FRACTURE FIXATION

1a

A typical bicondylar fracture in which a wiring technique is used. The wire is led by a surgical needle to attach the fragments.

1b

External fixators (left) are used to hold pins which have been inserted through the fracture fragments. Or pins and screws may be inserted alone (right). From Radin.
External Fixations

Screws are placed into the bone above and below the fracture, and a device is attached to the screws from outside the skin, where it may be adjusted to realign the bone.

Internal Fixations

Fractures of the wrist and hand

Percutaneous fixation of scaphoid fracture with a Herbert screw

Internal Fixations (cont.)

To stabilize a long bone fracture, a plate and screws outside the bone or a rod inside the bone may be used.
Two variations in screw threads
From Park and Lakes.

Various for bone plates.

Compression of fracture site through use of a dynamic plate either equipped with a jack (top) or through the seating of screws (bottom).
From Park and Lakes.
Variation in bending moment for various designs of bone plates. From Park and Lakes.

Bone plate positioning and normal loading modes for various fractures. From Radin.

Fixation of an orbital fracture with a titanium mesh. From Mermer and Orban.
Fixation of a metaphysial fracture through a highly cancellous region with a combination of plates, bolts, and screws.
From Park and Lakes.

Femoral and tibial nails.

Variations in cross-sectional geometries for hip nails.
From Park and Lakes.
Hip nail for fixation of femoral (intertrochanteric) fractures. From Park and Lakes.

Intramedullary rods are used for internal fixation of long bone fractures and may be designed for insertion from either the proximal or distal ends.

From Park and Lakes.

Intramedullary nailing of a broken femur under fluoroscopy
Examples of cross-sectional geometries of intramedullary rods. From Radin.

Natural tissue bone grafts (bottom) and calcium phosphate bone substitutes (right).

Grafton is demineralized bone matrix available in gel or fabric form.
Drawings of dental implants showing their integration with the jaw bone. From Radin (left) and Park (right).

JOINT REPLACEMENTS

Anatomy and cartilage contact surface of the hip. From Park and Lakes.
Various designs for total hip arthroplasty. From left: Ball and Socket, Double Cup, Trunion, Retained Ball and Socket. From Park and Lakes.

Various methods of hip stem fixation. From Park and Lakes.
Theoretical variation in fixation strength due to resorbable cement and bone ingrowth. From Park and Lakes.
Typical design of a hip implant without a proximal lip. From Park and Lakes.

Typical design of a press-fit hip implant with a proximal lip. Typical design of a cemented hip stem with a proximal lip. From Park and Lakes.

Typical design of a hip stem with porous coating limited to the proximal region. Typical design of a hip implant with full porous coating layer. From Park and Lakes.
Anatomy of the knee.
From Park and Lakes.

Knee Replacement

Total Knee Replacement (TKR)

Designs of various knee implants.
From Park and Lakes.
Designs of various congruent (top) and incongruent (bottom) ankle implants. From Park and Lakes.

Anatomy of the shoulder. From Park and Lakes.

Shoulder Joint Replacement
Three designs of shoulder implants.
From Park and Lakes.

Various designs of wrist implants.
From Park and Lakes.

Finger implants
Various designs of finger implants.
From Park and Lakes.