## PHYSICAL ANTHROPOLOGY OF THE PACIFIC

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**Keywords:** Physical anthropology, skeletal biology, bioarchaeology, paleopathology, craniology, biological distance, multivariate statistics, dental studies, genetic studies, Polynesian origins, Lapita skeletons

#### **Contents**

- 1. Introduction
- 2. Pacific Islands: Geology, Prehistory and Linguistics
- 3. First Impressions/Early Paradigms (Table 1)
- 4. Pacific Relationships and Polynesian Origins (Table 2)
- 5. Health, Disease, and Lifestyle of Early Pacific Islanders (Table 3)
- 6. Regional Studies in Skeletal Biology
- 7. Conclusions and Future Prospects

Acknowledgements

Glossary

**Bibliography** 

Biographical Sketch

### **Summary**

A brief summary of studies in physical anthropology and skeletal biology of the Pacific and Polynesia is presented. Commencing with early studies in physical anthropology in the mid-nineteenth century, which included studies of living as well as prehistoric inhabitants of the Pacific, this survey focuses mainly on two topics: What studies of skeletons from the region have revealed about 1) the initial peopling of the Pacific and the origins of the Polynesians and 2) the health and lifestyle of past Pacific Islanders and Polynesians.

Despite the limited number of studies in the physical anthropology of the Pacific and issues surrounding repatriation, a significant amount of information about the past inhabitants of this region continues to emerge from work involving human skeletons.

### 1. Introduction

This chapter summarizes previous work in physical anthropology and skeletal biology of the Pacific. Although evidence from other areas in physical anthropology (e.g., genetic and dental studies) is included, the major focus will be what studies of human skeletons and teeth reveal about the origins, health, and lifestyle of the indigenous inhabitants of the Pacific, particularly Polynesians.

After a brief overview of the geography and prehistory of the Pacific, this review summarizes some of the initial observations and descriptive reports in physical

anthropology using human skeletons (primarily crania) from the Pacific collected during the late eighteenth and early nineteenth centuries.

Comparisons of Pacific crania stored in museums soon followed, studies that unfortunately were mired in racial typology. Likewise, the first anthropometric studies of the living inhabitants of the Pacific were initiated in the early decades of the twentieth century. Coinciding with the initial systematic archaeological excavations in the Pacific following World War II, extensive osteological investigations involving prehistoric human skeletons began to appear.

The most recent work in the Pacific focuses on founding populations (e.g., from Vanuatu, New Guinea, and Fiji) and skeletons recovered during archaeological excavation and monitoring activities associated with Cultural Resource Management (CRM) surveys.

Although a great many earlier studies involving skeletons from the Pacific are found in the literature, since the 1990s the possibilities of studying human remains in many parts of the Pacific are now drastically reduced due to culturally sensitive issues surrounding repatriation and the concerns of the indigenous groups. Despite these obstacles, new information about the past inhabitants of the Pacific continues to emerge, albeit not as intensely as in the past.

# 2. Pacific Islands: Geography, Prehistory, and Linguistics

Although based on an incorrect perception of culture-history, this review will make reference to Dumont d'Urville's (1832) well known tripartite division of the Pacific: Melanesia, Micronesia, and Polynesia. This review further recognizes the importance of the distinction between Near Oceania (New Guinea, the Bismarck Archipelago, and the Solomon Islands), and Remote Oceania (Micronesia, Vanuatu, Loyalty Islands, New Caledonia, Fiji, and Polynesia) for understanding the prehistory of the Pacific (Green, 1991).

The human occupation of Near Oceania began approximately 40-50,000 years ago (Kirch, 2000). The first humans reached Remote Oceania some time between 3200 and 2800 years BP, an event coupled with an eastward expansion of Austronesian-speaking people and the Lapita Cultural Complex, a cultural horizon identified by its distinctive dentate-stamped pottery, horticulture, and sophisticated navigational skills (Kirch, 2000; Petchey et al., 2010).

