19 bones and 19 joints are necessary to produce all the motions of the hand.
The Hand

- Dorsal aspect
- Palmar aspect
- The digits are numbered 1-5
  - Thumb = #1
  - Little finger = #5
Osteology of the Hand

- 5 metacarpals
- 5 proximal phalanges
- 4 middle phalanges
- 5 distal phalanges

- Proximal end of metacarpals and phalanges = base
- Distal end of the metacarpals and phalanges = head

Lippert pg 174
Joints of the Hand

- Carpometacarpal joints (CMC)
  - Articulation between proximal metacarpal and distal row of carpals (5)
- Metacarpophalangeal joints (MCP)
  - Articulation between distal metacarpals and proximal phalanges (5)
- Interphalangeal joint (IP)
  - Articulation between phalanges in thumb (1)
- Proximal interphalangeal joints (PIP)
  - Articulation between proximal and middle phalanges of digits 2-5 (4)
- Distal interphalangeal joints (DIP)
  - Articulation between middle and distal phalanges of digits 2-5 (4)
The Hand Joints

- Distal Interphalangeal Joints (DIP)
- Interphalangeal Joints (IP)
- Proximal Interphalangeal Joints (PIP)
- Metacarpophalangeal Joints (MCP)
- Carpometacarpal Joints (CMC)
Joint Structure of the Thumb

- CMC joint
  - Saddle joint
    - Articulation of trapezium and 1st metacarpal
    - Allows for: flexion, extension, abduction, adduction, opposition, reposition

- MCP joint
  - Hinge joint
    - Allows for flexion, extension

- IP joint
  - Hinge joint
    - Allows for flexion, extension
Thumb Motions

- Flexion/extension
- Abduction/adduction
- Opposition/reposition
  - Opposition is a combination of flexion and abduction
  - Reposition is a return to anatomical position

Lippert pg 172
Joint Structure of the Fingers

- CMC joints
  - Plane joint that provides more mobility than stability
  - Articulation between trapezoid, capitate, hamate and metacarpals 2-5

- MCP joints
  - Condyloid joints
  - “knuckles”
  - Articulation between distal metacarpals and proximal phalanges
  - Allow for: flexion, extension, abduction, adduction, hyperextension

- PIP and DIP
  - Hinge joints
  - Articulation between phalanges
  - Allow for: flexion, extension

Lippert pg 173
Finger Motions

- Flexion/extension
- Abduction/adduction
  - Middle finger is the reference point
Name the Joints of the Hand
Myology of the Hand

- Anterior muscles
  - Flexor digitorum superficialis
  - Flexor digitorum profundus
  - Flexor pollicis longus

- Posterior muscles
  - Abductor pollicis longus
  - Extensor pollicis brevis
  - Extensor pollicis longus
  - Extensor digitorum
  - Extensor indicis
  - Extensor digiti minimi

Lippert pg 176
Myology of the Hand: Extrinsic

**Flexor Digitorum Superficialis**

<table>
<thead>
<tr>
<th>Origin</th>
<th>Common flexor tendon on the medial epicondyle of the humerus, coronoid process of the ulna and radius lateral to the bicipital tuberosity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion</td>
<td>By 4 tendons, each to the sides of the middle phalanges of the fingers</td>
</tr>
<tr>
<td>Innervation</td>
<td>Median n.</td>
</tr>
<tr>
<td>Action</td>
<td>MCP and PIP flexion</td>
</tr>
<tr>
<td>“tidbit”</td>
<td>What’s in a name?</td>
</tr>
</tbody>
</table>
### Myology of the Hand: Extrinsic

**Flexor Digitorum Profundus**

<table>
<thead>
<tr>
<th><strong>Origin</strong></th>
<th>Anterior ulna and interosseous membrane</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Insertion</strong></td>
<td>By 4 tendons, each to the base of the distal phalanx of digits 2-5</td>
</tr>
<tr>
<td><strong>Innervation</strong></td>
<td>Medial half: Ulnar n.</td>
</tr>
<tr>
<td></td>
<td>Lateral half: Median n.</td>
</tr>
<tr>
<td><strong>Action</strong></td>
<td>MCP, PIP and DIP flexion, wrist flexion</td>
</tr>
<tr>
<td><strong>“tidbit”</strong></td>
<td>What’s in a name?</td>
</tr>
</tbody>
</table>
## Myology of the Hand: Extrinsic

