

CHAPTER 1

History of Biological Anthropology

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THE EIGHTEENTH AND NINETEENTH-CENTURY ORIGINS OF PHYSICAL ANTHROPOLOGY

The fundamental subject matter of physical (or biological) anthropology is an interest in, and an exploration of, human origins and human variation. This interest dates back to antiquity, but professional writing on such topics might be said to have begun with the Enlightenment of the eighteenth century. The Enlightenment was also a time when the concept of ‘race’ was formalized and various racial classification systems were proposed (Brace 2005: 22ff.). ‘Race’ as a typological characterization of human variation was to become a dominant theme in physical anthropology until the mid-twentieth century. Classification, an elemental building block of all sciences, was first conducted for humans by the great Swedish taxonomist Carl von Linné (also known as Linnaeus) (1707–78). He identified the close relationships between humans and non-human primates; classified *Homo sapiens* as a member of this primate category (*Anthropomorpha* then, later, *Primates*); and identified several ‘racial’ varieties, both known and mythical (Broberg 1983, Mielke et al. 2006: 5). Johann Friedrich Blumenbach (1752–1840), the German physician and anatomist, followed Linné’s geographic four-fold classification system of human varieties from America, Asia, Africa, and Europe, but later added a fifth variety, Malay, to represent Pacific populations (Gould 1996: 401ff.). Some identify Blumenbach as one of the founders of physical anthropology because of his interest in ‘human varieties’ and in human craniology (Burns 2003: 29–30; Mielke et al. 2006: 7; Shapiro 1959).

In the United States the Enlightenment was represented by a number of important scholar–scientists (e.g. Benjamin Franklin), and the one most closely linked to physical anthropology was Samuel Stanhope Smith (1751–1819). Smith was on the faculty of Princeton University and later became president of this institution. His view of human diversity was one according to which all groups are members of the same species, having continuous variation and being subjected to environmental modification.

This view was similar to that of Blumenbach's, but differed from the 'fixed-race' (and even 'separate species') typologies of many of his contemporaries.

A very significant figure from Philadelphia who has been deconstructed in recent years is Samuel G. Morton (1799–1851; Gould 1996: 82ff.). Morton was, in his days, a highly respected physician and scientist who made many contributions to paleontology, geology, and anatomy (Brace 2005: 80). His principal contribution to anthropology was his work on cranial studies: he collected more than 700 crania, which he identified as Blumenbach's five racial varieties. A major work on Native Americans, *Crania Americana* (Morton 1839), was pronounced by Brace (2005: 82) "a monumental piece of scholarship." Aleš Hrdlička (1869–1943), who held Morton in the highest esteem, chose Samuel Morton's photograph as the frontispiece of his book on the history and status of physical anthropology and called him the "father of American physical anthropology" (Hrdlička 1919). Hrdlička was himself a major figure in the development of physical anthropology in the United States and will be discussed below.

Stephen Jay Gould's (1996) critique of Samuel Morton in his book *The Mismeasure of Man* was based on his conviction that Morton's calculations of cranial capacity were unconsciously biased – not only because of Morton's belief that some races were innately inferior to others, but also because of Morton's belief in *polygenism*. Polygenism was the idea that God had created the races separately and that the observed differences were a reflection of a hierarchy of quality in intelligence and ability. Polygenism explained human varieties as resulting from multiple origins. *Monogenism*, on the other hand, asserted a single human origin or creation by God. Polygenism was also linked to the belief that races were fixed entities, whereas monogenism allowed that races were capable of change, as some of the earlier Enlightenment thinkers believed. Both polygenism and monogenism could carry racist implications, since many monogenists believed that some races or varieties other than the European (or Caucasian) had degenerated over time to their present inferior state (Stocking 1988).

In the latter half of the nineteenth century, physical anthropology was dominated by studies of anatomy, craniology, skeletal biology, human origins, and race. Most of the physical anthropologists were trained as physicians or anatomists, and their primary data were gathered by anthropometric and osteometric measurements and morphological observations. There was little interest in evolution; races or human varieties were seen as fixed and unchanging; typological approaches were applied to concepts of race; studies seldom applied scientific methods of hypothesis testing; and knowledge of the impact of the environment on humans was limited. Much of the scientific activity during this period was taking place in Europe, particularly in England, France, and Germany. Charles R. Darwin's (1809–82) publication of the *Origin of Species* in 1859 and his ideas about evolution brought about changes within the community of ethnologists and physical anthropologists. In England a rift developed between the Ethnological Society of London (ESL), founded in 1843, and the Anthropological Society of London (ASL), founded in 1862 largely by physicians, anatomists, and physical anthropologists (Stocking 1987: 248ff.). The former was represented by ethnologists and Darwinian evolutionists (including Alfred Wallace (1823–1913), Thomas Huxley (1825–95), John Lubbock (1834–1913), and E. B. Tylor (1832–1917)), while the latter was characterized by interests in craniology and race, by a resistance to evolution, and by widespread support for polygenist views (Stocking 1987). This conflict was carried over to the British Association for the Advancement of Science and is probably at the origin of the separation of physical anthropology from both ethnology and evolution in the UK and

in the US throughout the latter half of the nineteenth century and into the first part of the twentieth. The ESL and the ASL combined to form the Anthropological Institute of Great Britain and Ireland in 1871, with Thomas Huxley as its first president.

As Brace (2005: 144) noted, “the appearance of Darwin’s *Origin of Species* and the outbreak of the American Civil War – combined to demolish the American School of Anthropology [essentialist, polygenist, craniological] as a recognizable entity.” And “[f]or the remainder of the nineteenth century there were no acknowledged representatives of the American School on the western side of the Atlantic.”

In the mid to late 1800s, physical anthropology (or ‘anthropology,’ as it was known in Europe) was most highly developed in France and Germany (Stocking 1988), where the majority of the physical anthropologists were trained in medicine and the physical anthropology training was done through medical studies (Proctor 1988). In France ‘anthropology’ was established by Paul Broca (1824–80), a celebrated physician and anatomist who, together with Claude Bernard, founded the Association Française pour l’Avancement des Sciences in 1872. Earlier on he had founded the Société d’Anthropologie de Paris (SAP) in 1859, the Laboratoire d’Anthropologie of the Ecole Pratique des Hautes Etudes (LA-EPHE) in 1867, and the Ecole d’Anthropologie in 1876 (Spencer 1997a). As Brace (2010) suggested, Paul Broca had a great admiration for Samuel Morton’s ideas, which he incorporated into his own, in turn influencing Aleš Hrdlička when he went to Paris in 1896, to study at the Laboratoire d’Anthropologie with Broca’s student, Léonce-Pierre Manouvrier (1850–1927). Throughout much of Hrdlička’s life, he hoped to develop a research/teaching institute of physical anthropology according to the French model (Stewart 1981).

