

Replacement of Neanderthals by Modern Humans Series

Hideaki Terashima
Barry S. Hewlett *Editors*

Social Learning and Innovation in Contemporary Hunter-Gatherers

Evolutionary and Ethnographic Perspectives

Replacement of Neanderthals by Modern Humans Series

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The planned series of volumes will report the results of a major research project entitled “Replacement of Neanderthals by Modern Humans: Testing Evolutionary Models of Learning”, offering new perspectives on the process of replacement and on interactions between Neanderthals and modern humans and hence on the origins of prehistoric modern cultures. The projected volumes will present the diverse achievements of research activities, originally designed to implement the project’s strategy, in the fields of archaeology, paleoanthropology, cultural anthropology, population biology, earth sciences, developmental psychology, biomechanics, and neuroscience. Comprehensive research models will be used to integrate the discipline-specific research outcomes from those various perspectives. The series, aimed mainly at providing a set of multidisciplinary perspectives united under the overarching concept of learning strategies, will include monographs and edited collections of papers focusing on specific problems related to the goals of the project, employing a variety of approaches to the analysis of the newly acquired data sets.

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Editors

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 Springer

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Photo Gallery 1 Aka in Central African Republic (photos by Barry Hewlett & Bonnie Hewlett)

Photo Gallery 2 Baka in the Republic of Cameroon (photos by H. Terashima and N. Kamei)



Photo Gallery 3 Inuit, Yolngu, and San (photos by K. Omura, S. Kubota, and K. Imamura)



Preface

The RNMH Project and the Study of Social Learning in Modern Hunter-Gatherers

An interdisciplinary 5-year project entitled “Replacement of Neanderthals by Modern Humans: Testing Evolutionary Models of Learning” (RNMH) was carried out from 2010 to 2015 and funded by Japan’s Ministry of Education, Culture, Sports, Science, and Technology (Grant-in-Aid for Scientific Research on Innovative Areas, Grant No. 22101001). With a team of social-cultural and biological anthropologists, developmental and clinical psychologists, a behavioral geneticist, and primatologists to contribute to the project, we investigated the learning abilities and behavior of contemporary hunter-gatherers living in various environments.

Marvelous developments in genetics in recent years have revealed that modern humans (*Homo sapiens*, hereafter referred to simply as “Sapiens”) originated in Africa around 200 ka (thousand years ago), then around 100 ka they began to spread out of Africa and into Eurasia. They arrived in central and western Europe by 45–47 ka and it was there they came into contact with Neanderthals. The Neanderthals were a highly advanced human species supposed to have evolved from *Homo heidelbergensis* (also supposed to be the ancestor of Sapiens). They thrived in Europe for about 300,000 years and adapted to the cold weather during the glacial epoch. However, they appear to have disappeared by ca. 40 ka, 5,000–7,000 years after the appearance of Sapiens on the continent. There remains an intriguing mystery: why and how did the Neanderthals go extinct and Sapiens survive? What determined the fates of the two advanced hominins? Many researchers have been studying this problem for decades and exchanging heated debates on the possible causes of the demise of Neanderthals, but no decisive conclusion has yet been reached.

When considering the characteristics of modern humans, we usually think of our advanced cognitive capacity—highly flexible and capable of symbolic thought and language. Working memory and the executive function of the human brain have been garnering particular attention recently. Thus, one of the simplest scenarios of the replacement might be that the Sapiens out-competed Neanderthals due to the advantage of cognitive superiority, perhaps allowing greater breadth and efficiency in hunting in gathering or advantages in interspecies in combat, although there is no substantive evidence of violent confrontation or battle between the two populations.

In any case, the development of higher cognitive abilities has doubtlessly contributed to the success of modern humans, but there seems to be little evidence to justify the assumption of a sudden increase in our cognitive abilities and advances in brain function, including language use, at the time of the replacement. Because the replacement in Europe seems to have happened so rapidly, it is doubtful that these cognitive advances occurred at that time. From the standpoint of neurobiology and population genetics, it would be very difficult or impossible for such significant differences in cognition to evolve in the span of just 5000–7000 years and permeate the entire Sapiens population. Rather, the rapidity of the replacement suggests

that the differences in Sapiens' cognition evolved earlier, probably before they left Africa. Higher cognitive capacity would have had to have evolved prior to its expression in the development of tangible innovations such as new lithic industries, efficient subsistence strategies, and flexible and effective social organization.

There have been many factors proposed so far by researchers regarding the differences between the two populations, such as their physical, social, and other adaptive capacities in addition to the cognitive abilities mentioned above. Those factors include differences in average body size and musculature, energy expenditure, birthrate and mortality, demographic patterns, subsistence systems, child development patterns, material culture such as clothing and stone tool technologies, behavioral adaptations to variable environmental conditions, movement of game animals, and social structures. All of those factors influenced the competition for survival to various degrees, but it is difficult to point out any one or combination of these as the primary catalyst(s) for the replacement. The RNMH project focuses instead on differences in the two species' capacities for learning, particularly social learning and innovative learning, to address the replacement problem. This approach is more parsimonious because learning abilities account for many of the possible differences listed above. Knowledge about how to construct and use effective clothing and tools in various environments, for example, results from the accumulation of technical and ecological know-how gathered over multiple generations. Learning and the social behavior that supports learning are the most important factors in the foundation of the human capacity to develop *cultural* adaptations for survival in various types of environments and ecologies. RNMH proposes a hypothesis called the "learning hypothesis" that suggests there were innate differences in learning ability between Neanderthals and Sapiens that might have divided the fates of the two populations. About 2.5 million years ago, a hominin group known as *Homo habilis* began to make stone tools in Africa. It was the beginning of lithic technology and the distinctive cultural development of our human ancestors, and since then culture has become the keystone of human adaptation not only in the area of technology but also in social and subsistence domains. Once cultural behavior was established as a basic human quality, the creation and transmission of culture became humans' preeminent trait.

In our learning hypothesis, learning is sorted into two types: (1) individual learning, i.e., learning on one's own through trial and error, drawing solely on one's own ideas, and (2) social learning, i.e. learning from others through imitation, being taught, or another process. The Neanderthals had advanced lithic culture, but it was very conservative. They continued to reproduce the same types of stone tools for almost 200,000 years, which suggests they were very good at social learning but did not have much ability to innovate. On the other hand, the Sapiens invented various lithic industries after arriving in Europe, which could be a product of their aptitude for innovative individual learning. The Neanderthals' learning behavior, characterized by concentration on social learning but not on innovation, seems to have been adaptive to places where environmental conditions were rather stable from generation to generation. The key difference may have been the flexibility of learning strategies in Sapiens, allowing them to switch between and effectively combine individual and social learning in quickly changing environments. The final phase of the glacial epoch when the replacement occurred was characterized by a climate that fluctuated widely and rapidly between cold and warm, an environment that may have favored Sapiens' learning strategies over that of Neanderthals. This flexibility would have enabled them to quickly solve adaptive problems and thus to move swiftly and successfully into novel environments as they spread across the globe.

A wide range of research is needed to test the learning hypothesis. In the RNMH project, six research teams (A01, A02, B01, B02, C01 and C02) were organized under a steering committee that gathered archaeologists, paleoanthropologists, social-cultural anthropologists, developmental psychologists, geneticists, climatologists, paleoecologists, neuroscientists, and

others for collaborative interdisciplinary research. Each team's specific objects were as follows:

A01: Archaeological research of the learning behaviors of the Neanderthals and early modern humans

A02: Research on human learning behavior based on fieldwork among hunter-gatherers

B01: Research on evolutionary models of human learning abilities

B02: Reconstructing the distribution of Neanderthals and modern humans in time and space in relation to past climatic changes

C01: Reconstruction of fossil crania based on three-dimensional surface modeling techniques

C02: Functional mapping of learning activities in archaic and modern human brains

It is indispensable to clarify the learning patterns in ancient and modern hunting and gathering societies for the demonstration of the learning hypothesis. A01 investigated archaeological evidence, artifacts and traces of living sites indicative of past learning behaviors of the Middle and Upper Paleolithic humans. Studies in experimental archaeology and ethnoarchaeology were also conducted to interpret ancient traces of learning. A02 investigated contemporary hunter-gatherers' learning behavior, their social and individual learning, mainly through children's everyday activities, to discern the characteristic learning behavior of modern humans.