### Flexor Pollicis Longus

<table>
<thead>
<tr>
<th><strong>Origin</strong></th>
<th>Middle anterior portion of the radius and interosseous membrane</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Insertion</strong></td>
<td>Base of the distal phalanx of the thumb</td>
</tr>
<tr>
<td><strong>Innervation</strong></td>
<td>Median n.</td>
</tr>
<tr>
<td><strong>Action</strong></td>
<td>CMC, MCP and IP flexion of the thumb</td>
</tr>
<tr>
<td>“tidbit”</td>
<td>What’s in a name?</td>
</tr>
</tbody>
</table>
Myology of the Hand: Extrinsic

<table>
<thead>
<tr>
<th><strong>Extensor Digitorum</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Origin</strong></td>
</tr>
<tr>
<td><strong>Insertion</strong></td>
</tr>
<tr>
<td><strong>Innervation</strong></td>
</tr>
<tr>
<td><strong>Action</strong></td>
</tr>
<tr>
<td><strong>“tidbit”</strong></td>
</tr>
</tbody>
</table>
# Myology of the Hand

## Extensor Indicis

<table>
<thead>
<tr>
<th><strong>Origin</strong></th>
<th>Posterior surface of distal ulna and interosseous membrane</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Insertion</strong></td>
<td>Blends with the index tendon of the extensor digitorum</td>
</tr>
<tr>
<td><strong>Innervation</strong></td>
<td>Radial n.</td>
</tr>
<tr>
<td><strong>Action</strong></td>
<td>Extension of the index finger</td>
</tr>
<tr>
<td><strong>“tidbit”</strong></td>
<td>What’s in a name?</td>
</tr>
</tbody>
</table>
Where would we be without the extensor indicis?
# Myology of the Hand: Extrinsic

## Extensor Digiti Minimi

<table>
<thead>
<tr>
<th>Origin</th>
<th>Ulnar side of the belly of the extensor digitorum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion</td>
<td>Joins the tendon of the extensor digitorum to the little finger</td>
</tr>
<tr>
<td>Innervation</td>
<td>Radial n.</td>
</tr>
<tr>
<td>Action</td>
<td>Extension of the 5th finger</td>
</tr>
<tr>
<td>“tidbit”</td>
<td>What’s in a name?</td>
</tr>
</tbody>
</table>
How would you drink tea if you didn’t have a EDM?
# Myology of the Hand: Extrinsic

**Extensor Pollicus Longus**

<table>
<thead>
<tr>
<th>Origin</th>
<th>Posterior surface of the ulna and interosseous membrane</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion</td>
<td>Dorsal base of the distal phalanx of the thumb</td>
</tr>
<tr>
<td>Innervation</td>
<td>Radial n.</td>
</tr>
<tr>
<td>Action</td>
<td>Extension of the IP, MCP and CMC of the thumb</td>
</tr>
<tr>
<td>“tidbit”</td>
<td>What’s in a name?</td>
</tr>
</tbody>
</table>
“Anatomic Snuff Box”

- Extensor Pollicis Longus
- Extensor Pollicis Brevis
- ABDuctor Pollicis Longus
### Extensor Pollicis Brevis

<table>
<thead>
<tr>
<th><strong>Origin</strong></th>
<th>Posterior aspect of the radius and interosseous membrane</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Insertion</strong></td>
<td>Dorsal base of the proximal phalanx of the thumb</td>
</tr>
<tr>
<td><strong>Innervation</strong></td>
<td>Radial n.</td>
</tr>
<tr>
<td><strong>Action</strong></td>
<td>Extension of the MCP &amp; CMC joints of the thumb</td>
</tr>
<tr>
<td><strong>“tidbit”</strong></td>
<td>What’s in a name?</td>
</tr>
</tbody>
</table>
## Myology of the Hand: Extrinsic

**Abductor Pollicis Longus**

<table>
<thead>
<tr>
<th>Origin</th>
<th>Posterior surface of the radius, ulna and interosseous membrane</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion</td>
<td>Base of the 1\textsuperscript{st} metacarpal</td>
</tr>
<tr>
<td>Innervation</td>
<td>Radial n.</td>
</tr>
<tr>
<td>Action</td>
<td>ABD and extension of the CMC of the thumb</td>
</tr>
<tr>
<td>“tidbit”</td>
<td>What’s in a name?</td>
</tr>
</tbody>
</table>
Myology of the Hand: Intrinsics

- Thenar
  - Flexor pollicis brevis
  - Abductor pollicis brevis
  - Opponens pollicis

- Deep palm
  - Adductor pollicis
  - Interossei
  - Lumbricales

- Hypothenar
  - Flexor digiti minimi
  - Abductor digiti minimi
  - Opponens digiti minimi
Special Structures in the Hand

- Thenar Eminence
Special Structures of the Hand

- Hypothenar Eminence
Identify!