In Germany, physical anthropology was badly tarnished by the extreme racism, ‘racial cleansing,’ and anti-Semitism which began in late nineteenth-century Germany (although these phenomena had earlier roots) and by the ‘scientific racism’ of the twentieth century (Barkan 1992; Proctor 1988, Spencer 1997b). As in France, physical anthropology was taught in medical schools. The founder of American anthropology, Franz Boas (1858–1942), was trained in physics and geography in Germany during a period of relative liberalism and experienced little anti-Semitism during his school days – that is, before anti-Semitism began to rise and liberalism declined after 1879 (Cole 1999: 58, 87). His basic training in physical anthropology took place in 1881–3, under the direction of Rudolf Virchow (1821–1902); then later, after his fieldwork on Baffin Island, he studied ethnography with Adolf Bastian (1826–1905) in Berlin. Both Virchow’s and Bastian’s anti-Darwinian views probably influenced Boas’s early ideas on evolution. Virchow’s liberal views on race and the unity of mankind certainly influenced Boas (Massin 1996). As Spencer (1997b: 428) stated: “It was during this time [the 1880s] that anthropology finally secured a permanent foothold in German academia.” Academic chairs in physical anthropology were established in Munich in 1886 and in Berlin in 1888. Prior to and after World War I, Germany had the strongest scientific establishment in the world and the largest number of physical anthropologists.

In England, interests in physical anthropology were held by many outside the realm of medicine and often in conjunction with paleontology, evolution, and archaeology. Aside from its author’s fame as Darwin’s friend and supporter, Thomas Huxley’s book *Evidence as to Man’s Place in Nature* (1863) might be considered the first text in physical anthropology. It included a synthesis of the information available on the comparative anatomy of human and non-human primates; a summary of fossil evidence up to that time; and a review of the natural history of non-human primates.

However, little information was available on the last two subjects mentioned. Huxley also conducted studies of living human populations after 1863. In 1873 the great biometrician Francis Galton (1822–1911), Darwin’s cousin, began conducting body measurements on children (among other contributions). Arthur Keith (1866–1955) survived the transition from nineteenth-century to post-World War II twentieth-century physical anthropology, although he upheld values that were largely derived from the nineteenth century. Keith, who spent most of his career at the Royal College of Surgeons in London and was widely respected in the UK and US, had interests in the comparative anatomy of primates, in non-human primate and human paleontology, in primate locomotion, and in human evolution. However, despite his professed commitment to Darwinian evolution, he was neither a believer in natural selection nor a believer in the Darwinian mechanistic model (Spencer 1997c).

TWENTIETH CENTURY BEGINNINGS AND THE RISE OF PROFESSIONALISM

Physical anthropology in Europe

There was in Europe a number of major figures who were active at the turn of the twentieth century. Léonce-Pierre Manouvrier, as noted, played an important role in Aleš Hrdlička’s training, but he was also the first to demonstrate that male and female cranial capacities were simply a function of differences in body size, and he established a number of skeletal indices which are still in use today (Spencer 1997d). Rudolph Martin (1864–1925), who was Swiss, joined the faculty as a physical anthropologist at the University of Zurich in 1899. He later published the *Lehrbuch der Anthropologie* [*Handbook of Physical Anthropology*] (Martin 1914), which became the classic reference and textbook during the early decades of the twentieth century. In Germany, Martin took the Chair in Anthropology at the University of Munich in 1918, and in the 1920s he conducted anthropometric surveys of Munich schoolchildren. Prior to World War I there was a number of German anthropologists who actively conducted research. Spencer (1997b) identified multiple centers of physical anthropology in Germany at the end of the Weimar Period (1918–33). The National Socialist Period (1933–45), which saw the rise of Adolf Hitler and Nazism, was, of course, marked by an obsession with ‘race’ and racial purity as well as by its own atrocities. One of the most influential anthropologists during this period was Eugen Fischer (1874–1964), who was the Rector of the University of Berlin and a strong proponent of the policy of ‘racial hygiene.’

English scientists made substantial contributions to comparative primate anatomy in the early part of the twentieth century, including Arthur Keith (above) in London and Grafton Elliot Smith (1871–1937) in Manchester. In fact both played an important role by training scientists who later left their mark on physical anthropology in the United States. Smith had worked with T. Wingate Todd (1885–1938) at Manchester, and Keith recommended Todd for a position at Western Reserve University (now Case Western Reserve University) in Cleveland, which the latter took in 1912. Todd established a skeletal collection of several thousand individuals (now the Hamann–Todd Collection) and did substantial research on skeletal development in humans. Earnest A. Hooton (1887–1954) was also influenced by Arthur Keith, with whom he had close contacts when he was a Rhodes Scholar at Oxford University, from 1911 to 1913. Little was done in the United Kingdom in the early 1900s on



Figure 1.1 Franz Boas posing in Inuit garb in Minden, Germany, after his return from Baffin Island in 1885/86. Courtesy of the American Philosophical Society

primate behavior, except for Keith's observations on gibbons in Thailand in the late 1890s and the publication of Solly Zuckerman's (1904–93) book on *The Social Life of Monkeys and Apes* later, in 1932. Considerable work was done by UK scientists in what is now known as paleoanthropology; this work included the Piltdown fraud, from its discovery in 1912 to its refutation in 1953 (Weiner 1955).

Physical anthropology in the United States

Three individuals were instrumental in founding physical anthropology during the first half of the twentieth century in the United States: Franz Boas, Aleš Hrdlička, and Earnest A. Hooton.

Franz Boas was a founder of American anthropology, but he is less well known for his contributions to physical anthropology – perhaps because the ones he made to other areas of anthropology were so great. Boas had a broad vision of anthropology as a four-field science, and contributed to each of these fields. His research in physical anthropology and biometrics alone led to the publication of more than 180 works, which ranged from anthropometrics and osteometrics to race and racial origins, to environmental influences, and to human growth and the development of children (Little 2010). He is best known in anthropology for his study of migrants from Europe to the United States (Boas 1912), but his most significant and lasting research was in child growth (see Figure 1.1). Boas's contributions in physical anthropology



Figure 1.2 The Department of Anthropology at the US National Museum in 1904. Aleš Hrdlička is third from the left. Courtesy of the US National Museum, Smithsonian Institution

were, in many ways, ahead of their times, and because of this they were seldom embraced by mainstream physical anthropologists. However, the term ‘culture,’ as defined by Boas, was an immediate and seminal contribution to cultural anthropology (Degler 1991). Boas served as one of the assistant editors of *Science* in the late 1880s, as president of the American Anthropological Association in 1907–8, and as president of the American Association for the Advancement of Science in 1931.