The study of hunter-gatherers has been one of the main themes in anthropology since its birth in the nineteenth century, and this way of life is believed to be the closest approximation in the contemporary world of ancient living conditions. While it is not acceptable or accurate to assert a one-to-one relationship between the lives of contemporary hunter-gatherers with that of our human ancestors, it is also inappropriate to think that the research of hunting and gathering societies can shed no light on the reconstruction of ancient human conditions. Appropriate and deliberate collaboration between socio-cultural anthropology and archaeology, paleoanthropology, and other related fields could help reconstruct the behaviors of ancient humans.

Team B01 conducted a theoretical study of the learning hypothesis by describing and analyzing mathematical evolutionary models. They simulated and compared various learning strategies to find out what conditions might have led to the expansion of social learners or individual learners in specific societies. Team B02 reconstructed the distribution of the Neanderthals and the Sapiens in time and space during 20–200 ka and also reconstructed the environments of those populations, including climatic conditions and ecological settings, in order to make comparisons of the differences in adaptation of each population to each environment.

The learning hypothesis does not necessarily postulate a large and sudden cognitive jump; however, there are apparent morphological differences between the crania of Neanderthals and Sapiens. Therefore, it is crucially important to understand the relationship between brain morphology and its functions. Team C01 tried to reconstruct the fossil crania and brains of Neanderthals and ancient modern humans, and C02 utilized fMRI in an attempt to identify the brain sites supposed to relate to various learning activities.

Learning behavior has essential importance for human culture and evolution. There is, however, a huge difference between the learning done in formal school settings in modernized societies and that in hunting and gathering societies in the past as well as present. Our study of social learning has been conducted mainly among contemporary hunter-gatherers in various natural and social environments and has revealed characteristics crucial to maintaining their culture, livelihood, and *joie de vivre*. Social-cultural anthropology has methodologically avoided the unilineal cultural evolutionary approach for decades because of the misuse of Darwinian theory, but recent theoretical and methodological developments provide insights into social learning in humans as well as research problems of the RNMH project.

In closing, we are grateful to all those who contributed to this book, the colleagues in the RNMH project, and to those who kindly permitted us to live with them for fieldwork. Financial support for the project was provided by Japan's Ministry of Education, Culture, Sports, Science, and Technology (Grant-in-Aid for Scientific Research on Innovative Areas, Grant No. 22101001).

Kobe, Japan

Hideaki Terashima

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Social Learning and Innovation in Hunter-Gatherers

1

Barry S. Hewlett

Abstract

This chapter provides an introduction to social learning and innovation in hunter-gatherers, summarizes major theoretical orientations on from whom and how children learn from others, and highlights new results from chapters in the book.

Keywords

Hunter-gatherers • Social learning • Innovation

1.1 Introduction

Little is known about hunter-gatherer social learning. Many more books and journal articles exist on great ape social learning than exist on hunter-gatherer social learning. Social-cultural anthropologists have been interested in the transmission and acquisition of culture for decades (Mead 1928; Malinowski 1928; Spindler 1974), but most of the classic systematic child-focused studies of social learning have been conducted with subsistence level farming societies (Mead 1930; Whiting and Whiting 1975; LeVine et al. 1994; Rogoff 1981; Lancy 1996). Some hunter-gatherer researchers include limited descriptions of children's social learning as part of their general ethnographies (see citations surveyed in Chap. 2 by Garfield et al.), but few hunter-gatherer researchers have conducted systematic child-focused studies on this topic (see Briggs 1971; Bock 2002 for exceptions).

This collection is the first edited volume to focus on social learning in hunter-gatherers. Authors were invited to contribute if they had conducted child-focused ethnographic field research on hunter-gatherer social learning, particularly research on from whom or how children learn from others.

We were open to any theoretical or methodological approaches to the study of social learning. We wanted to be open to diverse approaches because not many researchers work with hunter-gatherer children, and little is known about social learning in these groups. Most of the Japanese and some other authors received funding to conduct social learning research from a multidisciplinary project that tried to understand how modern humans replaced Neanderthals. The project is described in the preface, was called the replacement of Neanderthals by modern humans (RNMH), and was supported by a Grant-in-Aid for Scientific Research on Innovative Areas from the Japanese Ministry of Education, Science, Culture, and Technology. The project sought to examine the “learning hypothesis” which assumed that the replacement of Neanderthals by modern humans was due to innate differences in learning ability. One component of the project aimed to understand social learning in contemporary hunting and gathering groups. The project supported important field-based research on social learning, but only the last section of this book directly addresses the Neanderthal question.

1.1.1 Why Hunter-Gatherers?

Several reasons exist for focusing on hunter-gatherers. First, as mentioned above, the vast majority of previous research on social learning in small-scale (sometimes called

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“traditional” or “preindustrial”) cultures has been conducted in subsistence farming communities. Research in these cultures has provided important insights into how children learn outside of formal school settings (e.g., Rogoff 2003), but several features of farming life, such as political, age, and gender hierarchy, are substantially different from mobile hunter-gatherer (the term forager is also used in this chapter to refer to mobile hunter-gatherers) communities. Second, many systematic studies of social learning have been conducted with children in laboratory settings in nation states with complex levels of hierarchy, inequality, formal education, and capitalism. As Henrich et al. (2010) suggest, settings in WEIRD (Western, educated, industrial, rich, democratic) cultures may dramatically bias results. Hunter-gatherers are generally as egalitarian as human societies get and provide an opportunity to understand multiple ways in which children learn their culture. Finally, it seems reasonable to consider social learning in contexts that characterized most of human history. Global capitalism has been around for about 200 years, class stratification (chiefdoms and states) about 5000 years, simple farming and pastoralism about 10,000 years, and hunting and gathering at least hundreds of thousands of years (about 95 % or more of human history). Foragers today are not Paleolithic remnants nor do they live in a world isolated from global economic forces. But the few remaining hunter-gatherers in the world may provide insights into biases present in research in other modes of production and how social learning that characterized most of human history contributed to pronounced cultural diversity and adaptations to natural environments around the world long before the existence of subsistence farming or formal education systems.

1.1.2 What Is Social Learning?

Social learning is basically acquiring skills or knowledge from others rather than learning them on your own. Heyes (1994) defines it as “learning that is influenced by observation, or interaction with, another animal (typically conspecific) or its products.” Researchers from several disciplines, such as evolutionary biology, child development, social-cultural anthropology, economics, neurobiology, and archaeology, are interested in and have conducted research on social learning. Some researchers indicate that an “explosion of interest” is occurring on the topic (Galef and Giraldeau 2001; Hoppitt and Laland 2013; Whiten et al. 2012). Aristotle in the fourth century BC may have been the first person to document that animals acquire behavior through imitation, and Darwin was one of the first to suggest that apes imitated each other and that imitation was the bridge between animal instincts and human rationality (Hoppitt and Laland 2013). The history of social learning in evolutionary biology,

developmental psychology, and cognitive science focused on identifying various forms and features of imitation. The ability to imitate in humans is linked to the acquisition of culture, and these studies eventually led to debates as to whether or not other animals had “culture.”

