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## Anatomy in Three Dimensions™: The Hip

Brian Richey B.S., MES

## Integrated Movement Specialist™



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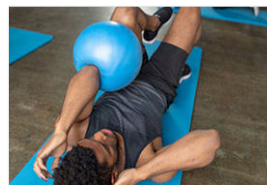
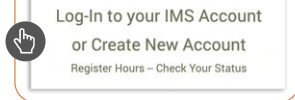
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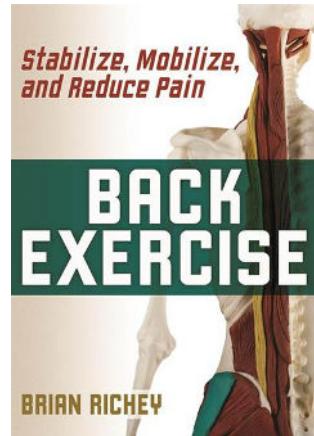


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## Back Exercise: Stabilize, Mobilize and Reduce Pain

By Brian Richey

My new book deals is for anyone who has or has a client dealing with low back pain. It goes into depth on specific spinal pathologies as well as non-specific low back pain, explaining each pathology, highlighting the contraindications and prescribing specific exercise programing to train and progress them safely.



## The Hip

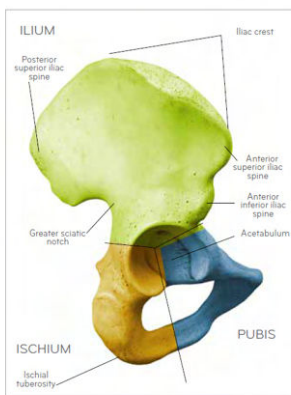
The Hip is a remarkable structure in its ability to:

- Create and absorb large amounts of force.
- Incredible mobility in all directions.
- It is the gateway connecting the core with the lower body.



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## The Pelvic Half



The ilium, ischium and pubis, three island of bones which fuse together to form the hemi pelvis or hip bone.

The pelvic bone is also called

- Innominate
- Os coxa
- Hip Bone
- Hemi-pelvis

The pelvic half is made up of three fused bones

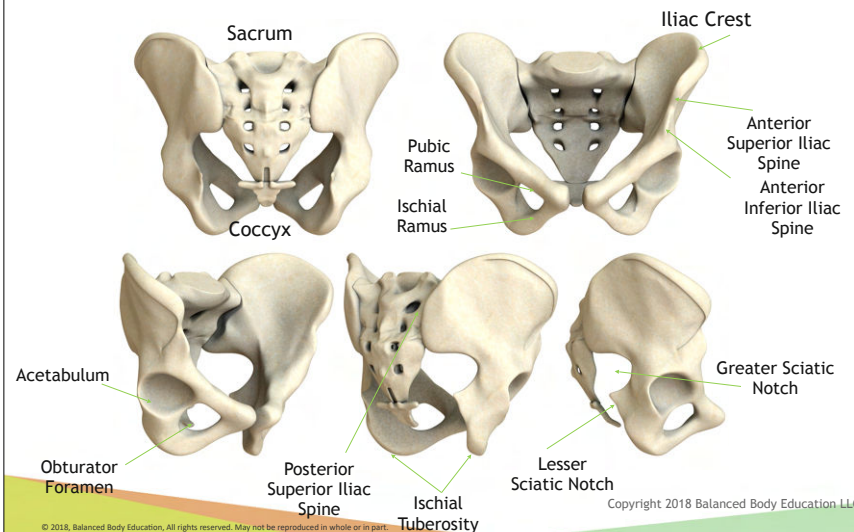
- Ilium
- Ischium
- Pubis

The acetabulum is the cup that holds the head of femur forming the hip joint.

By the end of puberty these three bones fuse together and ossify by around 25 years of age.