Aleš Hrdlička was committed to physical anthropology and determined to move it forward as a recognized science in the United States. He single-handedly founded the *American Journal of Physical Anthropology (AJPA)* in 1918 and kept it going in the early years with his own money. He was also the principal organizer and first president of the American Association of Physical Anthropologists in 1930. His energy and enthusiasm were instrumental in “securing the discipline’s identity” and a continuing place for it within the broader field of anthropology (Spencer 1982a: 6). Franz Boas, from his positions at the American Museum of Natural History and then at Columbia University, and Hrdlička, from his position at the Smithsonian Institution in Washington, DC, trained very few professional physical anthropologists during their long careers, but both of them were instrumental in building physical anthropology in many other ways, and especially its disciplinary identity (see Figure 1.2).

Earnest Hooton, who was considerably junior to Boas and Hrdlička, spent his entire professional career at Harvard University, beginning in 1913. He had been trained in classics at Wisconsin (PhD in 1911), then received a diploma in anthropology at Oxford in 1912. During his long career he supervised more than twenty-five PhD students (see Figure 1.3). Hooton’s students dominated the profession and played important leadership roles in the American Association of Physical Anthropologists through the 1970s and early 1980s. In sum, Boas’s primary contributions were in creative and forward-looking research design; Hrdlička’s contributions were in the resolute and persistent promotion of the profession; and Hooton’s contributions were in training the first generation of physical anthropologists, to fill an expanding faculty at universities around the US. In fact the majority of active American physical anthropologists were trained within the academic lineage leading directly back to Hooton (Kelley and Sussman 2007).

Three other important figures from this period were Raymond Pearl (1879–1940), T. Wingate Todd (above), and Adolph Schultz (1891–1976). Pearl was a Michigan-trained biologist with broad interests in human population biology and strong mathematical formation, who worked at Johns Hopkins University (Kingsland 1984). Pearl not only contributed to the development of ideas in human population biology, but he founded two journals that would define the field, namely the *Quarterly Review of Biology* (1926) and *Human Biology* (1929). Todd was a Manchester-trained anatomist influenced by two prominent anthropologists in England; subsequently he went to Western Reserve University in the US, to fill a chair in anatomy (Kern 2006). He made substantial contributions to skeletal age assessment. Both Pearl and Todd were presidents of the American Association of Physical Anthropologists in the 1930s. Schultz was a comparative anatomist trained at the University of Zürich, but he went to the US after completing his PhD (Erikson 1981). Later on he secured an appointment at Johns Hopkins University in anatomy, but as a physical anthropologist. His principal contributions were in comparative primatology. He was also a founding editor of *Folia Primatologica*.



Figure 1.3 Ernest A. Hooton in 1926, about the time when he trained his first PhD student. Courtesy of the Peabody Museum, Harvard University

Formative areas of physical anthropology were beginning to emerge from studies already underway and from perspectives just beginning to form: child growth and development from Boas's research in the 1880s and 1890s and from his later migrant design; centers of bone growth and formation and child development from Todd's work in the 1920s and 1930s; nineteenth-century anthropometrics and osteometrics from Manouvrier, Hrdlička, and Martin; primatology and paleoanthropology from Keith and Hooton in the early 1920s and 1930s; and demography, genetics, epidemiology, and statistics from Pearl's work throughout the early 1900s. Human population biology had not yet arisen as a defined area of study at the beginning of the century, yet Franz Boas's early studies and Pearl's involvement in physical anthropology and his editorship of *Human Biology* helped to define the field. Boas and Pearl were major figures in the development of scientific approaches to inquiry. Field primatology was yet to emerge as an interest on the part of physical anthropologists (Sussman 2007).

Physical anthropology as a profession

At the turn of the twentieth century there were virtually no physical anthropologists in academia in the United States, despite its institutional development in Europe. The oldest anthropology program in the United States had been established at Harvard University in 1888 by Frederic Ward Putnam (1839–1915; see Spencer 1982a). Putnam was an archaeologist who believed in a broad anthropology program, which included physical anthropology; yet only three PhDs in physical anthropology were produced at Harvard through to 1925. Up until the same date, only two other PhDs in the subject existed: one at the University of Pennsylvania, another under Boas at

Columbia University (Louis R. Sullivan, who died of tuberculosis at the age of 33). During the same period (1900–25), there were thirty-four PhDs awarded in archaeology and ethnology at the four PhD degree-granting institutions – Harvard, Penn, Columbia, Berkeley (Spencer 1981). Hence physical anthropology had rapidly fallen behind other branches of the field because of limited PhD training. Up until that time, most of the research in physical anthropology was carried out in museums, institutes, and medical schools. Boas was at the American Museum of Natural History in New York City before moving to Columbia University in 1905, and Hrdlička was at the US National Museum of Natural History (USNM – Smithsonian Institution) from 1903. Boas trained a handful of other students after Sullivan, but Hrdlička had no graduate program at the USNM.

It was not until Earnest Hooton began training students at Harvard that more professional physical anthropologists began to take academic positions. Between 1926 and the beginning of World War II Hooton trained about twenty PhDs in physical anthropology, many of whom began to fill academic positions throughout the United States. He trained eight more PhDs before his death in 1954. Other pre-war physical anthropologists who went on to distinguished careers were trained at Berkeley – Theodore D. McCown (1908–69), who worked with Alfred Kroeber and Arthur Keith; at the University of Chicago – Wilton M. Krogman (1903–87), who worked with Fay Cooper Cole; and at Western Reserve University – W. Montague Cobb (1903–90), who worked with T. Wingate Todd.

Founding of the *American Journal of Physical Anthropology* (AJPA) and of the American Association of Physical Anthropologists (AAPA)

The *American Journal of Physical Anthropology* was Hrdlička's brainchild, and he rightly believed that the publication would serve as a forum both to disseminate ideas in physical anthropology and to provide a base for identifying the field as an appropriate science among the others. Hrdlička edited the journal from 1918 until his retirement in 1941, and he published in it many of his own articles. The original editorial board included a number of anatomists, but also Franz Boas and two of his students – Alfred Kroeber and Clark Wissler – who were not, strictly speaking, physical anthropologists; an executive from the Prudential Life Insurance Company; the superintendent of the Battle Creek Sanitarium; the President of Clark University; and Earnest Hooton. It was a highly respected editorial board and it gave the journal the stature that Hrdlička felt it merited. The *AJPA* was originally published independently, but then it was acquired by Wistar Press in Philadelphia, where it remained for many years.

In December 1928, at the Section H (Anthropology) meeting of the American Association for the Advancement of Science (AAAS), Hrdlička presented the proposal to form a new professional society in physical anthropology. The proposal was approved, an organizing committee was formed, and a group of more than eighty charter members was solicited by Hrdlička. More than half of these first members were anatomists and physicians, and only eight were physical anthropologists. The first formal meeting of the AAPA was held in Charlottesville, Virginia, in April 1930, in conjunction with that of the American Association of Anatomists. The charter membership and linkage with the American Association of Anatomists reflected the close ties that Hrdlička

and many physical anthropologists had, at the time, with anatomical sciences. The distinguished Mexican physical anthropologist Juan Comas (1900–79) published a history of the AAPA from 1928 to 1968 that includes detailed descriptions of the annual meetings during that period (Comas 1969). A translation of this Spanish-language work is now available (Alfonso and Little 2005).