The debate about animal “culture” started with Imanishi’s (1952) research with a particular Japanese macaque identified by research assistant Satsue Mito that began to clean dirt from sweet potatoes in a stream. Over several years many other members of the macaque troop picked up the practice, and researchers referred to the behavior as precultural imitation (Kawai 1965). This led primatologists to examine the transmission of traits in great apes. A comprehensive study of chimpanzee social learning demonstrated that they have 42 traits that are socially transmitted and vary by region in Africa (Whiten et al. 1999).

Social learning is central to understanding the nature of culture. Definitions of culture in both anthropology and evolutionary biology include “transmitted,” “acquired,” or “learned.” The definition of culture used here is anything (information, skills, knowledge, behavior, etc.) socially transmitted, acquired, and shared by a group. The definition emphasizes that it is non-genetically acquired from others (adults, children, friends, teachers) and shared with a group over time. Many evolutionists prefer “information” in their definitions (Richerson and Boyd 2005), but several cultural anthropologists have issues with this because it implies culture is in our minds, when it also exists in our bodies (i.e., it is embodied in our muscles, neural network, and other biological systems, Downey 2010) and landscapes (Ingold 2001).

Human social learning can just as easily be called cultural learning and the terms are considered synonymous in this volume. Human social learning is relatively distinct from social learning in other nonhuman animals. Social learning in nonhuman animals is generally limited to a few traits, often linked to finding food or mates. By contrast, human social learning involves acquiring thousands of traits associated with cultural norms as well as kinship, political, economic, medical, and religious systems i.e., they have to learn the culture in which they live. Learning all these traits from others is an efficient way to acquire culture. There is no way one could learn everything they needed to know to survive in a culture by trial and error. The cost to learn from others is much lower than it is to try and learn everything by discovery and trial and error.

Social learning has limitations. Rogers (1998) and others have shown that social learning has costs because sometimes individuals copy the errors of others and these errors can accumulate. It is important to maintain some individual learning (i.e., trial and error). In environments that are very stable over time (e.g., reoccurring problems, climate, predators persist over thousands of generations), humans

and other animals adapt genetically to the environment. On the other hand, when environmental changes occur each generation, it is adaptive for individuals to learn by trial and error. Mathematical models indicate that social learning is particularly adaptive at an intermediate level of environmental variability (i.e., tens or hundreds of generations) (Henrich and McElreath 2003). Richerson and Boyd (2005) hypothesize that human culture, as we know it today, emerged about 50,000 years ago during Pleistocene periods of increased climatic variability. Clearly, social learning has enhanced human's ability to adapt relatively easily and rapidly to all types of climatic and environmental conditions around the world.

1.1.3 Why Children?

Social learning occurs throughout the life course of hunter-gatherers. Gurven et al. (2006) found that it takes 20 years beyond adolescence for male Tsimane foragers of South America to learn how to be proficient hunters, and several chapters in this volume demonstrate that most technological and knowledge innovations come from young and middle-aged adults, not children. While both adults and children learn from others, this volume focuses on children because this is when learning it is most intensive and the authors of chapters in this book conducted field research on social learning with children.

We encouraged authors to identify ages or stages of childhood when they described social learning in a culture. Ethnographers in the past described the lives of “children” or “youth” or “juveniles,” but the age range is often not clear. Age often impacts what a child can learn (e.g., from physical strength to brain growth and cognitive abilities) and influences interactions with others (see Bock 2005a, b and Tucker and Young 2005 for examples of how age and strength influence the acquisition of skills in hunter-gatherer children). Some authors used age categories from developmental psychology, while others preferred the stages and ages of biological anthropologist Barry Bogin (1999). Table 1.1 shows the stages and age ranges mentioned in this volume.

Table 1.1 Stages and ages of human development

Developmental psychology stages		Bogin stages	
Stage	Age range	Stage	Age range
Infancy	Birth until walking	Infancy	Birth until weaning
Early childhood	1–6 years	Childhood	3–7 years
Middle childhood	7–12 years	Juvenile	7–10 (girls)
			7–12 (boys)
Adolescence	13–18 years	Adolescence	12–20 years

Some developmental psychologists believe infancy goes up to 24 months, and Bogin's infancy stage assumes weaning occurs at about age 2–3 years of age in most small-scale societies. Bogin (1999) indicates that infancy and juvenile stages occur with nonhuman primates and social carnivores but that the childhood and adolescence stages are relatively unique to humans.

1.2 The Social-Cognitive Learning Environment of Hunter-Gatherers

Before reading the various chapters on hunter-gatherer social learning, it is essential to have a basic understanding of forager life and the common contexts in which children grow up. Ethnographers and the authors in this volume describe pronounced cross-cultural diversity in forager life, but some commonalities exist across forager groups and these features influence the learning environments of children (Lee and Daly 2004). The concepts of *habitus* (Bourdieu 1977) and developmental niche (Super and Harkness 1986) are used here to frame forager life.

1.2.1 Foundational Schema

In order to grasp the nature of social learning among hunter-gatherers, it is necessary to understand their foundational schema. Three foundational schemas (ways of thinking that influence many domains of forager life) pervade hunter-gatherer life: egalitarianism, autonomy, and giving/sharing. An egalitarian way of thinking means others are respected for what they are, and it is not appropriate to draw attention to oneself or judge others as better or worse than others. Egalitarianism has political, gender, and age dimensions. This is why foragers do not have strong chiefs, men and women have relatively equal access to resources important for survival, and elders are not accorded special status, respect, or deference. Respect for an individual's autonomy is also a foundational schema. One does not tell or coerce others what to do, including children. Men and women, young and old, do pretty much what they want. If they do not want to hunt that day, they do not do it, and if an infant wants to play with a machete, she is allowed to do so. A giving or sharing way of thinking also permeates hunter-gatherer life and is why foragers are characterized as extremely cooperative. Bird-David (1990) calls it the “giving environment,” and Sterelny (2012) identifies three types of cooperation among foragers: sharing food, childcare, and information. Hunter-gatherer families often share most of what they acquire on a given day, they share it with everyone in camp, and they share every day. Sharing of childcare is also extensive; cooperative care, including fathers, is more

pronounced in foragers than in other modes of production (Hewlett et al. 2011). The multiple ways information is shared with children is described in several chapters in this volume.

Sanctions exist for foundational schema. Others will tease and joke about an individual's sexual, dancing, or singing abilities if someone starts to think he or she is better than others, draws attention to himself/herself, or does not share (Crittenden, Chap. 5). If a child does not share, others make sounds, gestures, or comments. Children often hear stories about how people who do not share properly face sanctions (e.g., illness, death, death of a child, person who did not share was a sorcerer).

Other general features of forager life include an immediate return economic system, lack of food storage, plenty of leisure time, flexibility in camp composition, high residential mobility (move camps several times a year), relatively few material possessions, and relatively peaceful (Lee and Daly 2004; Kelly 2013). Immediate return means that individuals eat the food they hunted or collected that day or over the next few days; they do not store food (Woodburn 1982). This means that foragers are present oriented. Time allocation studies show that foragers spend less time in obtaining food and have more leisure time than individuals in other modes of production. Camp composition often changes daily with someone moving in or someone moving out. People like to travel and visit relatives in different camps, and conflicts between individuals or families generally mean one of the families changes camps.

1.2.2 Physical and Social Setting: Demography of Forager Social Learning

Forager social learning is at least partially influenced by the demographic composition (size, compactness, sex-age distribution) of forager camps. Hunter-gatherers live in camps of 25–35 people, of which about half are under the age of 15 due to high fertility and mortality (women average about five live births in their lifetimes and about 40 % of them die before age 15) (Hewlett 1991b). This means children have a limited number of same-sex peers and helps to understand why foragers are characterized as (a) having multi-age play groups after weaning and (b) having greater proximity to adults than children in other modes of production.

