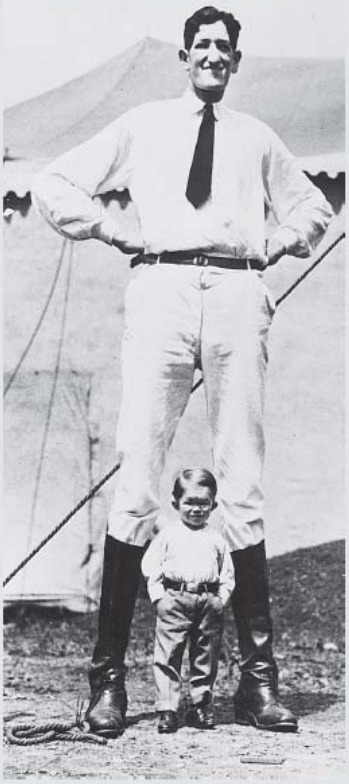
CLINICAL FOCUS

Bone Disorders

GROWTH AND DEVELOPMENT DISORDERS

Giantism is a condition of abnormally increased height that usually results from excessive cartilage and bone formation at the epiphyseal plates of long bones (figure B). The most common type of giantism, **pituitary giantism,** results from excess secretion of pituitary growth hormone. The large stature of some individuals, however, can result from genetic factors rather than from abnormal levels of growth hormone. **Acromegaly** (ak-rō-meg′ă-lē) is also caused by excess pituitary growth hormone secretion; however, acromegaly involves the growth of connective tissue, including bones, after the epiphyseal plates have ossified. The effect mainly involves increased diameter of all bones and is most strikingly apparent in the face and hands. Many pituitary giants also develop acromegaly later in life.

Dwarfism, the condition in which a person is abnormally short, is the opposite of giantism (see figure B). **Pituitary dwarfism** results when abnormally low levels of pituitary growth hormone affect the whole body, thus producing a small person who is normally proportioned. **Achondroplasia** (ă-kon-drō-plā′zē-ă), or **achondroplastic** (ă-kon-drō-plas′tik) **dwarfism,** is the most common type of dwarfism; it produces a person with a nearly normal-sized trunk and head but shorter than normal limbs. Achondroplasia is an autosomal-dominant trait. Approximately 80% of cases result from a spontaneous mutation of the fibroblast growth factor receptor gene on chromosome 4 during the formation of sperm cells or oocytes. Thus, the parents of most achondroplastic dwarfs are of normal height and proportions. The normal effect of the gene is to slow bone growth by inhibiting chondrocyte division at the epiphyseal plate. Mutation of the gene results in a "gain of function," in which the normal inhibitory effect is increased, resulting in severely reduced bone growth in length.



Giant and dwarf

FIGURE B **Bone Disorders**

BACTERIAL INFECTIONS

Osteomyelitis (os′tē-ō-mī-ĕ-lī′tis) is bone inflammation that often results from bacterial infection. It can lead to complete destruction of the bone. *Staphylococcus aureus,* often introduced into the body through wounds, is a common cause of osteomyelitis. Bone tuberculosis, a specific type of osteomyelitis, results from spread of the tubercular bacterium (*Mycobacterium tuberculosis*) from the initial site of infection, such as the lungs to the bones through the circulatory system.

TUMORS

Many types of tumors cause a wide range of resultant bone defects with varying prognoses. Tumors can be benign or malignant. Malignant bone tumors can metastasize to other parts of the body, or they can spread to bone from metastasizing tumors elsewhere in the body.

DECALCIFICATION

Osteomalacia (os′t-ē-ō-mă-lā′shē-ă), or the softening of bones, results from calcium depletion from bones. If the body has an unusual need for calcium—such as during pregnancy, when growth of the fetus requires large amounts of calcium—it can be removed from the mother's bones, which become soft and weakened. **Osteoporosis,** which is a major disorder of decalcification, is discussed in the "Systems Pathology" section on p. 196.