Basic themes of inquiry

There are several basic areas or themes of inquiry that characterize the early decades of the twentieth century. These include studies of race, eugenics, human origins, primates, and human osteology/skeletal biology. *Race* was a preoccupation which offered an essentialist or typological framework for viewing human population variation; it was largely discarded, but only after World War II (Washburn 1984). The *eugenics* movement began in the nineteenth century, was developed by Francis Galton in England, and declined in its impact on human population studies in the United States during the late 1930s. Studies of *human origins* were more highly developed among European scientists, while some work was done in the US by Hrdlička and others, particularly on the origins of New World populations. Research on *primates* began as the comparative anatomy of primates and humans in the nineteenth century and continued into the twentieth century. The first behavioral studies of non-human primates were done in zoos, whereas early research on naturalistic behavior began in the 1930s; but this early work was done by psychologists. *Genetics* was developed largely outside of physical anthropology. Interest in *human osteology* in the US dates back to Samuel Morton in the nineteenth century. Hooton had an interest in osteology and *skeletal biology*, and trained a number of physical anthropologists who began their careers under work relief programs during the Great Depression in the 1930s (Larsen in press).

Race Areas of interest during the early 1900s and between the two world wars were the identification of races through careful anthropometric measurements and morphological observation; determining the effects of mixture on behavior and biology; and ascertaining the origins and history of different racial groups. There was a sense that races were fixed entities which could be identified as pure groups, and that some races were clearly superior to others in biology and intelligence. These ideas were carry-overs from nineteenth-century beliefs linked to slavery in the United States and to contacts with Native Americans. There were exceptions to these beliefs; people's views ran the whole gamut, from extreme positions on racial inferiority to egalitarian and liberal ideas. A proponent of views of the latter kind was Franz Boas, who had long been interested in the environmental plasticity or flexibility built into the growth of children (Boas 1897, 1930, 1940). His famous migration study was designed to test the assertion, made by many, that the cephalic index was fixed by race and unchanged by the environment. This assertion had also influenced public views about US immigration policy. Boas found, from the measurement of thousands of immigrants from Europe, that there were generational differences in cephalic index which were statistically significant (Boas 1912). He also found that the children of immigrants were taller, and that children from large families with limited resources were shorter than their counterparts from small families. Although Boas's carefully designed studies of

growth and of migrants demonstrated the plasticity of race, the impact of these ideas was generally felt only after World War II (Little 2010).

Eugenics The term ‘eugenics’ was coined by Francis Galton, and it represented his late nineteenth-century Victorian view that ‘good breeding’ would give the ‘better’ races an advantage over the ‘poorer’ ones (Brace 2005: 178). More broadly, eugenics centers on the problem of improvements to the human species (Marks 1997). Eugenics beliefs are reviled today, largely because of the Holocaust atrocities committed by the Nazis during World War II. Other examples of extreme eugenics, including forced sterilization and ‘racial cleansing,’ are documented in Gould (1996). The eugenics movement in the United States developed during the 1920s, when many geneticists and physical anthropologists participated in the movement. Hrdlička (1919) believed that the growing science of eugenics would essentially be transformed into a form of *applied* anthropology. Charles B. Davenport (1866–1944), later president of the AAPA (1943–4), was an early proponent of eugenics. He established the Carnegie Institution-funded Eugenics Record Office at Cold Spring Harbor. Davenport, along with Henry Fairfield Osborn (1857–1935) and Madison Grant (1865–1937), founded the Galton Society in 1918 (Gregory 1919). Osborn’s nephew, Frederick Osborn, was one of the early directors of the American Eugenics Society and was instrumental in the society’s transformation to a post-war ‘new’ eugenics, which was largely concerned with family planning, human population demography, and medical genetics (Osborne and Osborne 1999). This post-war ‘eugenics’ rejected the earlier racist and racial improvement emphases that characterized the late nineteenth century and early twentieth century eugenics in England and the United States.

Human origins United States anthropologists tended to focus on New World populations, particularly Native Americans from North America. European anthropologists were active in England, France, other parts of Europe, and Asia. Important work was also done in Africa, especially in South Africa, by Raymond A. Dart (1893–1988), the discoverer of *Australopithecus* (Dart 1925). Hrdlička devoted considerable effort to exploring the Neandertal origins problem and argued that Neandertals were unilineal ancestors to the modern *Homo sapiens* (Hrdlička 1927; Spencer and Smith 1981). His major interest, however, was in the origin and prehistory of Native Americans (Hrdlička 1912).

Primateology Considerable work was done before World War II in comparative anatomy, paleontology, and the naturalistic behavior of primates. William King Gregory (1876–1970), a dedicated evolutionist, wrote on fish, birds, and mammals, but also on fossil primates and on human dentition. Adolph Schultz’s contributions to comparative primate anatomy have already been mentioned. An important publication from the late 1920s was the *The Great Apes* (Yerkes and Yerkes 1929), a compilation of knowledge up to that time, although almost nothing was known of primate natural history. Robert M. Yerkes (1876–1956) was a psychologist and avid eugenicist who stimulated the study of the naturalistic behavior of primates in the wild (Sussman 1997, 2007). He sponsored Henry Nissen’s (1901–58) two-month study of chimpanzees in the Congo. C. Raymond Carpenter (1905–75), also trained as a psychologist, after working with Robert Yerkes as a post-doctoral fellow at Yale,

studied Howler monkeys on Barrow Colorado Island in Panama. Several years later, in 1937, Carpenter participated in the famous multidisciplinary study of gibbons in Thailand. Adolph Schultz and a young Sherwood L. Washburn (1911–2000) were the physical anthropologists on the expedition. Carpenter was the only scientist before the late 1950s to do extensive research on primate natural history in the wild. His early writings were reprinted in a 1964 collection (Carpenter 1964).

Human osteology/skeletal biology Hooton's interests in human variation extended to archaeological populations, resulting in a number of key monographs (for instance Hooton 1930). While the work was largely typological and descriptive, a number of Hooton's students were central players in the description and publication of large series of human remains recovered in the 1930s, especially in the American southeast. Out of this work there developed methods and interests in population biology in a range of archaeological settings in North America (Larsen n.d.).

THE SCIENCE MATURES: POST-WORLD WAR II

World War II markedly reduced any scientific activity not associated with the war effort in the United States. The annual meeting of the AAPA was suspended in 1943 and 1944, and younger members of the profession were teaching, or were in the military, or were working in some sort of governmental capacity. Carleton Coon (1904–81) was a member of the Office of Strategic Services and worked in North Africa and in the Near East on account of his knowledge of these areas. Earnest Hooton and others assisted in the design of military clothing and equipment on account of their training in anthropometrics and human engineering. C. Raymond Carpenter assisted in making army training films. Gabriel W. Lasker (1912–2002) and William S. Laughlin (1919–2001) were conscientious objectors who worked on a variety of government projects. Following the war, there was an upsurge in undergraduate and, later, graduate enrollments in colleges and universities because of the GI-Bill to support veterans' education.