Population densities of foragers are generally low (a few people per square mile), but the living densities are high because houses are generally only a few meters apart from each other, i.e., camps are very compact. For instance, Aka camps occupy an area of about 56m², the size of a large dining and living room in a home in the US. Aka houses have about 4 m² of space and do not have doors. This means children grow up in an environment with many adults and children living very close by, and that it is easy to go in and

out of other families' houses. This enhances the opportunities for cooperative childcare, attachment to several others, and learning from nonparental adults. It also helps to explain why adults are usually within view or earshot of children.

Divorce and adult deaths are common among foragers (Hewlett 1991a, b). This means that older children and adolescents are not likely to live with both natural parents and that they will live with stepparents or in single-parent homes. This may help to explain why cultural transmission in adolescence may be more oblique than vertical.

Finally, foragers regularly travel great distances, especially in adolescence and early adulthood (MacDonald and Hewlett 1999). Recent studies show that this travel and inter-camp interaction means that foragers meet about 1000 individuals during their lifetime (Hill et al. 2014). These demographics help to understand the extensive number of opportunities forager children may have for social learning (i.e., being able to watch and copy so many others) as well as exposure to and observe more innovations.

1.2.3 Social-Emotional Setting: Cultural Practices that Impact Social Learning

1.2.3.1 Intimacy

Physical proximity and emotional proximity are particularly important to hunter-gatherers (Hewlett et al. 2011). Foragers prefer to be physically close to others. Compact camp composition described above is just one example of this. When hunter-gatherers sit down in the camp, they are usually touching somebody. Cross-cultural studies show that forager caregivers are more likely than caregivers in other modes of production to hold infants, show more signs of affection with infants, and are more responsive to fussing and crying (Hewlett et al. 2000). A study that compared Bofi forager and farmer holding in 2-, 3-, and 4-year-olds found that forager young children were held 44 %, 27 %, and 8 % of daylight hours, while farmer children of the same age were held 18 %, 2 %, and 0 % of the day (Fouts and Brookshire 2009). In a study of conflicts between toddlers and older juveniles among the same hunter-gatherer and farmer groups, Fouts and Lamb (2009) found that hunter-gatherer toddlers were substantially more likely to have conflicts over staying close to juveniles, while farmer toddlers were more likely to have conflicts with juveniles over competition for objects or over the juvenile hitting the toddler, which never occurred among the hunter-gatherer toddlers. Finally, Lewis (Chap. 12) provides another example of the importance of touch from his study of child spirit play singers: "Typically, singers sit together with their limbs resting on one another—literally 'mixing up their bodies' (*bo.sanganye njo*), or dance in tight coordinated formations."

1.2.3.2 Self-Directed

Hunter-gatherer children do pretty much what they want during the day. Children climb into their parents' laps or sit next to them to watch them cook, play an instrument, or make a spear. Forager children often want to learn more than what parents and others want to give. Several chapters in this volume describe the multiple ways in which learning from others was self-motivated and self-directed by children. This pattern is in part due to the egalitarian and autonomy foundational schema. Parents seldom direct forager children (sometimes parents try to give directives with mixed success) because parents respect the autonomy and relatively equal status of the child. This occurs in early infancy. For instance, when Aka forager 3–4-month-old infants breastfed, they took the breast on their own to nurse during 58 % of feeding bouts observations, whereas neighboring farmer infants of the same age initiated breastfeeding on their own in only 2 % of feeding bouts. Farmer mothers decided when to nurse or not the infant. At weaning, hunter-gatherer mothers said the child decided when she/he wanted to wean, while farmer mothers said they decided when to wean and often used dramatic techniques, such as putting red fingernail polish on their nipples and telling their child it is blood. In a study of cosleeping (Hewlett and Roulette 2014) with foragers and farmers, the forager parents said their children slept wherever they wanted, whereas the farmer parents said they told their children where to sleep.

1.2.3.3 Trust of Others

The development of trust of others is important to some degree in all cultures, but the socialization for trust of several others is particularly pronounced in hunter-gatherers, which makes sense given their extensive sharing and giving. Hunter-gatherer infants and young children are breastfed on demand, averaging about four bouts per hour, whereas farmers average about two bouts per hour. Some forager young infants are often breastfed by women other than mother, generally aunts and grandmothers (but sometimes even fathers offered their breast), while among farmers, breastfeeding by other women was thought to cause infant sickness and was not practiced except under unusual circumstances (Hewlett and Winn 2014). Cross-cultural studies show that forager caregivers are significantly more likely than caregivers in other modes of production to respond to infant crying and farmer infants cry significantly longer and more frequently than do forager infants (Hewlett et al. 1998, 2000). As mentioned above, hunter-gatherer infants and young children are held significantly more than similar aged children in other modes of production by many different individuals—fathers, grandmothers, siblings, others. Attachment theory predicts (Bowlby 1983) that the high degree of responsiveness and proximity that forager caregivers provide should enhance forager children's trust of self and self with others.

1.2.3.4 Play

Several chapters in this volume describe the importance of play for learning politics, religion, dance, song, subsistence skills, and knowledge. Play is listed here because it is an integral part of the forager learning environment. Several researchers indicate that hunter-gatherer children in early and middle childhood spend most of the day playing and are not expected to contribute much to subsistence or maintenance (Gosso et al. 2005; Konner 2005). Hadza children are the exception to this general pattern and forage extensively, but this is voluntary and not expected by parents (Crittendon, Chap. 5). By comparison to foragers, children in farming and pastoral communities are more likely to be given responsibilities for childcare and other tasks (Barry et al. 1959). Foragers in middle childhood spend a considerable amount of time playing, playing hunting and gathering, and laying around (Boyette in press; Hewlett and Boyette 2012; Kamei 2005; Imamura, Chap. 12). All of this play takes place in child-only groups, and most of the play involves learning about foundational schema and making a living as a hunter and gatherer as well as learning about the modern world (Boyette in press; Kamei 2005; Pandya, Chap. 16).

The four features of social-emotional setting are mentioned because educators and developmental psychologists indicate that these features enhance social learning (Meir 2002; Nell et al. 2013). Learning processes tend to be enhanced if (a) the learner trusts the teacher, (b) the skill is acquired in emotive and play contexts, (c) the learner is able to engage and direct his/her own learning, and (d) the teacher understands the learners' zone of proximal development and is able to scaffold. Both (a) and (d) develop out of the intimate nature of forager daily life, i.e., physical and emotional proximity promotes the trust as well as detailed understanding by the "teacher" of the "learner" abilities and can therefore sequence and scaffold on what the learner already knows. The social-cognitive features of the hunter-gatherer learning environment help to explain some of the results from the various chapters as well as why forager children learn quickly, easily, and without much verbal instruction. Studies show that forager children know most skills and knowledge necessary to make a living by age 10 (Hewlett and Cavalli-Sforza 1986; Hewlett and Lamb 2005) and in some cases provide up to 50 % of their own calories by age 5 (Crittenden, Chap. 5).

1.3 From Whom and How Do Children Learn?

The next section aims to introduce terminology and debates from diverse theoretical orientations on from whom and how hunter-gatherer children learn. Only a limited overview is

presented here, and Chaps. 2, 3, and 8 provide more detailed literature reviews of the issues. The terminologies and debates are used and discussed in several chapters in the book.

1.3.1 From Whom Do Children Learn?

Children can learn from many different individuals, and researchers from various disciplines have hypothesized about the importance of various potential contributors to social learning. Social-cultural anthropologists and some developmental psychologists indicate culture is a “provider of settings” (Whiting and Whiting 1975) that exposes children to particular types of individuals and learning environments. The Whiting’s (1975) cross-cultural studies of children indicate that the physical and social settings of children pattern their learning opportunities. Culture, primarily subsistence systems, influences where children go during the day, with whom they interact, and potentially what they will learn. If men hunt large game and women gather, children seldom accompany men, and therefore children spend most of the day with their mothers and other children. If both men and women hunt together, such as with several net-hunting Congo Basin foragers, children have learning access to a broad range of adults and children. By contrast, “culture” in nation states requires children to attend formal education schools where children learn from similar aged peers and teachers. Developmental psychologists such as Bronfenbrenner (1979) and Vygotsky (1978) also emphasize how social-cultural institutions impact the individuals from whom children learn.

