Chapter 4 looked at **macroevolution** as applied to the history of humans and their closest relatives. This chapter shifts the focus to **microevolution**, which devotes attention to short-term evolutionary changes that occur within a given species over relatively few generations. It is measured in what is sometimes called "ecological time," or the timescale experienced by organisms living and adapting to their ecological settings.

What Is Microevolution?

The Modern Evolutionary Synthesis and Its Legacy

In the 1930s and 1940s, biologists and geneticists worked to formulate a new way of thinking about evolution that combined Darwinian natural selection and Mendelian ideas about heredity. Until recently, this approach (called the "modern evolutionary synthesis" or "neo-Darwinism") dominated research and thinking in biology. As we saw in Chapter 2, contemporary evolutionary theorists have challenged, expanded, and enriched this neo-Darwinian research program, much the way the formulators of the modern synthesis had earlier challenged, expanded, and enriched the contributions made by Darwin, Mendel, and other early evolutionary thinkers. But some achievements of the modern synthesis remain fundamental to our understandings of living organisms. In anthropology, perhaps the most significant contribution of neo-Darwinism was the way it undermined the nineteenth-century anthropological concept of "biological race," refocusing attention on a new understanding of biological species. After World War II, anthropologists like Sherwood Washburn rejected the old, race-based physical anthropology of the nineteenth and early twentieth centuries and replaced it with a "new physical anthropology" or "biological anthropology." Research in biological anthropology took for granted the common membership of all human beings in a single species and addressed human variation using concepts and methods drawn from neo-Darwinism (Strum et al. 1999).

Biologists have proposed alternative definitions of **species** that attempt to respect the purpose of Darwinian taxonomy, which is to represent scientists' best current understanding of the relationships between and among organisms. As biological anthropologist John Fleagle points out, "Most biologists agree that a species is a distinct segment of an evolutionary lineage, and many of the differences among species concepts reflect attempts to find criteria that can be used to identify species based on different types of information" (Fleagle 2013, 2). Neo-Darwinians defined a species as "a reproductive community of populations (reproductively isolated from others) that occupies a specific niche in nature" (Mayr 1982, 273). This definition, commonly referred to as the *Biological Species Concept,* has been useful to field biologists studying populations of living organisms. However, this definition of species has been less useful for scientists studying fossils. In fact, Fleagle notes that the Biological Species Concept has even been losing favor among field biologists because "as more and more 'species' have been sampled genetically, it has become clear that hybridization between presumed species has been very common in primate evolution" (Fleagle 2013, 1; see also Stringer 2012, 34).

As we saw in Chapter 3, many taxonomists working with living primates prefer to use the *Phylogenetic Species Concept,* which identifies species on the basis of a set of unique features (morphological or genetic) that distinguish their members from other, related species. Contemporary paleoanthropologists also often rely on this concept of species, as we saw in Chapter 4, although they also sometimes apply a Phenetic Fossil Species Concept. Users of the Phenetic Fossil Species Concept first attempt to calculate the measurable morphological differences between living species. They then assume that similar degrees of morphological difference may also be used to distinguish species in the fossil record. Fleagle observes that this concept can be a useful way to sort fossils in a continuously changing lineage "in which the endpoints may be very different but individual samples overlap" (2013, 2).

Species normally are subdivided into *populations* that are more or less scattered, although the separation is not complete. That is, populations of the same species (or individual members of those populations) may be separated at one time, but may merge together again, and successfully reproduce, at a later time. Evolutionary theorists Ian Tattersall and Rob DeSalle describe this process of species differentiation and reintegration as *reticulation* (Tattersall and DeSalle 2011, 50). They emphasize that reticulation takes place *within species* and that the "resulting weblike pattern of relationships is very different from the dichotomous pattern among species"

microevolution A subfield of evolutionary studies that devotes attention to short-term evolutionary changes that occur within a given species over relatively few generations of ecological time.

macroevolution A subfield of evolutionary studies that focuses on long-term evolutionary changes, especially the origins of new species and their diversification across space and over millions of years of geological time.

species A distinct segment of an evolutionary lineage. Different biologists, working with living and fossil organisms, have devised different criteria to identify boundaries between species.