Before World War II began in the US in 1941, a private foundation was established that same year, with substantial funding, to support anthropological research and other activities. The Viking Fund Foundation was endowed by Axel Wenner-Gren and directed by Paul Fejos (1897–1963) during the first twenty-two years of its existence. Now known as the Wenner-Gren Foundation for Anthropological Research, it was, during the 1940s and 1950s, a vital source of financial and organizational support for anthropology. In 1945, the Viking Fund/Wenner-Gren Foundation sponsored the Summer Seminars in Physical Anthropology, which were 'state of the art' occasions to bring together younger and more senior anthropologists to discuss the most current and exciting research in the profession (Little and Kaplan 2010). Held in New York City, they were organized largely by Sherwood Washburn, who had completed his PhD degree under Hooton in 1940. Washburn along with Gabriel Lasker, a brand new PhD under Hooton, initiated the *Yearbook of Physical Anthropology* that same year, both to report on the Summer Seminars and to review the important research which had been conducted during the previous year (Lasker was the *Yearbook* editor). The Summer Seminars continued through 1955, whereas the *Yearbook* continues to be published to the present day as an annual supplement to the *AJPA*.

In June 1950, a watershed symposium was held at the Cold Spring Harbor Institute for Quantitative Biology on Long Island, New York. This was the same institute where Charles Davenport had housed the Eugenics Record Office, but the perspectives of the institute had changed dramatically after the war. Organized by Sherwood Washburn and by the distinguished population geneticist Theodosius Dobzhansky (1900–75), the 15th Cold Spring Harbor Symposium on Quantitative Biology was entitled “The Origin and Evolution of Man” (Warren 1951). The meeting was attended by more than 100 of the most influential anthropologists, geneticists, and evolutionary biologists, as well as by scientists from the Institute. Both the Viking Fund/Wenner-Gren Foundation and the Carnegie Corporation funded the conference. In many ways the symposium signaled the end of the old era of a descriptive science, while ushering in modern concepts of evolutionary biology. The talks at the symposium focused more on population as a unit of evolution than on fixed races, and there was a sense of scientific problem-solving and breadth of inquiry that suggested a change in perspectives and directions for physical anthropology.

The ‘new physical anthropology’ of Washburn

About a year after the Cold Spring Harbor Symposium, Washburn published a seminal paper on the ‘new physical anthropology’ (Washburn 1951), on which he elaborated in a chapter published in the Kroeber compendium *Anthropology Today* (Washburn 1953). Washburn’s ideas were formative and original, but they were built on the Summer Seminars in New York City during the 1940s and on the Cold Spring Harbor Symposium in 1950. Washburn’s ‘new physical anthropology’ was to focus on primate and human evolution and human variation, but with a return to Darwinian evolutionary theory and with genetics as an important unifying perspective (Stini 2010). Also, races were to be studied as populations rather than as essentialist ‘types,’ and the more common descriptive studies were to shift to studies employing scientific design and hypothesis testing. These ideas were both a driving force in transforming the profession of physical anthropology and a reflection of changes that were already taking place. A few physical anthropologists had traditionally employed hypothesis-driven research design, particularly Franz Boas and Raymond Pearl, but this was not the norm until the post-war period.

‘Race’ in the 1950s and 1960s

Despite Washburn’s contention that the concept of ‘race’ was inappropriate as a means of studying human variation and that the broader concept of ‘population’ was more productive, the concept of ‘race’ as a more or less concrete and identifiable unit was still fixed in people’s minds, including many scientists’ minds. A new book on race was published in 1950 by three of Earnest Hooton’s former students: Carleton S. Coon (above), Stanley M. Garn (1922–2007), and Joseph B. Birdsell (1908–94). They presented a six-fold geographical classification, divided the major races into thirty subpopulations, and then identified several micropopulations and hybrid populations. In the classifications of race there were concepts of adaptation to the environment and of natural selection that attempted to explain the bases for these variations. Boyd (1950) produced a classification of six races according to their blood group genetics.

About a decade later, Garn (1961) refined these classifications and identified geographical and local races as well as microraces, in a hierarchy of populations and sub-populations. These three works were different from previous efforts at classification in that they attempted to apply contemporary evolutionary, genetic, and ecological principles to the identification of racial variation (or population variation) around the world. They were transitional in the sense that they applied modern theory to an outdated typological system, in which the boundaries between populations were fixed. They were hierarchical classifications of human populations, but they differed from pre-war classifications in that evolutionary processes were considered.

In 1949, Julian Huxley, Thomas Huxley's grandson and former director general of UNESCO (United Nations Educational, Scientific and Cultural Organization), supported a recommendation that a committee be convened to study and report on the current status of race (Shipman 1994: 158–159; Marks 2010). The rapporteur for the committee was Ashley Montagu (1905–99), who was well known for having written a book on race called *Man's Most Dangerous Myth: The Fallacy of Race* (1942) in which he argued against concepts of race, claiming that race was a social concept, not a biological one. Only one other physical anthropologist was on the committee: the Mexican Juan Comas. Montagu largely wrote the 1950 UNESCO document, but there was substantial criticism. On the basis of this criticism of the first document, UNESCO convened a second committee, composed largely of biologists. The second document tended to be more hereditarian and weakened the statements of the first document concerning equality among the races. A modern revised statement of the UNESCO document was prepared by an AAPA committee chaired by Solomon Katz in 1993 (AAPA Statement 1996; see also Cartmill 1998).

Another significant event was the controversy over Carleton Coon's book on *The Origin of Races* (1962). In it he asserted that there were five races – Congoid, Mongoloid, Caucasoid, Capoid, and Australoid – and that all of them, evolved as they were from *Homo erectus*, had crossed the threshold to *Homo sapiens*, but some had developed into our modern species earlier than others. This assertion caused a storm of controversy. As Relethford (2010) observed, the book was data-rich and detailed, but the evolutionary model was weak and not well defined. Stimulated by the controversy over Coon's book, several papers were published in the international journal *Current Anthropology* by established evolutionary scientists and physical anthropologists (Theodosius Dobzhansky, Ernst Mayr, Loring Brace, Juan Comas, and Frank Livingstone) who argued for and against the concept of race as a biological unit of study. In some cases the older concept of a fixed race was conflated with a more recent view of race-as-population, which confused some of the arguments. Controversies over race did not end in the 1960s. They continue up to the present, but there is a general sense in physical anthropology that the earlier use of race as a unit of study or as a conceptual unit is no longer viable and that this transition came in the 1960s (Harrison 1998; Brace 2005).