Evolutionary approaches are also very interested in from whom children learn and have emphasized the trade-offs (i.e., costs and benefits) of learning from different types of individuals. Children are predicted to want to learn from parents in stable environments, but if the environment is rapidly changing, beliefs or practices of parents may be outdated and instead turn to peers or other adults for updating. Evolutionary approaches also indicate that parental transmission of culture contributes to intracultural diversity (each child learns cultural variants from his/her parents) and high conservation of cultural features (more resistant to change). Learning from nonparental others, such as peers (called horizontal) or other adults (called oblique), is impacted by the frequency of interaction with them and can lead to cultural conformity and rapid culture change if interactions are frequent. Both are hypothesized to be pathways for the introduction of innovations. The terms vertical, horizontal, and oblique come from evolutionary theories (Cavalli Sforza and Feldman 1981), but these groups of individuals are equally important for social-cultural anthropologists and developmental psychologists.

For instance, debates exist in cultural anthropology as to whether parents or the general group are more important in the transmission of culture in hunter-gatherer societies (Hewlett and Cavalli Sforza 1986), and debates in developmental psychology focus on whether parents or peers are more likely to impact children’s learning (Harris 1998). Table 1.2 lists and defines these various types of people from whom children can learn.

Evolutionary approaches also emphasize the agency of children and indicate that they use learning strategies when selecting models to imitate. Young children may learn from parents in infancy and early childhood because they are nearby (low cost of learning) and have an emotional bond and trust with parents, but as they get older, they are predicted to evaluate the knowledge and abilities of others in determining which cultural variants to adopt. The “abilities and features” in Table 1.2 identify some of the different qualities of individuals children are hypothesized to consider in making decisions as to whom to watch, imitate, and learn (Rendell et al. 2011; Mesoudi 2011; Henrich and McElreath 2003). Some child development researchers (Harris 2012) are interested in determining factors that influence the “selective trust” of children and indicate that young children preferentially learn from close family members due to the emotional attachment and familiarity, but by middle childhood, emotional trust is less important, and they evaluate the reliability of knowledge and abilities of others as the basis for who they imitate. This is an emerging area of study in hunter-gatherer studies. Research with children from urban industrial cultures with substantial political and economic stratification have demonstrated that older children pay attention to prestige or success, but focused studies with egalitarian foragers are limited (Chudek et al. 2013). Chapters in this volume are some of the first to consider these issues in foragers.

The “group impact” and “institutional forces” in Table 1.2 have been identified as important factors for learning in WEIRD cultures (Rogoff 2003), but few systematic studies with foragers exist. Group impact factors are sometimes called “many-to-one” forms of transmission, are hypothesized to contribute to high conservation of culture, and likely impact learning in hunter-gatherers. Copying the most common cultural variants in a group is likely to occur because forager living densities are high (i.e., camps are small but very compact). Concerted transmission is also likely because adolescent initiation ceremonies for both boys and girls are relatively common in forager cultures (Hewlett and Hewlett 2012; Lewis, Chap. 12). “Institutional forces” are all examples of what are called one-to-many transmission, are hypothesized to contribute to rapid culture change, and are relatively rare in active hunter-gatherer groups (but common in hunter-gatherer groups exposed to formal education and media technologies).

Table 1.2 Potential types of individuals from whom children can learn

	General features
<i>1. Age-kin relationships</i>	
Parents (vertical)	Children learn from parents
Peers (horizontal)	Children learn from similar aged individuals
Other adults (oblique)	Children learn from nonparental adults
<i>2. Abilities and features of individuals</i>	
Prestige	Children want to learn from individuals with qualities admired by the group (e.g., giving, healing, hunting)
Dominance	Children want to learn from individuals who are able to dominate others
Skill/knowledge	Children want to learn from individuals with greater skills or knowledge
Familiarity	Children prefer to learn from individuals who look, sound (same language), and act like them
Attachment	Children are likely to want to stay near and learn from best friends and close family
Gender	Children prefer to learn from children of the same gender
Age	Children prefer to learn from older children and adults
Success	Children are more likely to watch and adopt cultural variants from individuals with more children, resources, or other measures of success
<i>3. Group impact</i>	
Many individuals have the same cultural variant (conformist)	Children observe the group and adopt common cultural variants
Group organizes to transmit cultural variants (concerted)	Adults organize and systematically transmit particular cultural variants, e.g., adolescent initiation rituals
<i>4. Institutional and technological forces</i>	
Institutional teachers	Children learn from teachers in formal schools or in an apprenticeship
Leaders	Children adopt (by choice or imposition) cultural variants transmitted by political leaders
Media technologies	Children adopt cultural variants transmitted by TV, the Internet, and other technologies

1.3.1.1 Previous Hunter-Gatherer Studies on from Whom Children Learn

Early systematic studies with foragers suggested that parents were particularly important. Aka hunter-gatherer adults, adolescents, and children were asked how they learned a

list of 50 skills. Overall, they indicated that about 80 % of their knowledge about subsistence, childcare, sharing, and other skills was acquired from their parents, generally from the same-sex parent (Hewlett and Cavalli Sfora 1986). Other studies with Congo Basin hunter-gatherers (Aunger 2000; Hattori 2010) and North American Cree foragers (Ohmagari and Berkes 1997) that asked adults about how they learned particular knowledge or skills also identified parents as important.

By contrast, several other studies with foragers indicated that peers or nonparental adults were primary transmitters of skills and knowledge. Macdonald (2007) reviewed ethnographies on how children learn to hunt and suggested that both parents and nonparental adults were key contributors, Bird and Bliege Bird (2005) conducted an observational study of Martu children and found that children learn how to hunt lizards without adults and that older children played key roles (horizontal), and Reyes Garcia et al. (2009) interviewed Tsimane forager-farmers about their ethnobotanical knowledge and analyzed who shared knowledge with particular others and found that nonparental adults (oblique) were particularly influential. Reyes-Garcia et al. (2009) found little evidence of horizontal transmission. Building upon the “two-stage” model proposed by Henrich et al. (2008), Hewlett et al. (2011) indicated that early social learning in foragers was primarily vertical, in large part due to attachment and the low cost of learning from nearby parents, whereas in middle childhood and adolescence, children learn more from peers in practice and play and nonparental adults, especially in late adolescence when they evaluate the abilities and status of nonparental adults.

Chapters 2, 4, 6, 7, 13, 17, 18, and 22 consider the abovementioned issues and debates.

1.3.2 How Do Children Learn?

Different theoretical orientations identify various processes by which children learn. This section briefly describes three general theoretical orientations and associated learning processes used by authors in this book.

1.3.2.1 Evolutionary Approaches

All of the chapters in Part I and Chaps. 13, 17, 22, 24, and 25 use evolutionary frameworks to examine topics in social learning. Evolutionists identify several learning processes that occur in animals (Hoppitt and Laland 2013), but studies with humans have focused on imitation and teaching. Table 1.3 lists and provides definitions of the primary processes identified by evolutionary researchers who have studied human social learning (Whiten 2011).