Following its immediate origins in the Bismarck Archipelago, approximately 3350 BP, the Lapita culture spread through the Solomon Island chain and other islands in eastern island Melanesia, eventually reaching Tonga and Samoa in western Polynesia (Petchey et al., 2010).

After a pause of approximately one thousand years, these early Pacific navigators went on to inhabit the rest of the islands of Remote Oceania, arriving in some of the more marginal islands in the triangle (e.g., Easter Island, Hawai`i, and New Zealand) as late as 800 years BP (Hunt and Lipo, 2006). Recently, Hung et al. (2011) suggested that the

first human expansion into Remote Oceania preceded the Lapita expansions by one to two centuries with the colonization of the Mariana Islands in the western Pacific Ocean via the northern Philippines.

Most of the evidence from historical linguistics, archaeology, and physical anthropology indicates that the ultimate origins of these two great colonization events were in Southeast Asia. However, the timing and other details regarding the appearance and dispersal of the Lapita cultural complex believed to be associated with the earliest colonization of Remote Oceania, the focus of this chapter, remain much-debated topics.

Several competing models, based mainly on archaeological, historical, linguistic, and genetic data, have been advanced to explain the exact tempo and mode of the initial colonization of Remote Oceania and Polynesia.

Among these, the so-called "Express Train" model, argues that the ancestors of Polynesians ultimately originated from an expansion of Austronesian-speaking agriculturalists that left Mainland Asia or Taiwan approximately 4000 years ago (Bellwood, 2005).

These Austronesian-speaking people moved rapidly through island Southeast Asia and Near Oceania with little or no genetic admixture with the already indigenous groups they encountered along the way before going on to colonize the rest of Remote Oceania within the last 3000 years.

This expansion is associated with the spread of speakers of the Austronesian language family and the initial development of the Lapita cultural complex in the Bismarck Archipelago.

Other models suggest maritime contacts, some as early as 12,000 years ago (Solheim, 2006), between the peoples of Island Southeast Asia and Melanesians in Near Oceania creating what some have termed spheres of interaction along a "voyaging corridor" as detailed in the "Entangled Bank" model (Irwin, 1992; Terrell et al., 2001; Hurles et al., 2003; Terrell, 2004).

These models suppose a long history of cultural and genetic interactions among the ancestors of Polynesians and the already established inhabitants of Island Southeast Asia and Melanesia.

The "Slow Boat" model, based primarily on Y-chromosome data, is similar to the Express Train model but proposes the ancestors of Polynesians emerged within Island Southeast Asia but then moved slowly eastward into Remote Oceania and Polynesia with significant admixture between them and the peoples of Near Oceania (Richards et al., 1998; Oppenheimer and Richards, 2001a, 2001b).

A more extreme model argues for the indigenous development of the Lapita cultural complex in Near Oceania with no input from outside this region (Allen, 1984). Roger Green's mobile founding migrant category of models (Green, 1994, 2003) maintains

that there was interaction between the immigrant Austronesian speakers and the indigenous peoples of the Bismarck Archipelago.

Detailed discussions of these and other models are provided elsewhere (e.g., Green, 2003; Matisoo-Smith and Robins, 2004; Pietrusewsky, 2006a; Donohue and Denham, 2010; Petchey et al., 2010).

## 3. First Impressions/Early Paradigms

The earliest impressions of the indigenous inhabitants of the Pacific are found in writings of explorers, naturalists, missionaries, and other early European visitors to the Pacific that appeared in the late seventeenth and early eighteenth centuries.

## 3.1. Early Explorers

Johann Reinhold Forster, a naturalist on Captain James Cook's second Pacific voyage (1772-1775) provides one description of Pacific Islanders:

"We chiefly observed two great varieties of people in the South Seas; the one more fair, well limbed, athletic, of a fine size, and kind benevolent temper; the other blacker, their hair just beginning to become woolly and crisp, the body slender and low, and their temper, if possible, more brisk though somewhat mistrustful. The first race inhabits Tahiti, and the Society Islands, the Marquesas, the Friendly Islands, Easter Island, and New Zealand. The second race peoples New Caledonia, Tanna and the New Hebrides, especially Mallicollo" (Forster, 1778: 228).