Increasing specialization and development in the 1960s, 1970s, and 1980s

The period from the 1960s through to the 1980s was one of considerable research and training of doctoral students in physical anthropology. The National Science Foundation (NSF) had been established in 1950 and science was being promoted in

the United States, partly as a result of competition with the Soviet Union. Before World War II physical anthropologists could, in some sense, be generalists and conduct studies of skeletal biology, measure living populations, deal with the prehistory, and understand the current research in human paleontology. That picture began to change after the war, and during the 1960s graduate training started to incorporate increasing specialization and focus on a number of subareas of physical anthropology. These areas included genetics, living population biology, child growth and development, primatology, paleoanthropology, skeletal biology, and forensic science.

Genetics Theodosius Dobzhansky was extremely influential within post-war physical anthropology up his death in 1975. When Washburn was teaching at Columbia University during the 1940s, the two became friends, which led to their co-organization of the Cold Spring Harbor Symposium in 1950. It is probably this friendship that led Dobzhansky to know other physical anthropologists during that time. A center of human population genetics was the University of Michigan, with James V. Neel (1915–2000), the founder of the Department of Human Genetics, and with James Spuhler (1917–92) and Frank B. Livingstone (1928–2005) in the Department of Anthropology. This was a powerful group of scientists, who were engaging in innovative research and were training students in what later became known as anthropological genetics. Livingstone's work on malaria and sickle-cell prevalence in Liberia became a classic example of culture influencing evolution via changes in gene frequencies (Livingstone 1958). As Weiss and Chakraborty (1982: 383) pointed out: "The major thrust of Livingstone's synthesis, namely, the *ongoing* effect of culture in molding human evolution, is a point still largely misunderstood or ignored by many researchers without anthropological training." One might add that the point is also misunderstood by anthropologists with no genetics training.

There were some former students of Hooton who had developed professional expertise in population genetics. Alice Brues (1913–2007) was marvelously creative and innovative in the modern sphere of physical anthropology. She published a paper of the ABO blood groups, one of the polymorphic systems thought to be neutral – that is, not under strong selective pressure (Brues 1954). She demonstrated that the worldwide distribution of these blood groups was not uniform and strongly suggested selection. Spuhler (1951) conducted original research on Native American origins and genetic variations.

James Neel also made substantial contributions to anthropological population genetics through his studies of South American tropical forest natives in Brazil and Venezuela, and particularly through his work with the Yanomama (Neel and Salzano 1966). This pioneering multidisciplinary research was done under the aegis of the International Biological Programme (IBP) Human Adaptability (HA) projects.

By the late 1970s, population genetics was in a state of transformation. New laboratory methods permitted the DNA to be studied directly, so that the time-honored method of determining the genotype from protein separation (that is, from the phenotype) was becoming less important. Both nuclear and mitochondrial DNA studies were being used to establish 'precise' phylogenetic relationships among the primates, including humans, and the 'mitochondrial Eve' hypothesis on modern human origins was first presented a decade or so later (Cann et al. 1987). The culmination of the new DNA research was the completion of the Human Genome Project shortly after the turn of the new millennium.

Human population biology The 1950s and 1960s were a period of scientific maturation for those anthropologists interested in human population biology. J. B. Birdsell was one of the pioneers of ecology in the 1950s (Mai et al. 1981). The period during the 1960s was unusual by being one of the few times when some anthropologists from the subfields of sociocultural anthropology, archaeology, and physical anthropology were united in the pursuit of a common theoretical perspective: adaptation to the environment in the context of human ecology (Vayda and Rappaport 1968). There was also receptivity to integrated, collaborative research. In the physical anthropology of living populations, topics in genetics, child growth, demography, nutrition, and disease were all being explored within evolutionary and adaptive frameworks. There was also a rise in international exchange and communication that enriched the advancement of the research.

In 1964 several distinguished British human biologists published a new text (Harrison et al. 1964). Nigel A. Barnicott (1914–75) and Geoffrey A. Harrison (1927–) wrote sections on genetics and phenotypic variation; James M. Tanner (1920–) wrote on human growth; and Joseph S. Weiner (1915–82) wrote on human ecology and adaptation. This important book coincided with the initiation of the International Biological Programme (IBP), which was to continue from 1964 through to 1976 and to focus on the worldwide study of ecology and human welfare. The human study component of this program was called ‘human adaptability,’ and the international head was Joseph Weiner of the UK (Weiner 1965). A planning meeting in 1964 was sponsored by the Wenner-Gren Foundation and held in Austria at the Burg Wartenstein castle; it outlined the basic plan for the human adaptability research (Baker and Weiner 1966). Later studies (Collins and Weiner 1977; Little et al. 1997) centered on a great deal of multidisciplinary and multinational research (Andean Natives, Circumpolar Inuit and Saami, Tokelau Island Migrants, Yanomama Natives, Papua New Guineans), which moved human population biology forward in a quantum leap. One of the leaders of IBP Human Adaptability in the United States was Paul T. Baker (1927–2007), who also directed pioneering high-altitude research in Peru (Baker 1978). In addition, at Pennsylvania State University, Baker trained more than twenty-five PhD students in human population biology through the early 1990s.

When the IBP came to a close in the early 1970s, a new international program was established through UNESCO, in order to continue some of the worldwide ecological research initiated by IBP projects. There was a number of single-population, multidisciplinary projects that were either conducted under the aegis of this UNESCO program – called The Man and the Biosphere Program – or were independently conceived; these projects studied Andean Aymara, Samoan Migrants, Ituri Forest Pygmies, Central American Garafuna, and Turkana Pastoralists. Several of them were continued into the 1990s.

Growth and development Interests in human growth in anthropology arose from several sources in the late nineteenth and early twentieth centuries. First, Franz Boas’s studies, which served as a basis for modern growth investigations, were derived from his interest in human plasticity and the characteristics of populations. Boas also had concerns with child health and welfare and initiated the practice of longitudinal growth studies (sequential measurements of the same children). There was considerable long-term survey of child growth in the United States from the 1920s through to

the 1950s, in response to the child welfare movement (Tanner 1981: 299ff.). Another source was the anthropological, cross-cultural interest in child and adolescent behavior and socialization, as displayed in Margaret Mead's early work. A third source has an anatomical and skeletal origin in interests in skeletal growth and maturation, such as shown in T. Wingate Todd's research in Cleveland. And a fourth source was the clinical research dealing with everything from craniofacial growth and orthodontics to pediatrics and childhood diseases.