Table 1.3 Social learning processes from evolutionary biology

	Definition and description
<i>Providing access to learn</i>	
Local enhancement	Attention of a child is directed toward a place or resources that a person is interacting with, e.g., taking a walk on a trail to find nuts
Stimulus enhancement	Attention of a child is drawn to objects provided by another person, e.g., giving a child a knife or gathering basket
<i>Observe and copy</i>	
Mimic	The child copies the actions of others without understanding their purpose, goal, or intention. Later the child comes to discover the effects of the action in different situations, e.g., child mimics the behaviors of animals
Emulation	The child observes a particular effect on an object when someone interacts with it. The child is motivated to reproduce the effect but uses her/his own methodology to do so
Imitation	The child copies the actions of a model to obtain the same effects using the same objects
Overimitation	The child copies relevant as well as irrelevant actions to obtain the same effects using the same objects
<i>Other processes</i>	
Teaching, general	Individual modifies his/her behavior to enhance learning in the child
Natural pedagogy	One type of teaching where individual uses cues (e.g., pointing, calling child's name) to draw child's attention to important aspects of a skill or knowledge
Reinforcement	Child receives positive or negative reinforcement for a particular behavior
<i>Learning together</i>	
Collaborative learning	Children utilize one another's resources and skills, e.g., asking one another for information, evaluating one another's ideas, to solve a problem or learn a skill

The first two processes provide social learning opportunities to children by exposing children to particular environments or tools. The daily lived experiences of adults or older children, such as taking children for a walk on forest trails to find fruits, nuts, mushrooms, and other resources, draw the children's attention to these resources, where they are located, prepared, consumed, etc. The "observe and copy" set of processes all deal with various forms of imitation in humans. Considerable debate exists on human imitation. Some researchers (Tomasello 1996) suggest that "true" imitation requires the cognitive capacity for intentionality, which is generally limited to humans, whereas others indicate imitation exists in other animals (Byrne 2002). The "other" processes in Table 1.3 include the evolutionary definition of general teaching and two other forms of teaching, natural pedagogy and behavioral reinforcement.

Chapters 2, 3, 6, 17, and 22 discuss teaching in hunter-gatherers in greater detail.

Chapters by Hagino and Yamauchi (Chap. 11), Lewis (Chap. 12), Yamagami (Chap. 21), and Dira and Hewlett (Chap. 6) provide examples of children's collaborative learning activities and processes. Part VI of the book also uses evolutionary approaches but focuses on macro-level (i.e., stages) analyses of human biocultural evolution to address the Neanderthal question of social learning mentioned above.

1.3.2.2 Social-Cultural Anthropology and Participatory Approaches

As mentioned, social learning has been of interest to social-cultural anthropologists for a long time, but most of the studies with small-scale cultures have been conducted with subsistence farmers. "Socialization" or "enculturation" studies were an important anthropological topic between 1920 and 1970 in part because of the influence of Freudian psychology that indicated adult personality characteristics were determined by childhood socialization practices such as feeding, weaning, and obedience training. The term socialization is not used as much as it was in the past; researchers today are more likely to use the term cultural learning or the anthropology of learning (Lancy et al. 2011).

Social-cultural anthropologists and cross-cultural psychologists who have worked with small-scale cultures have published extensively on learning in cultures without formal education. Table 1.4 identifies and defines some of the social learning processes that have emerged from these studies.

Table 1.4 Social learning processes from social-cultural anthropology and cross-cultural psychology

<i>Key to all social-cultural approaches</i>	
Observation and imitation	Careful observation, listening, and copying of those with skills or knowledge
<i>Forms of teaching</i>	
Direct instruction	Verbal explanation, demonstration
Narrative	Stories with information about skills or knowledge
Feedback	Positive or negative evaluation of skill or behavior
Scaffolding	Mentor uses sequential steps to build upon and be sensitive to the child's existing skill or knowledge level
Formal education	Children learn skills and knowledge through curriculum organized by teacher in institution outside of adult productive activities
<i>Participatory processes</i>	
Intent community participation	Learning through observation and listening during participation in shared endeavors
Legitimate peripheral participation (situated learning)	Children learn skills and knowledge by participating in simple but productive tasks in the community of practice

(continued)

Table 1.4 (continued)

Guided participation	Children acquire skills or knowledge by their active participation in adult activities with experienced individuals
Chores	Children learn skills and knowledge by adults giving them age appropriate productive chores
Apprenticeship	Mentor provides child with learning opportunities by making skills accessible and with some direct instruction
Initiation	Children, primarily adolescents, acquire core values and symbolic culture during adult-directed ritual activities

All researchers working with small-scale cultures emphasize the importance of children's keen observation, listening, and then imitating others with the skills or knowledge. These researchers have argued that formal teaching, as is known in urban industrial cultures, is rare or nonexistent in small-scale cultures. However, all the processes listed in Table 1.4, with the exception of observation and imitation, are processes that are consistent with the evolutionary definition of teaching, i.e., individuals modify their behavior to enhance learning in another (Hewlett et al. 2011; Kline 2014). Gaskins and Paradise (2010) indicate that small-scale cultures use directed instruction, storytelling, and scaffolding, while Lancy and Grove (2010) describe how the chore curriculum, apprenticeships, and initiation ceremonies all contribute to children's social learning. All these processes require demonstrators to modify their behaviors to help others learn.

Several cross-cultural psychologists have compared social learning in informal versus formal education systems and have made significant contributions to the learning literature (Rogoff 2003; Greenfield 2004; Lave and Wenger 2001) by emphasizing that formal education systems are not always efficient and that children's active and motivated participation in adult activities contributes to rapid acquisition of complex skills. Rogoff et al. (1993, 2003) use the terms intent community participation and guided participation, and Lave and Wenger (2001) use the terms situated learning and legitimate peripheral participation to describe the importance of these participatory approaches to learning.

These participatory researchers indicate that multiple processes of social learning are necessary for children to acquire complex skills such as weaving. Greenfield and Lave (1982: 206) conclude their review of learning crafts:

"Teaching by demonstration" is *not* a sufficient characterization of informal teaching techniques... "Learning by observation and imitation" is *not* sufficient to account for learning activities in either the weaving or tailoring settings... (italics from authors).

They go on to say that other processes such as verbal explanation, cooperative learning, scaffolding, and trial and error also contribute to the learning of these crafts. Hunter-gatherer researchers have seldom utilized participatory approaches (but see Takada 2015 for a recent exception) possibly because foragers do not have formal apprenticeships or craft specialization, the focal topics of major contributors to this approach (i.e., Rogoff, Greenfield, Lave, and Lancy). The chapters in Part II as well as chapters by Lewis (Chap. 12) and Imamura (Chap. 15) are some of the first to use these approaches in foraging communities, and chapters by Koyama (Chap. 20) and Takada (Chap. 8) provide examples of scaffolding.

1.3.2.3 Social Learning and Play

The abovementioned "participatory" approaches tend to emphasize children's engagement in adult productive "work," such as chores, learning a craft, or, in the case of foragers, participating in hunting and gathering. Another context of social learning that has received less attention by social-cultural anthropologists is play (see Chick 2010 for a review). Social-cultural anthropologists and developmental psychologists have described various types of play, such as rough and tumble play, pretend role-play play, and games with rules. Developmental psychologists (Pelligrini 2009) indicate children's play has three functions: learning future skills, learning skills for current survival and adaptation, and a source of innovation to adapt to new environments. The limited number of hunter-gatherer studies of play (Kamei 2005; Bock 2005a, b; Gosso et al. 2005; Hewlett and Boyette 2012) and the chapters in this volume provide empirical support for the first two, but question the last. Play is an integral part of hunter-gatherer life. Foragers may play more often than individuals in other subsistence systems because they have relatively more leisure time than in other ways of life (Lee and Daly 2004). As in other cultures, the frequency of play in forager childhood declines with age (Boyette, Chap. 13), but ethnographers emphasize its persistence into adulthood (Imamura, Chap. 14). Chapters by Lewis (Chap. 12), Dira and Hewlett (Chap. 6), and Musharbash (Chap. 14) demonstrate how adults use play and humor to promote the learning of core values, skills, and knowledge. Chapters by Boyette (Chap. 13), Imamura (Chap. 15), and Musharbash (Chap. 14) illustrate how play with other children enhances social learning of forager's skills and knowledge.