Similarly, the Cook's journals described the Maori men of New Zealand as being large and of robust proportions, an attribution that was seen throughout Polynesia (Cook, 1955). Comparable descriptions of the physical characteristics of other Pacific peoples are common in these early texts (Roggeveen, 1970).

## 3.2. Early Craniology and Printed Catalogs

Following on the heels of the great scientific exploring and collecting expeditions to the Pacific in the early nineteenth century, descriptive studies of skeletons, mainly crania, began to appear (Table 1). One example of these early descriptive reports is William Turner's (1884) study of crania collected during the voyage of H.M.S. Challenger (1873-76) and other crania that eventually found their way into the osteological collections of the University of Edinburgh. In another report, Emil Zuckerkandl (1875) described crania from various regions of the world including the Pacific, collected during the Austro-Hungarian scientific Novara-Expedition (1857–1859), crania that eventually became part of the Natural History Museum in Vienna.

Reference	Collection	Polynesian Islands	Data
Pierre Marie Alexandre Dumoutier (1846)	Paris	Tonga	Figure showing two male Tongan crania
Carl Wilhelm Friedrich Uhde (1861)	Germany	4 Hawaiian skulls	Morphological observations
Anders Retzius (1864)	Germany	Hawaiian skulls from Kauai	Metric and nonmetric variation and pathology
Joseph Barnard Davis (1867, 1875)	Thesaurus Craniorum; private collection in England	Crania from Fiji (10), Society Islands (3), Cook Islands (1), Gambier (1), Marquesas (39), Hawaii (140), New Zealand (14), Chatham Islands (6)	Some cranial measurements and notes on special features
Hermann Weckler (1866, 1888)	Craniometric data from the published literature	Crania from Tahiti, Marquesas, Hawaii, and Chatham Islands	One of the earliest studies to include Polynesian crania in a worldwide comparison using the cranial index
Jeffries Wyman (1868)	Peabody Museum, Harvard University, Cambridge, MA	Hawaiian skulls from Kauai	Metric and nonmetric variation and pathology
Johann Wilhelm Spengel (1873, 1874)	Godeffroy Museum, Hamburg	Crania from the Society Islands, Marquesas, Tonga, and Fiji	One of the earliest comparative studies of Polynesian crania
Emile Zuckerkandl (1875)	Natural History Museum, Vienna	7 Maori and 2 Moriori crania collected during the SMS Novara Expedition (1857-59),	A morphological study of crania
Johann Wilhelm Spengel (1876)	Godeffroy Museum in Hamburg and comparative data	Crania from Tonga, Society Islands, Marquesas, and comparative data from Cook Islands, Tahiti, Marquesas, Tuamotu, and Futuna	One first comprehensive studies of Polynesian crania
M. Le Batard (1878)	Private collection and Anthropological Society of Paris	24 crania and some severed heads from the Marquesas Islands	Metric and nonmetric descriptions
Alexander Ecker (1878)	Universität Freiburg im Breisgau, Germany	Crania from Fiji, Papua New Guinea, and Hawaii	Metric and nonmetric descriptions