Major post-war figures in human growth studies were James M. Tanner, who was conducting innovative studies of adolescent growth in the UK, and Wilton M. Krogman, who established the Philadelphia Center for Research in Child Growth and Development at the University of Pennsylvania in 1947 (named the Krogman Center later, in 1971). Stanley M. Garn was the leading anthropologist at the University of Michigan Center for Human Growth and Development from 1968 until his retirement. In the 1960s, one of the major areas of worldwide study as a part of the IBP was the comparative research on child growth. Hundreds of studies were conducted around the globe and synthesized in a major compilation by Eveleth and Tanner (1976). The field of human growth was expanding considerably, with students being trained at the University of Pennsylvania and elsewhere during the 1960s and 1970s. New research demonstrated that growth can be saltatory; that a 'lifetime approach' is a productive way to explore adult disorders; and that birth weight variation can profoundly influence adult health in middle age and beyond.

Primateology There was a remarkable expansion of primate studies during the late 1950s and 1960s. As early as 1942, Earnest Hooton had argued for the importance of primate studies (Hooton 1942, 1954), which were only beginning to flourish at the time of his death in 1954. The earliest post-war research was conducted by biologists on the Barro Colorado howler monkeys originally studied by Carpenter, and the Japanese set up a colony of Japanese macaques to begin longitudinal studies of this native species. Sherwood Washburn led the resurgence of interest in primatology in the US after observations of baboons in the wild made in the mid-1950s (Haraway 1988; Ribnick 1982). The first study of the social behavior of baboons was carried by Washburn and DeVore (1961) at the Amboseli Game Reserve in Kenya. Following his move to Berkeley, Washburn began training a whole generation of students in primatology. Between 1962 and 1974 more than thirty Berkeley students completed a PhD degree in primate behavior, comparative primate anatomy, and paleoanthropology under his supervision. By the mid-1950s and early 1960s, many conferences and books focused on the relationship between primate behavior and human evolution. By the 1960s, conferences on free-ranging primates were held and related books began to appear. These included the first intensive studies of the great apes. Washburn was the major catalyst of many of these meetings and his influence on primate field biology cannot be overestimated. In fact, by 2007, over 60 percent of the field primatologists active in the US were derived from Washburn's academic lineage (Kelley and Sussman 2007).

What stimulated these interests in primate behavior toward the study of non-human primates was the realization that living populations might serve as models for human ancestral populations (Sussman 1997). Knowledge of primate ecology was linked to concerns about the growing number of endangered primate species both in the Old World and in the New World tropics. Conservation then became an important issue,

which led to a practical need to gather information on primate ecology, habitats, diets, and declining land resources (Wolfheim 1983; Cowlshaw and Dunbar 2000). A major trend that began in the 1980s was the reclassification of numerous primate species on the basis of the DNA.

Paleoanthropology By the late 1950s, after the discovery that Piltdown was a fraud (Weiner 1955), Australopithecines became accepted as the earliest ancestors of humans, and a more modern view of human evolution emerged (Sussman 2000). By this time discoveries of fossil hominids shifted from Europe and Asia to East and South Africa. Mary D. Leakey's (1913–96) and Louis Leakey's (1903–72) discovery of *Zinjanthropus* (*Australopithecus*) in 1959 and of *Homo habilis* in 1964 at Olduvai Gorge in Tanzania placed the Leakeys and East African hominids in the spotlight of paleoanthropology. Australopithecines, *Homo habilis*, and *Homo erectus* specimens were found at a number of sites in East Africa throughout the 1960s to 1980s. Work in the Omo Valley in southern Ethiopia began in 1967 with a team of French, American, and Kenyan investigators headed by F. Clark Howell (1925–2007) and led to many fossil discoveries. Around that time, Richard Leakey discovered the hominid fossil-bearing site of Koobi Fora, on the eastern shore of Lake Turkana in northwest Kenya, and in 1972 Donald Johanson began working with French scientists in Hadar, Ethiopia. Also in Ethiopia, the Awash River Valley project was begun in 1981 and produced specimens from pre-Australopithecines up to specimens of early modern *Homo*. In 1974 Mary Leakey's Laetoli discoveries, including those of Australopithecine footprints, added to the accumulating evidence for an early hominid evolution in East Africa. All of these sites were highly productive. Two major new sites opened up during the 1970s and 1980s. Atapuerca in northern Spain has produced rich fossils of archaic specimens of *Homo*, dated as early as 800,000 years ago. Dmanisi in the Republic of Georgia has produced hominids dated to 1.8 mya.

With the exception of F. Clark Howell, whose PhD in 1953 was under Washburn's direction, few physical anthropologists had been trained in paleoanthropology in the US until the 1960s. Theodore D. McCown (1908–69) was trained by Alfred Kroeber at Berkeley, but his real training in paleoanthropology came through his associations with Arthur Keith and the Mount Carmel (Israel) studies. During this decade Sherwood Washburn trained several paleoanthropologists at Berkeley who took positions at the University of Chicago, at the University of Pennsylvania, and at Columbia University. These Washburn students then began training their own students, to add to the pool of American paleoanthropologists. When John T. Robinson (1923–2001) moved to the University of Wisconsin from South Africa in 1963, another center of training was established. Most of the current generation of senior US paleoanthropologists were trained either at these universities or abroad.

Early research in non-human primate evolution was conducted by vertebrate paleontologists or by general mammalian anatomists. Since the 1960s, however, Elwyn Simons (1930–), of Yale and Duke Universities, has had the greatest influence on paleoprimatology in anthropology. Simons was trained by G. L. Jepson (1903–74), a vertebrate paleontologist at Princeton University, and by Wilfrid E. Le Gros Clark (1895–1971) at Oxford University. Simons revived the discipline in the early 1960s with his reviews of the primate fossil record. He is responsible for training a vast

majority of primate paleontologists in the field since that time (Fleagle and Hartwig 1997; D. T. Rasmussen, personal communication).

Skeletal biology, bioarchaeology, and forensic science Craniology and skeletal biology have been traditional pursuits of physical anthropologists. Up until the 1960s, much effort was devoted to what Armelagos et al. (1982) referred to as the ‘racial–typological model’ of skeletal analysis, where the research focused on cranial and morphological types or races that were particularly associated with New World and other human origins. By the 1970s papers in skeletal biology had increased to more than half of the published papers in the *American Journal of Physical Anthropology*, and half of these articles were classified as descriptive rather than analytical in scope (Lovejoy et al. 1982). However, by the 1960s and 1970s papers were dealing increasingly with paleodemography, biomechanics, growth, and skeletal maturation rather than with anatomical description. In addition to these developing areas, there were new methods of analysis of the bone material for dating purposes; dietary analyses (^{12}C to ^{13}C ratios); trace-element analyses; behavioral reconstruction; and biomechanics (Ubelaker 1982; Larsen 1997). Studies of craniofacial growth expanded during the 1960s and 1970s, as did work in bone density, through the use of a variety of x-ray and physical methods (Baker 1961; Garn 1981). The shift from description to understanding past populations in relation to lifestyle, behavior, and health in biocultural perspective was a fundamental development (Buikstra and Beck 2006; Larsen 1997).