1.3.2.4 Social Learning and Embodiment

Social-cultural anthropologists' embodiment approaches to social learning emphasize that learning occurs through the body and is not just in the mind (Ingold 2001). When learning to dance, a child imitates others but the learning is not limited to cognitive or symbolic knowledge in the mind;

the information and knowledge are also stored in many parts of the body (e.g., in muscles and neurons) (Downey 2010). The approach is somewhat consistent with the participatory approaches because it focuses on “doing” particular activities as well as with Bourdieu’s (1977) emphasis as *habitus* as the central way children learn culture, but participatory and *habitus* approaches do not focus on the body. Chapters by Kaneko (Chap. 18), Takada (Chap. 8), Sonoda (Chap. 9), Hagino and Yamauchi (Chap. 11), and Peng (Chap. 7) emphasize the importance of bodily movement and active participation and involvement in the acquisition of culture.

1.3.2.5 Social Learning and Language

The evolutionary processes of learning described above are useful for understanding social learning from a cross-species perspective, but they are limited because spoken language is unique to humans. Clearly, language is a key cognitive ability in humans that enables rapid, precise, and high-fidelity social learning. The participatory approaches and several chapters in this volume indicate that verbal explanations and interactions are limited in small-scale culture social learning (especially in comparison to formal education systems), but it can and is used in several important ways. Chapters by Takada (Chap. 8), Sonoda (Chap. 9), and Musharbash (Chap. 14) illustrate the subtle but key ways that language facilitates social learning.

1.3.2.6 Indigenous Approaches to Social Learning

Another social-cultural anthropology approach to social learning might be called indigenous, native, or “emic.” This approach focuses on how local people think and feel about how children learn skills and knowledge. Chapters by Naveh (Chap. 10) and Omura (Chap. 23) in particular provide insights into how foragers think about how children learn. Some indigenous ideas are consistent with the processes listed in Tables 1.3 and 1.4 (i.e., by watching and imitating, participating), but some local perspectives provide insight into other ways of thinking about how children learn (e.g., togetherness of making knowledge in Naveh, Chap. 10).

1.4 Innovation

Few studies exist on social learning in foragers, but even fewer studies have been conducted on innovation in contemporary hunter-gatherers (see Jordan 2014 for a recent exception). It is unfortunate because innovation is key to understanding cumulative culture and human abilities to adapt to new or changing natural and social environments. The social learning mechanisms described above contribute to keeping a vast array of cultural variants in a population

long enough and with high enough fidelity so that innovations can be added to and sometimes (not all aspects of culture are adaptive) improve upon existing cultural variants. Innovation is the source of cultural variability and complexity.

Some researchers distinguish invention (creating something new) from innovation—invention that is adopted by many others (i.e., it is a successful invention) (O’Brien and Shennan 2010). The three chapters in Part IV and several chapters in Part V of the book examine innovations—new techniques, beliefs, or practices that have been adopted by others. Research shows that the vast majority of innovations are not entirely new; they are novel recombinations or small additions to existing beliefs, practices, technology, institutions, etc. The chapters in this volume examine some of the following questions: Who innovates? Why do they innovate? What do they innovate? Who adopts the innovations? How do others acquire the innovations?

Theoretical and observational reasons exist to suggest that creativity and innovation are common among hunter-gatherers. Theoretically, Henrich (2010) indicates that demography is key for understanding innovation and hypothesizes that the innovativeness (i.e., rate of innovation) of a culture is based largely upon its population size and the nature of its cultural interconnectivity (e.g., ritual, political, economic, and other networks that encourage contacts with other people). Forager population densities are low, but they are known for their extensive and regular long-distance travel as well as their ritual-economic networks. MacDonald and Hewlett (1999) show that foragers travel farther than farmers during their lifetime, often to visit distant family and friends. In terms of cultural long-distance social networks, Wiessner (1977) describes extensive *hxaro* exchange networks among the !Kung San, and Lewis (2015) identifies the extensive networks and movement of spirit plays and dances among the BaYaka. The recent Hill et al. study (2014) on the social-economic networks of two forager groups, Aché and Hadza, found that an average forager meets about 1000 others during his/her lifetime.

Common social structures of forager life may also contribute to regular innovation. Some forager cultural structures encourage “do what the rest of the group is not doing.” Evolutionary theorists call this anticonformist bias (Henrich and Boyd 1998), and those that study music and dance cross-culturally call it “improvisation” (Furniss 2014). Forager dances and songs are often organized and structured in a way that encourages innovation or modification. Dances may start in lines with everyone doing the same movements and steps, but there comes a point when each individual moves out of the line or the circle and dances on his/her own using different steps and movements. Furniss (2014) provides the details of the improvisation that is structured into Congo Basin forager music. In the passage below,

Lewis (Chap. 12) demonstrates how the autonomous modifications of individuals are incorporated into BaYaka song:

Each singer has to hold their own melody, avoiding entrainment to melodies sung by others (if too many sing the same melody the polyphony dissolves), while being in harmony with them. This cultivates a particular sense of personal autonomy that is not selfish or self-obsessed, but is keenly aware of what others are doing and seeks to complement this by doing something different.

1.5 What's New?

The material above provides an overview of the theoretical and topical issues that authors in this volume used to frame their studies of social learning and innovation. This section highlights a limited number of relatively new and insightful results from particular chapters. The theoretically and methodologically diverse approaches provide important and sometimes novel contributions to the literature.

Some results from hunter-gatherer research were consistent with studies of social learning with subsistence farmers: (a) authors consistently reported that observation and imitation were the most common learning processes; (b) the majority of authors indicated that direct verbal instruction was either explicitly discouraged or very rare; (c) several authors indicated that children seldom, if ever, asked questions when trying to acquire a particular skill or knowledge; and (d) several authors indicated that foragers primarily learned by practice and doing, i.e., participation in daily activities and bodily engagement, rather than by linguistic articulation. These features of social learning appear to be common to most small-scale or “traditional” cultures.

1.5.1 From Whom Forager Children Learn?

- (a) Reyes-Garcia et al. (Chap. 4) provide cross-cultural evidence for a multistage model (versus the two-stage model of Henrich and Broesch (2011)) of cultural transmission where vertical transmission is important in infancy and young childhood and horizontal transmission and oblique transmission become more common in middle childhood and adolescence.
- (b) Vertical transmission was important in infancy and early childhood (Hewlett et al., Chap. 3; Musharbash, Chap. 14); horizontal transmission of skills and knowledge was particularly important in observational field studies of middle childhood (Reyes-Garcia et al., Chap. 4; Lewis, Chap. 12; Boyette, Chap. 13; Imamura,

Chap. 15; Pandya, Chap. 16); and oblique transmission was common in late adolescence (Reyes-Garcia et al., Chap. 4; Dira and Hewlett, Chap. 6; BL Hewlett, Chap. 17).

- (c) A cross-cultural literature review of hunter-gatherer ethnographers that describe social learning found that vertical transmission and oblique transmission over a broad range of skills and knowledge were equally important, but that ethnographers (Garfield et al., Chap. 2) infrequently mentioned horizontal transmission.
- (d) Different methods to evaluate modes of transmission and acquisition may contribute to different results. Dira and Hewlett (Chap. 6) found that when Chabu adults were asked about from whom boys generally learn to spear hunt, all informants answered fathers (vertical); when the adult men were asked how they themselves learned to spear hunt, 80 % said their father; but when adolescents were asked about how they recently learned to spear hunt, only 18 % mentioned their fathers. Only 11 % reported going on their first spear hunt with their father, and only 14 % preferred to spear hunt with their father. Observational and time allocation studies of Baka and Aka middle childhood indicate that forager children spent most of their day with other children and that horizontal transmission was especially important (Reyes Garcia et al., Chap. 4; Boyette, Chap. 13), whereas the literature review found little evidence of horizontal transmission.