William Henry Flower (1879)	Royal College of Surgeons, London	Crania from Fiji (33), Samoa (1); Hawaii (5), New Zealand (29), Chatham Islands (6), and one complete skeleton of a Tahitian	Metric and some nonmetric traits
Rudolf Virchow (1880)	Museum of Ethnography, Berlin	•	Description of crania and tibiae from the Pacific
William Henry Flower (1881)	Royal College of Surgeons, London	16 crania from mountainous region of Viti Levu (Kai Colos)	Comparisons between crania from interior with those from coastal regions of Fiji Islands
Rudolf Krause (1881)	Godeffroy Museum, Hamburg (collection destroyed in WWII	32 Fijian skeletons, and crania from Society Islands (3), Tuamotu (2,) Maori (3), Moriori (1)	Detailed descriptions of skeletons and crania
Rudolf Virchow (1881)	Berlin	Crania from Chuuk, Kiribati and other parts of Micronesia	Detailed discussion of various cranial indices
Jean Louis Armand de Quatrefages (de Bréau) and Ernst Théodore Hamy (1882)	Musée de l'Homme, Paris	Crania from Fiji (12), Tahiti (23), Tuamotu (40), Easter Island (40), Hawaii (22), Marquesas (2), New Zealand (15), and Chatham Islands (3)	Detailed cranial morphological descriptions
William Turner (1884)	H.M.S. Challenger Expedition (1873- 1876)	Crania from Hawaii (37), New Zealand (10), Chatham Islands (8)	Description of cranial modification and some metric and nonmetric observations
Rodolf Krause (1886)	Berlin	Approximately 105 Micronesian crania (16 from Marshall Islands)	Summary of craniometric data
Ludwig Prochownick	Natural History	31 (24 males and 7 females) Fijian skeletons once	Infracranial measurements with
(1887)	Museum, Hamburg	part of Godeffroy Museum	detailed analysis of pelvic girdles
Augustin Weisbach (1890)	Natural History Museum, Vienna	16 Maori skulls	A comparative craniometric study of Maori and other Pacific crania
John Halliday Scott (1893)	University of Otago, Dunedin, New Zealand	83 Maori and 50 Moriori crania	Detailed observations of cranial and infracranial variation

Reference	Collection	Polynesian Islands	Data
Wilhelm Voltz (1895)	Collections in Berlin and Dresden	49 Easter Island crania	Individual descriptions including measurements and indices
Harrison Allen (1898)	Collections in Philadelphia, Harvard and Princeton universities, U.S.A.	65 male Hawaiian skulls	Metric and non-metric observations in crania
Wynfrid Laurence Henry Duckworth (1900)	Cambridge University, UK	10 crania and 2 skeletons of Moriori from the Chatham Islands	A detailed description and analysis of metric and nonmetric features of Moriori skeletons
Howard Slater (1901)	Australia	12 New Zealand Maori skulls	Brief descriptions, mainly craniometric
Adolf Barnard Meyer and Jozsep Jablonowski (1901)	Museum für Völkerkunde, Dresden	24 Easter Island crania	Detailed metric and nonmetric descriptions of crania and some comparisons
Wynfrid Laurence Henry Duckworth and A. E. Taylor (1902)	Cambridge University, UK	6 skulls and 3 crania from Rotuma	Detailed descriptions of metric and nonmetric traits
Heinrich Poll (1903)	Collections in Bremen, Berlin, and Dresden, Germany	20 skulls and 1 skeleton from the Chatham Islands	Detailed descriptions of metric and nonmetric traits
Otto Schlaginhaufen (1906)	Museum of Ethnography, Berlin	Approximately 45 crania and cranial fragments from a limestone caves near Tanapag, Saipan	Cranial analysis with focus on cranial indices
Felix Ritter von Luschan (1907)	Museum of Ethnography, Berlin	Crania from the Society Islands (28), Cook (9), Marquesas (23), New Zealand (53), and Chatham Islands (5)	Detailed study involving metric data
Theodor Mollison (1908)	Anthropological Institute, Zurich	17 Maori skulls and skeletons	A comparative craniological study