Forensic anthropological skeletal analyses probably began with Wilton Krogman’s (1939) guide on skeletal identification for the FBI and with its application in identifying war dead from World War II. Another physical anthropologist who participated in war dead identification was Mildred Trotter (1899–1991), who developed stature estimates from long bones. These activities further stimulated forensic publications by T. Dale Stewart (1901–97), Harry L. Shapiro (1902–90), J. Lawrence Angel (1915–86), and Wilton Krogman (Thompson 1982). The 8th Wenner-Gren Summer Seminar in 1955 was devoted to forensic anthropology and held at the Smithsonian Institution in Washington at the end of the Korean War. After Krogman’s seminal *The Human Skeleton in Forensic Medicine* was published in 1962, forensic anthropology began to be recognized in anthropology as an appropriate applied science. The American Academy of Forensic Sciences, founded in 1948, established a new section on physical anthropology in 1972. Following this, there was an increasing professional identification of many physical anthropologists as forensic anthropologists.

Currently, with DNA analysis techniques serving the classic purpose of victim identification, forensic anthropology is in the process of developing a new conceptual framework. Forensic anthropologists are now increasingly involved in the interrelated fields of forensic taphonomy, forensic archaeology, and forensic trauma analysis, fields concerned with the reconstruction of events surrounding death (Dirkmaat et al. 2008).

NEW JOURNALS AND PROFESSIONAL SOCIETIES

At the end of World War II there were two journals – the *American Journal of Physical Anthropology* and *Human Biology* – that published papers in physical/biological anthropology and one professional society – the American Association of Physical

Anthropologists. The quarterly journal *Human Biology* had been founded by Raymond Pearl in 1929 and had survived the war, although Pearl's death in 1940 had left the journal in a precarious position. The annual *Yearbook of Physical Anthropology*, established in 1945, reprinted articles, but served to broaden the topical coverage of the profession. It was not until 1972 that the next new journal was founded: the *Journal of Human Evolution*. The Human Biology Council, affiliated with the journal *Human Biology*, was established in 1974 (later, in 1994, it became the Human Biology Association). In 1981, the American Society of Primatologists was founded and its associated *American Journal of Primatology* began to be published. The Dental Anthropology Association was founded in 1986, the Paleoanthropology Society in 1992, and the American Association of Anthropological Genetics in 1994. Three new journals were initiated during that period: the *American Journal of Human Biology* in 1989 (affiliated with the Human Biology Association), *Evolutionary Anthropology* in 1992, and *PaleoAnthropology* in 2003 (affiliated with the Paleoanthropology Society). This proliferation of professional societies and specialized journals reflects the continuing division of physical anthropology into subfields that require increasingly specialized training programs.

INTO THE TWENTY-FIRST CENTURY: CONTEMPORARY TRENDS AND APPROACHES

Research, discoveries, and the expansion of professionals in physical anthropology in the late twentieth and early twenty-first centuries are testimony to the health and importance of our science. The important tools that physical anthropologists have traditionally had and that maintain the viability of the science are: (1) a biocultural/biobehavioral approach capable of solving scientific problems that are intractable for unidisciplinary social or biological scientists; (2) a theoretical perspective and process applied to humans, *evolution*, whose explanatory power is truly remarkable; (3) an ability to view humans and their biobehavior in deep time and in evolutionary perspective and to use this information to foresee problems in contemporary societies, and the reverse; (4) the exploration of human biology and behavior within a population perspective; and (5) the application of the comparative approaches to human societies, to non-human primate relatives, and to our evolutionary antecedents. Use of these valuable tools, along with the application of the scientific method, has enabled physical anthropologists to make substantial progress in a number of our subfields in the years bracketing the millennium.

In anthropological and molecular genetics, DNA research, the Human Genome Project, and its expansion toward the exploration of the variation associated with the human genome have revolutionized human population genetics in anthropology (Crawford 2000). Multidisciplinary and interdisciplinary science has expanded over the past few decades, the National Science Foundation being much more receptive to multi-year and integrated research projects. Arising from a detailed knowledge of skeletal anatomy and variation, forensic science in anthropology has literally exploded in the past two decades. Diplomate membership (by examination) in the American Board of Forensic Anthropology has grown to more than 80 physical anthropologists, and training capabilities at United States universities have

expanded to fill increasing demands. A new area of exploration is Darwinian medicine, where applications of evolutionary theory are leading to insights into the bases of human health and welfare. At the same time, biomedical anthropology is drawing on epidemiological and anthropological principles and placing trained students in various health-care contexts. Research in primatology, especially studies of naturalistic behavior and of the ecology of non-human primates in the wild, has expanded substantially (Kelley and Sussman 2007). This is partly because of our interest in our closest relatives among mammals, but also because of habitat loss and the need to preserve threatened and endangered species of primates. Finally, in paleoanthropology, new discoveries are providing a finer resolution to non-human primate and human origins and to the web of our ancestors' evolutionary pathways – one of the earliest objectives of our science.

ARCHIVAL AND PUBLISHED SOURCES

Some of the important bibliographic sources for the history of physical anthropology have been cited in earlier sections of this chapter. However, it is useful to summarize them here. By far the most significant historical research has been done by the late Frank Spencer (1982b, 1997e; Boaz and Spencer 1981). His teacher, C. Loring Brace (2005), has done substantial work on race, as have Ashley Montagu (1942, 1961), Stephen Jay Gould (1996), and Pat Shipman (1994). Other sources of biographical information on physical anthropologists can be found in: (1) several autobiographical prefatory articles in the *Annual Review of Anthropology*; (2) *Biographical Memoirs* of the National Academy of Sciences; (3) *Festschriften* published by students and colleagues; (4) autobiographical memoirs; (5) obituaries; and (6) archived unpublished letters, papers, photographs, and other documents (Little et al. 1995). Finally, there are several published histories of professional organizations and journals. These include the American Association of Physical Anthropologists (Comas 1969; Alfonso and Little 2005), the Human Biology Association (Little and James 2005), the *Annals of Human Biology* (Tanner 1999), and *Human Biology* (Crawford 2004).

CONCLUSIONS

The history of physical anthropology in the western world has its roots in the eighteenth-century *Age of Enlightenment*. Interest was focused on race typology and craniology in the United States and Europe during the early nineteenth century. Physical anthropology only began to achieve professional recognition in the US after the first quarter of the twentieth century, when students began to be trained in larger numbers, principally at Harvard under Hooton. The younger generation of post-World War II physical anthropologists largely discarded typological ideas of race, embraced evolutionary theory, and began applying the scientific method to research designs. During the 1950s and 1960s these perspectives transformed the profession, such that the subfields of genetics, human population biology, human osteology, paleoanthropology, and primatology could begin to move into the rapidly developing

world of science. Since that time, physical anthropology has grown in breadth of research interests and in numbers of professionals, and it continues to make unique contributions to science that are not possible in other scientific realms.

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