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INTRODUCTION

Advances in Forensic Anthropological Research in East and Southeast Asia

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Introduction

Diversity has been a central focus within anthropology since its disciplinary origins. In forensic anthropology this has come to include understanding the wide range of physical variation present in the human species across the spectra of geographies, generations, life stages, sexes, and different lived experiences for the purposes of estimating group membership and identification. Research has particularly flourished in the Americas and Europe largely owing to a history of prominent scholars, well-equipped university graduate programs and facilities, and large skeletal reference collections that characterize these regions. Strides in professionalizing the discipline have also been accomplished through the establishment of certifying bodies, specifically the American Board of Forensic Anthropology in 1977, the Latin American Association of Forensic Anthropology (Asociación Latinoamericana de Antropología Forense) in 2003, and the Forensic Anthropology Society of Europe in 2003. Relative to these areas and the populations studied therein, East and Southeast Asia have received less scholarly attention, particularly in North America. This is surprising given that the diversity found in these regions represents a substantial portion of worldwide variation and that these regions are home to many forensically significant (i.e., vulnerable) populations.

This special issue aims to highlight the diverse and emerging research on modern human skeletal variability in East and Southeast Asia that is ameliorating this problematic research gap. This issue stems from an organized symposium held during the 86th Annual Meeting of the American Association of Physical Anthropologists in New Orleans, Louisiana, on April 22, 2017 (Go & Tallman 2017). Many of the original contributors to the symposium are included in this issue, as well as additional authors. The articles are organized thematically by components of the biological profile—ancestry, sex, age at death, and stature—followed by a case study in trauma analysis. While in no way exhaustive or entirely representative of Asia, skeletal collections from Japan, Thailand, the Philippines, Korea, and Cambodia are represented. Taken together, these papers push forward the boundaries of current forensic anthropological theory, methodology, and practice by creating a more inclusive discipline that better reflects contemporary global demographics and further benefits local and transnational communities.

To introduce this special issue, we describe here some of the practical motivations for focusing on forensic anthropology in East and Southeast Asia. We also briefly discuss how forensic anthropology has grown in local contexts and how it has been applied in specific cases. Lastly, we provide a table of Asian skeletal collections that, while arguably incomplete, we hope scholars and colleagues will find useful in their own research endeavors.

Why Asia?

The Asia-Pacific region is the largest and most populated continent in the world, commonly divided into the geopolitical subregions of the Middle East (West Asia), Russia and Siberia (North Asia), Central Asia, the Indian subcontinent (South Asia), the Far East (East Asia), and Southeast Asia. We bring to focus East and Southeast Asia, whose peoples account for half of Asia's population and have historically represented one of the three major continental groupings considered in the forensic anthropological estimation of ancestry at its broadest sense, the other two being Europe and Africa. Despite this, the forensic anthropology of East and

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Southeast Asians has lagged behind relative to research into the skeletal variability of individuals with biogeographic ancestral ties to Europe or Africa. The impetus for this regional focus is further justified given the convergence of disasters, violence, and diaspora in the area, which greatly contribute to the need for anthropological identification of human remains. For the sake of clarity, we define East Asia as the geographic region encompassing the territories of China, Taiwan, Mongolia, Korea, and Japan; and we define Southeast Asia as the territories of Myanmar, Thailand, Cambodia, Laos, Vietnam, Malaysia, Singapore, Brunei Darussalam, East Timor, Indonesia, and the Philippines.

According to a 2017 report by the UN Economic and Social Commission for Asia and the Pacific (UNESCAP), the region experienced greater than 40% of the world's natural disasters, 88% of the world's disaster-affected populations, and 57% of the global death toll over a period from 1970 to 2016, with fatalities principally from floods, storms, and earthquakes including tsunamis, resulting in East and Southeast Asia being the hardest hit (UNESCAP 2018). These statistics partly correspond to the region's population size, but even taking size into account, a person living in the Asia-Pacific region is five times more likely to be affected by natural disasters than a person living outside the region. Some of the deadliest natural disasters within this century were the 2004 Indian Ocean tsunami, killing as many as 260,000 people; Cyclone Nargis, hitting Myanmar in 2008 and killing 140,000; the 2008 Sichuan, China, earthquake, killing 87,000; and the 2011 Tohoku, Japan, earthquake and tsunami, killing 16,000. Other recent natural disasters include Typhoon Haiyan hitting the Philippines in 2013, the 2011 floods in Thailand, and 2016 droughts in Mongolia and Vietnam.