1.5.2 How Do Forager Children Learn?

- (a) Various forms of teaching, defined as modification of behavior to enhance learning in others, exist in hunter-gatherers (Chaps. 2, 3, 15, 17, and 23). It is particularly common in Aka forager infancy, its frequency declines in middle childhood, and increases in frequency in adolescence with the acquisition of complex skills and knowledge. The cross-cultural study of social learning indicated that teaching (from demonstration to storytelling) was the most common process of social learning reported by ethnographers.
- (b) A particular form of teaching, natural pedagogy, existed in hunter-gatherer infancy, but the process relied more on touch and pointing and less on verbal interactions (i.e., the use of personal name, motherese) than it did in urban industrial cultures (Hewlett et al., Chap. 3). Teasing, described in several chapters, used many features of natural pedagogy—i.e., children had to pay attention to the adult's use of facial expressions, gestures, and tone of voice in order to obtain the meaning of the teasing

- (Omura, Chap. 23). Yamagami (Chap. 21) described how Baka children seldom talked during her experiments but were more likely to use pointing, gazing, and murmuring to draw attention to something, and Sonoda's (Chap. 9) microanalysis of rat hunting provided several instances where older children or adults used pointing to draw a child's attention to something, e.g., a rat, a rat tunnel, or where a rat may run.
- (c) On the other hand, several authors indicated that some forms of teaching (e.g., verbal explanation, scolding, direct teaching) were explicitly discouraged or avoided (Lewis, Chap. 12; Naveh; Chap. 10; Omura, Chap. 23) because they were inconsistent with forager foundational schema of autonomy and egalitarianism. Omura stated "teaching, scolding, or forcing teenagers to do something is considered discourteous because they do have reason, albeit under-developed, and thus must be accorded respect for their autonomy."
- (d) Several authors stated that teaching was rare or that a word for teaching did not exist, but the authors were generally referring to direct verbal instruction common to formal education systems. Many cultures did not have terms for teaching, but some had a term for advice. Omura (Chap. 23) states that Inuit are "virtually forbidden from teaching teenagers," but much of the chapter described how adults use playful teasing (a form of teaching) to prepare children for "the spirit of approaching difficulties." Lewis (Chap. 12) stated BaYaka do not have a word for teaching but describes an example of teaching when young children learn music "Any infant or small child that makes an attempt at musical performance is immediately and often lavishly praised, and encouraged to continue regardless of the quality of their performance."
- (e) Microlevel analysis of videotapes picked up more subtle and brief instances of teaching and verbal guidance (both teaching and verbal information often occur within a few seconds) than did informal participant observation or focal follows.
- (f) While rare and limited, verbal guidance and children asking questions were evident in a few chapters. Sonoda's (Chap. 9) study showed that the oldest person in a rat-hunting expedition verbally instructed others about a wide range of actions, e.g., "you leave the rat, even if he comes up," and "go look there." Dira and Hewlett (Chap 6) found that on actual spear hunts, adults regularly gave brief verbal guidance to adolescents during the hunt. Takada (Chap. 8) described how teenage girls verbally encouraged and guided a 3-year-old dancing. But in all the abovementioned cases, the verbal comments were very limited and brief.
- (g) Rough teasing of children is used in several forager groups (Crittenden, Chap. 5; Dira and Hewlett, Chap. 6; Omura Chap. 23; Musharbash, Chap. 14). Rough teasing of children was used to help children learn to share, how to hunt, what is dangerous in the environment, about the difficulties of life, about how to control emotions, and how to become what is considered a mature adult in the culture. Rough teasing may be an extension of rough joking (i.e., joking insults to someone who tries to draw attention to himself) frequently described in the hunter-gatherer literature and hypothesized to be a mechanism to maintain egalitarianism (Lee and Daly 2004). Teasing can be a form of teaching as well as a form of play.
- (h) Overimitation exists in hunter-gatherer adults but occurs less frequently in younger children than it does in many studies of children in urban industrial settings (Hewlett et al., Chap. 3).
- (i) Collaborate learning among children is an important social learning process in hunter-gatherers. Hagino and Yamauchi (Chap. 11) indicated Baka children collaboratively learn to bail fish and hunt for rats without the presence of any adults, Lewis (Chap. 12) described several instances of children learning collaboratively to dance and sing, Dira and Hewlett (Chap. 6) described how children in middle childhood collaboratively learned to spear hunt through role-playing, and Omura (Chap. 23) stated that collaborative learning was a key process by which Inuit children learn to hunt.
- (j) Kinesthetic movement and gestures were important features of forager learning in several chapters (Takada, Chap. 8; Sonoda, Chap. 9; Lewis, Chap.; 12; Naveh, Chap. 10).
- (k) Competition was rare in forager social learning. Competitive games with rules were rare (Boyette, Chap. 13), and Yamagami (Chap. 21) reported that competition between children was rare in her art experiments.
- (l) Evidence exists that selected trust and model-based biases exist in foragers. Dira and Hewlett (Chap. 6) found that adolescent Chabu boys preferred to spear hunt more frequently with nonparental adults with reputations for getting lots of game or knowing the forest trails even though their fathers were present. BL Hewlett (Chap. 17) found that Aka and Chabu innovators had prestige and that many adolescents sought to learn from them.
- (m) Evidence exists that teaching ability is another feature of children's selected trust (from those listed in Table 1.2). Aka adolescents sought out innovators who were good teachers (BL Hewlett, Chap. 17), and some Chabu adolescents indicated that they preferred to

learning to spear hunt from good teachers (Dira and Hewlett, Chap. 6).

- (n) The desire to play motivated learning and children learned about religion, political, and economic practices through play (Lewis, Chap. 12; Pandya, 16).

1.5.3 Innovation

- (a) Young and middle-aged Aka adults rather than adolescents or other children created technological innovations, and these innovations were transmitted from adults (oblique) rather than peers (horizontal) (BL Hewlett, Chap. 17).
- (b) More stylistic innovations were created by Baka children working on collaborative art projects than children working on projects on their own (Yamagami Chap. 21).
- (c) A market economy increased the innovation rates of commodities traded or sold at markets (Kaneko, Chap. 18; BL Hewlett, Chap. 17; Kubota, Chap. 19).
- (d) Vertical transmission (parent to child) of innovations in craft specializations (clay pots, art for markets) was common (Kaneko, Chap. 18; BL Hewlett, Chap. 17; Kubota, Chap. 19).
- (e) Chabu innovations were transmitted by observation, imitation, and teaching (BL Hewlett, Chap. 17), whereas Aari innovations were transmitted by observation and imitation (Kaneko, Chap. 18).
- (f) Aka children spent more time in creative play—providing practice in invention/innovation—than in imitation of adults or peers (Boyette, Chap. 13).

1.6 Organization of the Book

The book is organized into six parts. The first two parts are organized by theoretical orientation: Part I focuses on evolutionary approaches to social learning, while chapters in Part II utilize theoretical orientations from social-cultural anthropology. The Garfield et al. chapter in Part I is different from most of the other chapters in the book because the study is based upon a cross-cultural review of the hunter-gatherer literature on social learning. All of the other chapters are field-based ethnographic studies of social learning. Part III uses a variety of theoretical perspectives to examine how play in hunter-gatherers is used to learn egalitarianism, dance, song, religion, and deal with the outside world. Part IV as well as some chapters in Part III consider innovation in hunter-gatherers. Part V has two chapters

by developmental psychologists on the cognitive abilities of Baka foragers of Cameroon. The final chapters in Part VI focus on how the study of social learning in contemporary hunter-gatherers helps researchers understand the human evolution question of why Neanderthals were replaced by modern humans.

Finally, we did not require authors to adhere to a standardized set of definitions because they came from different disciplines and utilized various theoretical and methodological approaches. Most authors are social-cultural anthropologists, but others are developmental psychologists, educators, and biological anthropologists.

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