Otto Schlaginhaufen	Museum für Völkerkunde, Dresden	Crania from New Guinea and New	Detailed morphometric and
(1910a,b)	,	Ireland	morphological descriptions of crania.
Eveline Y.	Royal College of Surgeons, London	63 Moriori crania	Morphological descriptions
Thompson (1915)			
Henry. G. Chappel	B. P. Bishop Museum, Honolulu,	Prehistoric Hawaiian skeletons	First comprehensive investigation of
(1927)	U.S.A		ancient Hawaiian dentitions
Rufus Wood Leigh	B. P. Bishop Museum, Honolulu,	Skeletons from Guam	Dental morphology and dental pathology
(1929)	U.S.A		
Fredrick Wood-	B. P. Bishop Museum, Honolulu,	Guam crania	Study of cranial non-metric traits
Jones (1931a)	U.S.A		
Fredrick Wood-	B. P. Bishop Museum, Honolulu,	100 Hawaiian crania	Study of cranial non-metric traits
Jones (1931b)	U.S.A		
Felix Von Bonin	Hunterian Museum of the Royal	~79 Easter Island crania	Craniology and some non-metric traits;
(1931)	College of Surgeons, London;		one of first studies to use C.R.L. statistic
	Riksmuseum voor Volkerkunde,		
	Leiden; British Museum of Natural		
	History, London		
Elizabeth Weber	Museum für Völkerkunde, Leipzig	18 (15 males and 3 females) Fijian	Cranial and infracranial measurements
(1934)	(formerly in Godeffroy Museum) —	skeletons	and descriptions
	material destroyed during WWII		
Helmut Petri (1936)	Natural History Museum, Vienna	16 Easter Island crania	A descriptive, mostly metric, study of
			Easter Island crania
Karl Otto Henckel	Concepción, Chile	8 Easter Island crania and a few	Detailed metric and nonmetric
(1939)		infracranial bones	descriptions
Karl Wagner (1937)	Oslo, Norway and from literature	35 Maori, 24 Australian Aboriginal	A detailed craniometric study of
		crania, and comparative data from	Polynesian and other Pacific crania using
		Polynesia	C.R. L. statistic
Helga Maria Pacher (1947)	Natural History Museum, Vienna	3 crania and 5 mandibles of Maori	Metric and nonmetric descriptions

José Imbelloni	Collections in Chile	61 Easter Island crania	Morphological study of Easter Island
(1951)			crania
Piero Messeri (1956)	Institute of Anthropology, University	5 Moriori crania	Detailed metric and nonmetric
	of Florence, Italy		descriptions; racial mixing
Donald S. Marshall	Museum specimens from around the	1000 + crania from all parts of	Summary of metric and non-metric
and Charles E. Snow	world	Pacific	observations recorded in Polynesian
(1956)			crania
Jane H. Underwood	B. P. Bishop Museum, Honolulu,	Approximately 97 skeletons from	An osteological report
(1969)	U.S.A.	Sand Dune Site (H1), South Point,	
		Hawaii	

Table 1. Early Studies of Pacific Crania and Skeletons (1846-1965)

Other, early descriptions of human skeletal remains from the Pacific were printed catalogs of anatomical collections in museums and private collections, primarily in Europe, (e.g., Davis, 1867, 1875; Flower, 1879). In addition to offering anatomical material for sale, these catalogs provided information on details of cranial morphology, including some measurements, and unusual anatomical and pathological features present in the collections. Data found in these catalogs, especially measurements, provided the basis for the initial efforts to reconstruct human racial history.

One example of a printed catalog was one written by Joseph Barnard Davis, an English doctor, who provided a comprehensive description of over 1500 crania from around the world acquired during his lifetime (Davis, 1867). In this massive work, Davis devoted several sections of his report describing crania from the Pacific [Hawai'i (N=140), Marquesas (N=30), New Zealand Maori (N=14), and the Loyalty Islands (N=12)], a collection that would eventually become part of holdings of the Natural History Museum in London. In addition to recording measurements for each cranium, Davis provided descriptions of dental pathology, auditory exostoses, tooth ablation, and cranial modification in the skulls from Hawai'i. Davis was also one of the first researchers to attribute the extensive dental wear and dental abscessing observed in New Zealand Maori crania to dietary practices. As was customary for this period, Davis' interpretations of cranial morphology were based on racial classification.