In addition to natural disasters, the region has experienced episodes of large-scale conflict and violence, many of which transpired in the late 20th and early 21st centuries or are ongoing struggles. Both East and Southeast Asia have served as battlegrounds for major international conflicts, namely, World War II's Pacific Theater, collectively, and the Korean and Vietnam Wars, respectively. Political turning points have also been marred by internal militant and state-sanctioned violence, such as genocides in Cambodia, Laos, Myanmar, and East Timor, and numerous dictatorships, coups, and massacres in Vietnam, Indonesia, Thailand, the Philippines, North and South Korea, and China, among others. In recent years, extremist terrorist and insurgent attacks have risen in Southeast Asia, particularly in Thailand, Indonesia, and the Philippines.

Finally, Asian populations are highly mobile, both interregionally and globally. Whether voluntarily or by force, coercion, or desperation, the flow of peoples across national borders and oceans remains prevalent. The most readily apparent mass migrations are refugees from natural disasters such as floods or famine or from human rights abuses such as ethnic cleansing or religious persecution (United Nations High Commissioner for Refugees 2018). Some of the more clandestine networks of movement primarily involve human trafficking to supply labor demands in the industrial and sex tourism sectors. Many countries in Southeast Asia serve as global hubs for both the sourcing and receiving of trafficked persons (Anil Kumar 2018; Kranrattanasuit 2014). These displaced groups, especially ethnic minorities, women, children, and those living in extreme poverty, are at a heightened risk of entering the forensic context. Furthermore, East and Southeast Asian countries, particularly China, the Philippines, Vietnam, and South Korea, consistently rank high as source countries for both documented and undocumented immigrants to North and South America, Australia, and the European Union, among others (McAuliffe & Ruhs 2017). The increasingly diverse biocultural demographics of modern metropolises necessitates a more representative understanding of skeletal variation and application of anthropological methods.

Past Research and Applications

Despite our present call for more focus into this region, forensic anthropology in Asia is far from sterile. In recent decades the discipline has certainly flourished both as an academic pursuit and applied investigative tool. For country-specific reviews see Traithepchanapai et al. (2016) for Thailand, Indriati (2009) for Indonesia, and Go (2018) for the Philippines. Zhang (2013) also reviews forensic anthropology in China, but this is written in Mandarin. Although not specific to anthropology, Ubelaker's (2015) edited volume on the global practice of forensic science has entries on Hong Kong (Hamilton & Beh 2015), Japan (Maeda et al. 2015), South Korea (Chung et al. 2015), and Singapore (Paul & Chui 2015). However, such advances in the region, equipped with newly established baseline data and the introduction of novel forensic techniques built upon strong theoretical backgrounds and cutting-edge technologies, are often beyond the arm's length of academic and professional communities, especially in North America.

Anthropology has played prominently in several mass fatality incidents in the region, the best-known of which are the disaster victim identification operations in Thailand from the 2004 Indian Ocean tsunami (Black 2009) and the Cambodian Killing Fields from the 1970s Khmer Rouge regime (Fleischman 2016; Klinkner 2008; Ta'ala et al. 2006). These events resulted in large-scale international intervention due to their scope and severity. Other notable events involving anthropological expertise integrated into multidisciplinary approaches include the Bali bombings in 2002 and 2004 (Briggs & Buck 2009), the 1991 Santa Cruz massacre (Blau & Fondebrider 2011; Blau & Skinner 2005) and 1999 conflict in East Timor (Komar & Lathrop 2012), the 2003 Daegu subway fire in South Korea (D. K. Park et al. 2009), the 1998

Manila orphanage fire (Calacal et al. 2005), and clandestine mass graves from human trafficking camps along the Thailand-Malaysia border (Mohd Noor et al. 2017). Even in cases where DNA matching yielded the majority of positive identifications, forensic anthropological analysis played a critical role in providing the first line of prompt (and economical) evidence that facilitated the recovery and reassociation of disaster victims as well as accurate identification (Calacal et al. 2005; S. J. Park 2002; D. K. Park et al. 2009). Taken together, these cases demonstrate the need for anthropological expertise in the region, particularly in the search for and recovery of highly compromised and commingled assemblages, the development of biological profiles for identification and disaster victim triage, and the documentation of skeletal trauma in cases of human rights violations. Moreover, they provide lessons learned and insight into the unique challenges and limitations when working in this region.