- Flexor digitorum superficialis
- Flexor digitorum profundus
- Flexor pollicis longus
Identify!

- Extensor digitorum
- Extensor digiti minimi
- Extensor indicis
- ABDuctor pollicis longus
- Extensor pollicis brevis
- Extensor pollicis longus
Functional Position of the Wrist & Hand

- Wrist in slight extension
- MCP & PIP in some degree of flexion
- Thumb is in opposition.

Lippert pg 189
Hand Function

- Primary function is prehension
- Power grips
  - Cylindrical grip
  - Spherical grip
  - Hook grip
- Precision grips
  - Pad to pad grip
  - Tip to tip grip
  - Pad to side grip
  - Side to side grip
  - Lumbrical grip
Hand Function: Grips

- Power grip
  - Significant amount of force
  - Most powerful grip
    - Fingers flex around an object in one direction and the thumb wraps around in the opposite direction providing counterforce to keep the object in contact with the palm and/or fingers.
- 3 types
  - Cylindrical, spherical & hook
Power Grips: Cylindrical

- All fingers are flexed around the object which is usually at a right angle to the forearm.
- The thumb is wrapped around the object, often overlapping the fingers.
Power Grips: Spherical

- All of the fingers and the thumb are ADDUcted around an object, and unlike the cylindrical grip, the fingers are more spread apart. The palm of the hand is often not involved.
Power Grips: Hook

- Involves the second through fifth fingers flexed around an object in a hooklike manner.
- The MCP joints are extended, and the PIP and DIP joints are in some degree of flexion. The thumb is usually not involved.
**Hand Function: Precision Grips**

- Tend to hold the object between the tips of the fingers and thumb.
- Involves intrinsics and extrinsics
- Thumb is ABDucted
  - Fine movement & accuracy
    - Objects are small or fragile, no palm involvement, no movement of proximal joints
  - 5 types:
    - Pad to pad, tip to tip, pad to side, side to side, & lumbrical grip
Precision Grips: Pad to pad

- MCP and PIP of the fingers are flexed, thumb is ABDucted and the distal joints of both are extended bringing the pad of the finger(s) and thumb together.

- (AKA 3 jaw chuck, pinch)
Precision Grips: Tip to tip

- Bring tip of thumb to the tip of another digit
- Picking up small objects
Precision Grips: pad to side

- Pad of the extended thumb presses an object against the racial side of the index finger
Precision Grips: Side to Side

- Requires ADDuction of 2 fingers, usually the index and middle fingers
- Weak grip and does not permit much precision

Lippert pg 191
Precision Grips: Lumbrical

- Sometimes referred to as the plate grip
  - MCP and PIP joint flexed and the DIP joint extended the thumb opposed the fingers holding and object horizontal.
  - The lumbricals flex the MCPs while extending the IP joints

Lippert pg 192
The Hand:

- Hand specialists study and treat the hand exclusively to be considered hand therapists.
- Most clinicians refer patients with diagnoses of the hand to a hand therapist.
- What is expected?
  - Osteology
  - Extrinsic myology
  - Familiarity with the intrinsic myology by names of the muscles
  - Familiarity with the overall function of the structures intrinsically and extrinsically
  - Common injuries and potential causes
Common Wrist and Hand Pathologies

- Colles’ Fracture
  - Fracture of the distal radius
- Carpal Tunnel Syndrome
  - Compression of the median nerve within the carpal tunnel
  - Causes numbness, tingling, weakness
- DeQuervain’s Tenosynovitis
  - Inflammation of a sheath containing the extensor pollicis longus and brevis
  - Causes pain on radial side of wrist

Lippert pg 186
Common Wrist and Hand Pathologies

- Dupuytren’s Contracture
  - Palmar aponeurosis undergoes thickening
  - Causes flexion contractures of the fingers