Likewise, the catalogs of William Henry Flower (1879, 1881), an English comparative anatomist and surgeon, offered detailed descriptions, mainly craniometric, of crania from the Pacific that were then part of the Royal College of Surgeons. Most notably these collections included Polynesian (29 New Zealand Maori) and Fijian (N=33) crania. In his 1881 catalog Flower described 16 crania from the mountainous region of Viti Levu in Fiji and compared them with others from coastal regions of the Fiji Islands. Again, as was typical of this period, Flower's interpretation of the morphology observed in these skulls rests on the identification of races and racial mixing among the Fijians.

The skeletal collections in Germany and surrounding regions were particularly well described by a series of catalogs published in the early issues of *Archiv für Anthropologie*, which were part of a large scale project, *Die anthropologischen Sammlungen Deutschlands*, initiated by Hermann Schaaffhausen (Schaaffhausen, 1878; Ecker, 1878) as well as other similar endeavors (e.g., Krause, 1881; von Luschan, 1907; Schlaginhaufen, 1910a, 1910b). The information provided in these descriptions included age, sex, geographical origin, completeness, and the recording of a standard number of cranial measurements and the notation of any unusual features observed.

Appearing around the same time as these first descriptive studies, were comparative studies of skulls that typically used cranial measurements and indices to compare Polynesian and Micronesian skulls with other groups from around the world (e.g., Uhde, 1861; Retzius, 1864; Pruner-Bey, 1864-1867; Weckler, 1866; Wyman, 1868; Spengel, 1873, 1874, 1876; Le Batard, 1878; Virchow, 1880, 1881; Quatrefages and Hamy, 1882; Krause, 1886; Prochownick, 1887; Weisbach, 1890; Volz, 1895; Allen, 1898; Duckworth, 1900; Slater, 1901; Meyer and Jablonowski, 1901; Duckworth and Taylor, 1902; Schlaginhaufen, 1906; Poll, 1903; Mollison, 1908; Thomson, 1915; Giuffrida-Ruggeri, 1921; Pearson, 1921; Wood-Jones, 1931a, 1931b; von Bonin, 1931).

While most of this initial work involving Pacific crania emanated from Europe, descriptions of Polynesian crania by American physical anthropologists began to appear as well. One anatomist and pioneer anthropologist in the U.S. who examined skeletons from the Pacific was Jeffries Wyman. Wyman was a professor of anatomy at Harvard University and the first curator of Peabody Museum of Archaeology and Ethnology. Wyman described, in great detail, a series of Hawaiian crania from the island of Kaua`i (Wyman, 1868). His observations included the presence of auditory exostoses, pegshaped teeth, and other aspects of cranial and dental morphology. Overall, Wyman's work was novel and introduced an innovative comparative approach that included systematic observation and recording of cranial pathology in the Pacific.

Harrison Allen, another American pioneer in the study of physical anthropology in the Pacific, provided detailed descriptions of 65 Hawaiian skulls from several collections in Philadelphia, Harvard, and Princeton (Allen, 1898). In addition to a detailed summary of metric and nonmetric variation, Allen also made extensive notes on cranial and dental paleopathology.

Unlike his contemporaries who were preoccupied with race and race formation, Allen's comprehensive study of Hawaiian skulls included an astonishing number of observations of paleopathology, including osteoporosis, periodontal disease, craniosyntosis, external auditory exostoses, linear enamel hypoplasia, etc. By employing a descriptive and comparative methodological approach, Allen was the first investigator to speculate that some of the observed features were the result of nutritional deficiencies, disturbances during growth and development, and/or cultural modification.

The first detailed examination of complete skeletons from the Pacific was made by Halliday Scott, an anatomist and the first Dean of Otago Medical School in Dunedin, New Zealand (Scott, 1893). In addition to detailed descriptions of metric and non-metric variation in 133 Maori and Moriori skulls, Scott included detailed observations of 13 Maori and five Moriori skeletons. In this same report, Scott made observations of dental pathology (e.g., dental caries and dental abscessing) and described features such as rocker jaw and squatting facets in Polynesian skeletons. As was typical of the period, Scott's interpretations of cranial morphology, which rested on cranial indices, were expressed in terms of racial mixing.

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# **Biographical Sketch**

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