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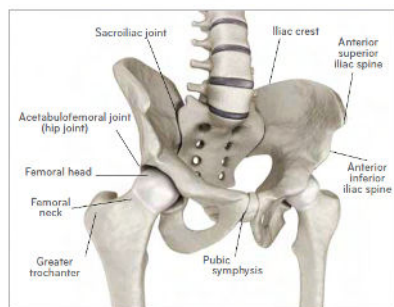
## Pelvis - Bony Landmarks



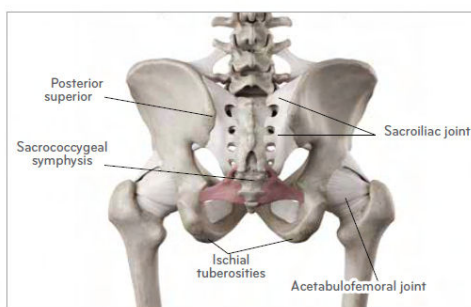
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## The Hip – Bony Landmarks

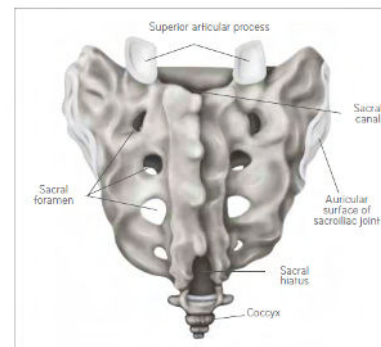


Pelvis, Hip and Spine, Anterior View

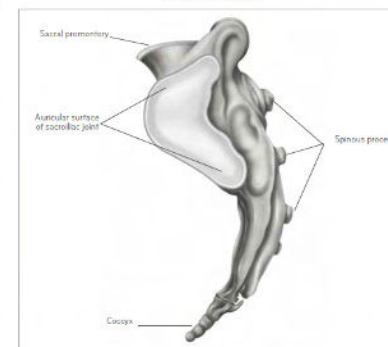


Pelvis, Hip and Spine, Posterior View

## Sacrum – Bony Landmarks



Sacrum, Back View



Sacrum, Side view

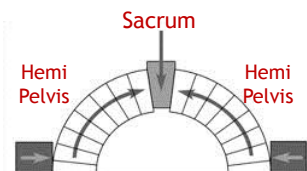
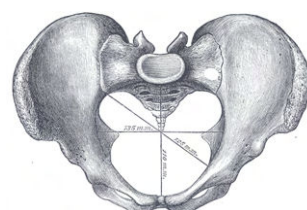
## Sacrum as Keystone of the Pelvis

The sacrum has two roles, one is the keystone to pelvis, the other is the platform for the spine.

Keystone is a wedge between two arching columns.

A keystone prevents the columns from falling in on one another

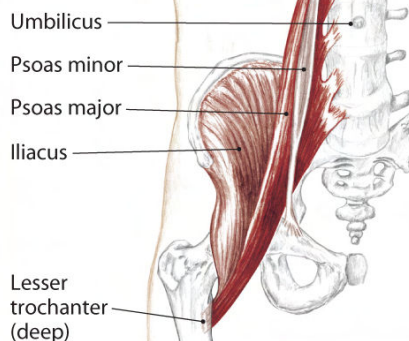
The downward forces of the body fall onto the sacrum via the spine and are met by the ground forces pressing upward and inward through the femur heads and around the ilium.



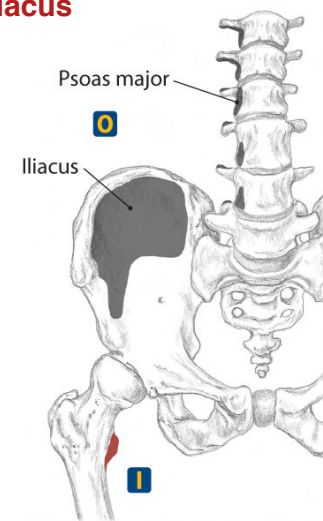
## Origin and Insertion - Example Iliacus

**Origin** - Refers to the stationary or fixed end of a muscle (O)

**Insertion** - Refers to the more mobile end of a muscle (I)



6.126 Anterior view of spine and right hip



6.129 Anterior view of spine and right hip showing origins and insertions

## Let's Build the Hip

### Deep Rotators

- Obturator Externus and Internus
- Gemellus Inferior and Superior
- Piriformis
- Quadratus Femoris

### Psoas and Iliacus

### Abductors and lateral thigh

- Gluteus Minimus and Medius
- Iliotibial Band
- Tensor Fascia Lata
- Gluteus Maximus