Historically, Japan has a long legacy of anthropological studies based on human skeletal remains. The establishment of the Anthropological Society of Nippon dates to 1884. Its official peer-reviewed journal, *Anthropological Science*, which is published in English and features a large volume of bioarchaeology and paleoanthropology of the Japanese archipelago, is contributed to and accessed by both regional and international researchers. Such interests have further led to the validation, development, and introduction of various osteological techniques targeting Japanese biological profile estimation (e.g., sex and age) as well as the estimation of (paleo)demographic parameters (İşcan et al. 1987, 1994, 1995; Igarashi et al. 2005; Nagaoka & Hirata 2007; Nagaoka et al. 2008a, 2008b, 2012; Sakaue 2004, 2006). South Korea, too, has been active in human skeletal biology research. Since the inauguration of the Korean Association of Physical Anthropology in 1958, early scholars explored sexual dimorphism and age-related changes within Korean populations (Choi & Chung 1999; H. J. Kim et al. 1998), followed more recently by anthropologically relevant studies of age, sex, and stature estimation (Han et al. 2009; D. I. Kim et al. 2013; J. Y. Kim et al. 2008; Lee et al. 2014). However, the association's annual meeting and official journal feature more clinically oriented studies due to its roots in anatomy. While these studies and methods have rarely been integrated into routine forensic casework, they are promising evidence and serve as an invaluable body of baseline knowledge for future work in forensic anthropological research.

Perhaps the strongest impetus behind a shift of research to this region has been the relatively recent creation of and international access to stellar Asian skeletal reference collections available for study, most notably those in Thailand and Japan. An increasing number of doctoral dissertations studying modern skeletal populations from this region have in turn been produced not only in North America (e.g., Dudzik 2015; Freas 2011; J. E. Kim 2016; Tallman 2016) but also within the region (e.g., Im 2012; Ruengdit 2018). To further promote this trend, we have attempted to collate here information on new and previously listed skeletal reference collections in Asia (Table 1). Because of the dynamic nature of ◂T1 collections—some collections are continuously growing, or housing institutions change hands, names, and curators—it is difficult to maintain consistency on the reported status of these collections. Where possible, we have used information from the most recent publication when available. At a regional level, by providing a list of skeletal reference collections, we hope to assist in filling the void in the field of forensic anthropology where population-specific data are lacking. With a more global, integrative perspective in mind, it is equally our hope to foster both comparative analysis and holistic-approach studies that can contribute to a better understanding of the complex interplay between human biology, environment, and culture, and ultimately biological variation of modern populations.

Contents of the Special Issue

The 12 articles included in this special issue address important research topics in ancestry, sex, age at death, stature, and trauma that not only provide methodological applications for forensic anthropology practitioners but also contribute more broadly to human skeletal biology research in Asia. Four articles explore ancestry utilizing various methodological approaches, including traditional metrics (Go et al.), geometric morphometrics (GM) (Dudzik; Manabe), and dental nonmetric analyses (George & Pilloud 2019), to better understand cranial morphometric variability in Asian and Asian-derived populations. In particular, Go et al. employ nine craniometric variables to explore how modern Filipino individuals classify in Fordisc 3.1 (FD3). Due to the complex population history of the Philippines, modern Filipinos variably classify into Asian, Hispanic, Indigenous American, African, and European groups. Dudzik utilizes GM and coordinate data to explore why Hispanic individuals often classify into Asian groups in FD3. Similarly, George and Pilloud explore the classification trends of modern Asian (from Japan) and Asian-derived (from Mexico) individuals using worldwide data on dental nonmetric traits and biodistance analyses. Manabe utilizes eight promising coordinate-derived midfacial angles to explore differences and cross-validated classification accuracies between American Black, American White, and Japanese individuals.

Five articles address population-specific sex estimation methods in Asian groups through cranial nonmetric (Tallman), cranial and postcranial metric (Cho; Lee; Patterson & Tallman), and dental metric approaches (Adams & Pilloud). Specifically, Tallman examines cranial nonmetric sexual dimorphism in a large sample of modern Japanese and Thai

