Most people are extremely skilled in many everyday movements like standing, walking, or climbing stairs. By the time children are two, they are skilled walkers with little instruction from parents aside from emotional encouragement. Unfortunately, modern living does not require enough movement to prevent several chronic diseases associated with low physical activity (USDHHS, 1996). Fortunately, many human movement professions help people to participate in beneficial physical activities. Physical Educators, coaches, athletic trainers, strength & conditioning coaches, personal trainers, and physical therapists all help people reap the benefits of physical activity. These human movement professions rely on undergraduate training in kinesiology, and typically require coursework in biomechanics.

**WHAT IS BIOMECHANICS?**

Biomechanics has been defined as the study of the movement of living things using the science of mechanics (Hatze, 1974). Mechanics is a branch of physics that is concerned with the description of motion and how forces create motion. Forces acting on living things can create motion, be a healthy stimulus for growth and development, or overload tissues, causing injury. Biomechanics provides conceptual and mathematical tools that are necessary for understanding how living things move and how kinesiology professionals might improve movement or make movement safer.

Most readers of this book will be majors in departments of Kinesiology, Human Performance, or HPERD (Health, Physical Education, Recreation, and Dance). Kinesiology comes from two Greek verbs that translated literally means “the study of movement.” Most American higher education programs in HPERD now use “kinesiology” in the title of their department because this term has come to be known as the academic area for the study of human movement (Corbin & Eckert, 1990). This change in terminology can be confusing because “kinesiology” is also the title of a foundational course on applied anatomy that was commonly required for a physical education degree in the first half of the twentieth century. This older meaning of kinesiology persists even today, possibly...
because biomechanics has only recently (since 1970s) become a recognized specialization of scientific study (Atwater, 1980; Wilkerson, 1997).

This book will use the term kinesiology in the modern sense of the whole academic area of the study of human movement. Since kinesiology majors are pursuing careers focused on improving human movement, you and almost all kinesiology students are required to take at least one course on the biomechanics of human movement. It is a good thing that you are studying biomechanics. Once your friends and family know you are a kinesiology major, you will invariably be asked questions like: should I get one of those new rackets, why does my elbow hurt, or how can I stop my drive from slicing? Does it sometimes seem as if your friends and family have regressed to that preschool age when every other word out of their mouth is “why”? What is truly important about this common experience is that it is a metaphor for the life of a human movement professional.

Professions require formal study of theoretical and specialized knowledge that allows for the reliable solution to problems. This is the traditional meaning of the word “professional,” and it is different than its common use today. Today people refer to professional athletes or painters because people earn a living with these jobs, but I believe that kinesiology careers should strive to be more like true professions such as medicine or law.

People need help in improving human movement and this help requires knowledge of “why” and “how” the human body moves. Since biomechanics gives the kinesiology professional much of the knowledge and many of the skills necessary to answer these “what works?” and “why?” questions, biomechanics is an important science for solving human movement problems. However, biomechanics is but one of many sport and human movement science tools in a kinesiology professional’s toolbox. This text is also based on the philosophy that your biomechanical tools must be combined with tools from other kinesiology sciences to most effectively deal with human movement problems. Figure 1.1a illustrates the typical scientific subdisciplines of kinesiology. These typically are the core sciences all kinesiology majors take in their undergraduate preparations. This overview should not be interpreted to diminish the other academic subdisciplines common in kinesiology departments like sport history, sport philosophy, dance, and sport administration/management, just to name a few.

The important point is that knowledge from all the subdisciplines must be integrated in professional practice since problems in human movement are multifaceted, with many interrelated factors. For the most part, the human movement problems you face as a kinesiology professional will be like those “trick” questions professors ask on exams: they are complicated by many factors and tend to defy simple, dualistic (black/white) answers. While the application examples discussed in this text will emphasize biomechanical principles, readers should bear in mind that this biomechanical knowledge should be integrated with professional experience and the other subdisciplines of kinesiology. It is this interdisciplinary approach (Figure 1.1b) that is essential to finding the best interventions to help people more effectively and safely. Dotson (1980) suggests that true kinesiology professionals can integrate the many factors that interact to affect movement, while the layman typically looks at things one factor at time. Unfortunately, this interdisciplinary approach to kinesiology instruction in higher education has been elusive (Harris, 1993). Let’s look at some examples of human movement problems where it is particularly important to