## Movements of the Hip

Flexion



Extension



Medial and Lateral Rotation



## Movements of the Hip

Abduction



Adduction



## Deep Rotators

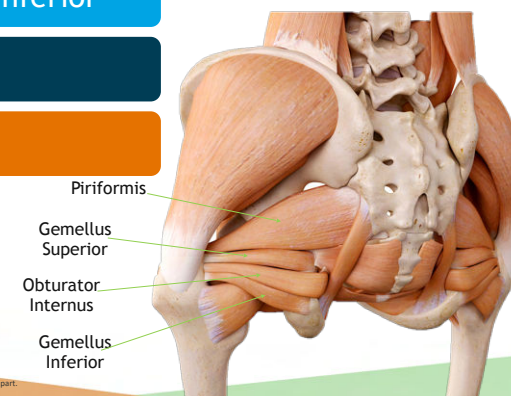
Ready, set, build!

Obturator Externus and Internus

Gemellus Superior and Inferior

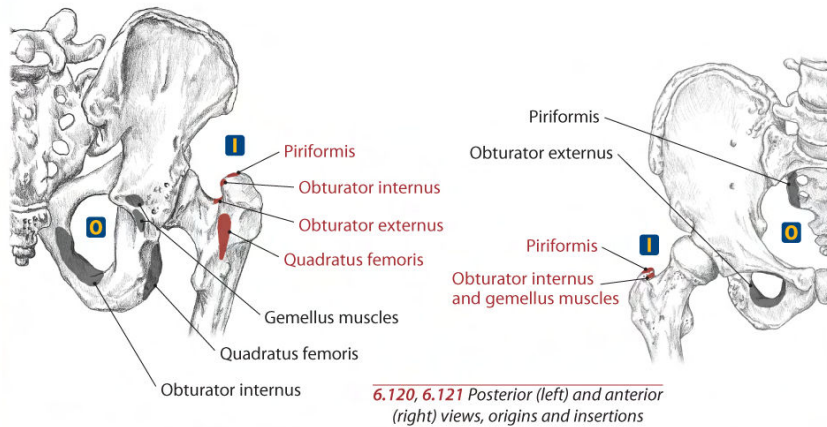
Quadratus Femoris

Piriformis





## Lateral Rotators of the Hip

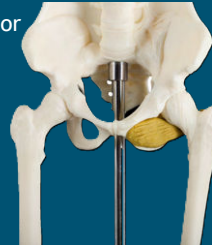


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TGB, p. 329

## Obturator Externus

Anterior View



### Origin:

- Rami of pubis
- Rami of the ischium
- External surface of obturator membrane

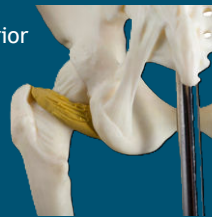
### Insertion:

- Trochanteric fossa of the femur

### Actions:

- Lateral rotation
- Adduction
- Supports the inferior surface of femoral neck and stabilizes the pelvis

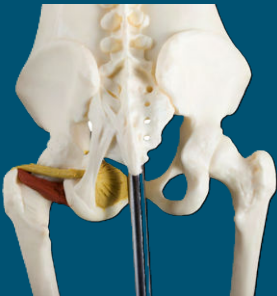
Posterior View



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## Obturator Internus

Posterior View



### Origin:

- Fills lesser pelvis covering inferior surface of obturator membrane

### Insertion:

- Medial surface of greater trochanter of femur
- Proximal and superior to trochanteric fossa.

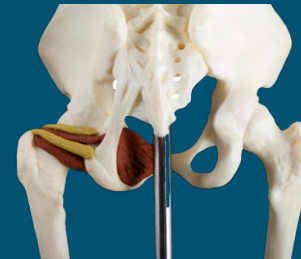
### Actions:

- Laterally rotates
- Abducts and laterally rotates extended hip
- Abducts leg when hip is neutral, flexed or extended
- Stabilizes hip during walking
- Serves as attachment point for Levator

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## Gemellus Superior and Inferior

Posterior View



### Origin:

- *G. Superior*: External surface of ischial spine superior to obturator internus.
- *G. Inferior*: Superior ischial tuberosity just inferior to obturator internus.