TABLE 1—*Non-exhaustive List of Skeletal Reference Collections in Asia.*

Housing Institution	Location	Details[a]	References
Human Skeletal Research Centre, Khon Kaen University	Khon Kaen, Thailand	—745 individuals (507 M/235 F), 682 of which have known age and sex, and some with known COD and occupation —20th to 21st century —Self-donated collection	Techataweewan et al. 2017
Forensic Osteology Research Centre, Chiang Mai University	Chiang Mai, Thailand	—472 individuals (289 M/183 F) of known age, sex, COD, and occupation —20th to 21st century[b] —Self-donated collection	Traithepchanapai et al. 2016
Archaeological Studies Program, University of the Philippines Dililman	Quezon City, Philippines	—127 individuals (82 M/42 F), 81 of which have known age and sex —20th to 21st century[b] —Urban cemetery collection	Go 2018
Department of Anatomy, Jikei University School of Medicine	Tokyo, Japan	—1,100 individuals of known age and sex, 800 of which are only skulls —Self-donated collection (1960s–1990s) and dissection cadavers —19th to 20th century[b]	İşcan et al. 1994; Tanaka 1999
Department of Bioenvironmental Medicine, China	Chiba, Japan	—200 individuals of known age and sex —19th to 20th century[b] —Dissection cadavers	J. E. Kim 2016; Tallman 2016
The University Museum, University of Tokyo	Tokyo, Japan	—~100 individuals of known age and sex —19th to 20th century[b]	Case & Heilman 2005
The Kyoto University Museum	Kyoto, Japan	—200 individuals of known age and sex —19th to 20th century[b]	Hirai & Tabata 1928; Miyamoto 1925
Okamoto Research Laboratory of Dentistry	Yonago, Japan	—2,000 human teeth of individuals with known sex, age, and side	Aoki 1990; Morita 1990
Institute of Forensic Sciences, Ministry of Public Security	Beijing, China	—276 males, majority of known sex, age, stature, and birthplace —20th century (1980s)	Cui & Zhang 2013; Liu et al. 1988
Department of Systematic Anatomy, Xinjiang Medical University	Urumqi, China	—169 individuals of Han ethnicity —Modern cemetery collection from Urumqi, Xinjiang	Wu et al. 1982
School of Biomedical Sciences, University of Hong Kong	Hong Kong, China	—800 skulls, of which ~100 have postcranial elements of known age, sex, and COD —Urban cemetery collection	King 1997
Yishui School of Medicine	Yishui, China	—Urban cemetery collection from Qingdao, Shandong Province, and Changchun, Jilin Province	İşcan & Ding 1995
Department of Anatomy, Yonsei University College of Medicine	Seoul, Korea	—128 individuals (40 M/19 F, 69 undocumented)	Choi & Chung 1999

[a]Current demographic status of the collection may have diverged from initial to most recent publications.
[b]Range is from birth years to death years.

individuals and provides univariate sectioning points and cross-validated logistic regression equations. Patterson and Tallman investigate metric sexual dimorphism in modern Thai and archaeologically derived Native American individuals from the American Southwest. Due to population differences in sexual dimorphism, Patterson and Tallman present separate cranial and postcranial univariate sectioning points and cross-validated discriminant function equations for the Thai and Native American samples. Similarly, Lee provides cross-validated postcranial discriminant function equations for a modern Filipino sample. Based on the fact that the best indicators of sex (i.e., pelvis, long bones, and cranium) may be missing from assemblages, Cho developed cross-validated discriminant function equations from carpal, metacarpal, metatarsal, and tarsal measurements for Japanese and Korean individuals. Though less effective than traditional sexually dimorphic regions, the hands and feet may be useful in sex estimation for East Asian individuals.

Lastly, Adams and Pilloud offer logistic regression and linear discriminant function equations developed from standard crown and cervical dimensions for modern Japanese individuals. Dental measurements have traditionally been neglected in sex estimation; however, teeth are the most durable human structures, and their inclusion the biological profile is therefore important and necessary.

The remaining three articles cover important advances in age-at-death (Kim et al.), stature (Scott et al.), and trauma (Fleischman) analyses. Kim et al. employ a Bayesian framework with three different priors on age estimation methods of the pubic symphysis, auricular surface, and sternal rib ends for modern Japanese and Thai individuals. The importance of using an informative prior that considers the appropriate geographical and temporal origins is emphasized. Concerning stature, Scott et al. utilize 10 calcanei and tali measurements to develop regression formulae for modern Thai individuals. Similar to Cho, Scott et al. highlight the importance of developing biological profile methods on skeletal elements that may be present in fragmentary, incomplete, and otherwise less-than-ideal forensic cases. Lastly, Fleischman analyzes patterns in cranial trauma for those killed at the Choeung Ek Genocidal Center during the period of Khmer Rouge control in Cambodia. While countless individuals were killed by the Khmer Rouge, the disinterred remains have only recently begun to be scientifically analyzed.

Conclusion

While in no way exhaustive, the articles presented herein highlight just some of the exciting and novel skeletal biology research that importantly incorporate long-neglected Asian groups in the international scene of forensic anthropology. Several of the studies provide validations, cross-validations, and/or relevant statistical models that allow for their incorporation into forensic casework. Most notably, the studies' population specificities, particularly for Filipino, Japanese, and Thai individuals, make them more appropriate for these and other closely related groups than methods developed from non-Asian individuals (i.e., African- and European-descended groups), which have historically dominated forensic anthropological research. Additionally, the ancestry, sex, age-at-death, and stature methods are particularly germane to a myriad of incomplete, fragmentary, and mass disaster scenarios that practitioners may encounter in the dynamic forensic casework within the countries that comprise Asia. Further, where appropriate, the methods provided herein can be cautiously applied to other Asian groups that lack reference samples and/or population-specific biological profile methods. However, it is hoped that this unique issue spurs additional research efforts into the skeletal biology in the subregions of Asia that are not yet represented in the forensic anthropological literature, which would further broaden the global scope, impact, and relevance of forensic anthropology.

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