within-archipelago variation before comparisons with other samples are performed. This may also allow for a biological analysis of intra-archipelago relationships, although Pietrusewsky (1973) suggests this is not practical based on his analysis of Hawaiian crania. An analysis of Marquesan crania may provide an ideal test case since intra-archipelago linguistic divisions have been previously identified (Lavondès and Randall 1978). If a biological distinction within the Marquesan archipelago can be identified, it could be expected to parallel the linguistic divisions. If the results are positive, biological anthropology may be increasingly used in questions relating to within-archipelago variation and will assume increased importance in the understanding of prehistoric Polynesian society. Only through a more rigorous methodology will biological anthropology make a greater contribution to Polynesian, and more specifically, Easter Island research.

#### Conclusion

Biological anthropology has traditionally played a minor role in Easter Island research. While in the past decade a number of preliminary bioanthropological studies have been conducted, only a small portion have been published. This trend appears to be changing with recent publications by Gill

and Owsley (1993), Hagelberg (1995), and Hagelberg *et al.* (1994). Early biological studies of the Rapanui focused upon racial affiliation with a number of recent studies continuing the investigation of Rapanui origins (Chapman 1993; Hagelberg 1995; Hagelberg *et al.* 1994). In addition, certain recent studies also attempt to attain a greater understanding of prehistoric and protohistoric Easter Island society from osteological remains (Gill and Owsley 1993). Current studies cast a positive light on the potential for bioanthropological research on Easter Island. Rapanui homogeneity, gene flow with South America, and Rapanui origins are all currently being investigated via cranial nonmetric data. Indeed, with the large osteological collection now housed on Easter Island, as well as various museums throughout the world, the potential for bioanthropological research is immense.

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### Dig Rapa Nui

In October and November 1996, Earthwatch volunteers under the direction of Dr. Christopher M. Stevenson will conduct an 8th season of archaeological survey and excavation. The project area is located on the north coast of the island. Volunteers will be involved in all aspects of the archaeological investigation.

For a project briefing please contact:

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