### Insertion:

- With the tendon of the obturator internus onto medial surface of greater trochanter of femur

### Actions:

- Lateral rotation on neutral or extended hip
- Abduction on neutral, flexed or extended hip
- Steadies head of the femur in acetabulum

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## Quadratus Femoris

Posterior View



### Origin:

- Proximal part of lateral border of ischial tuberosity

### Insertion:

- Intertrochanteric crest between the greater and lesser trochanters

### Actions:

- Lateral rotation of the hip
- Adduction of the hip
- Stability of femur and acetabulum

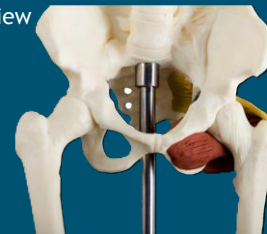
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## Piriformis

Posterior View



Anterior View



### Origin:

- Pelvic surface of sacrum between (and lateral to) pelvic sacral foramen 1-4
- Margin of greater sciatic foramen
- Pelvic surface of sacrotuberous ligament

### Insertion:

- Superior border of the greater trochanter

### Actions:

- Laterally rotates and abducts neutral or extended hip
- Medial rotation when hip flexed above 60°
- Creates posterior wall of the pelvis and shares connective tissue with the Coccygeus of the pelvic floor

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## Deep Posterior Hip Muscle Movements

Muscle	Lateral rotation	Medial rotation	Adduction	Abduction	Extension	Stability
Quadratus femoris	X		X			X
Obturator externus	X		X			X
Obturator internus	X			X		X
Gemellus inferior and superior	X			X		X
Piriformis	X	X (above 60 degrees of flexion)		X	X	X

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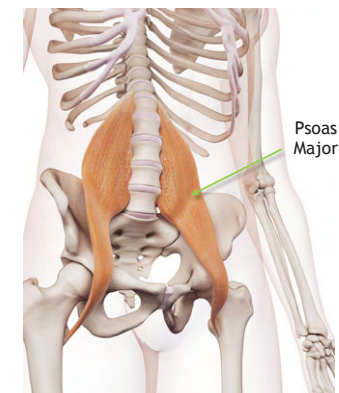


## Iliacus and Psoas

Iliacus

Psoas Major

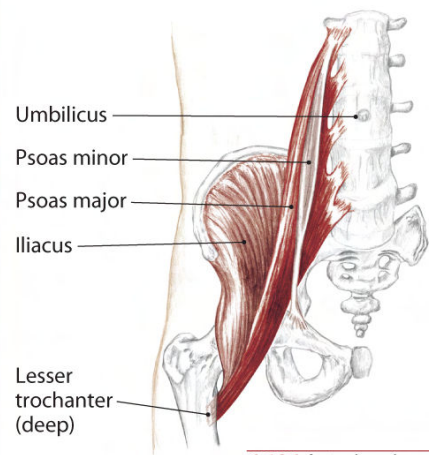
Psoas Minor



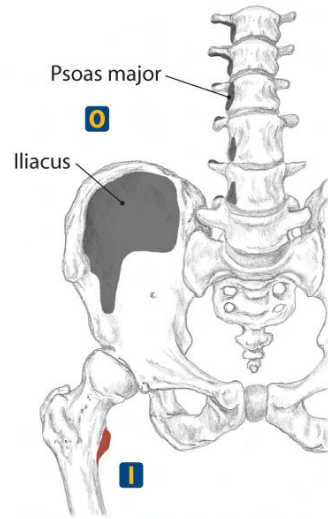
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## Iliopsoas

*Psoas Major  
Iliacus*



6.126 Anterior view of spine and right hip



6.129 Anterior view of spine and right hip showing origins and insertions

TGB, p. 332 & 333

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## Iliacus

Anterior View



### Origin:

- Superior two thirds of iliac fossa
- Iliolumbar and ventral sacroiliac ligaments

### Insertion:

- Lesser trochanter of the femur

### Actions:

- Fixed Pelvis:
  - Hip flexion, adduction, lateral rotation
- Fixed Leg:
  - Anterior pelvic tilt

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## Psoas Major

Anterior View



### Origin:

- Bodies, transverse processes and intervertebral discs of T12 to L5

### Insertion:

- Lesser trochanter of the femur
- Shares common tendon with iliacus

### Actions:

- Fixed Pelvis:
  - Hip flexion, adduction, lateral rotation
- Fixed Leg:
  - Anterior pelvic tilt

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## Psoas Minor

Anterior View



### Origin:

- Sides of vertebral bodies of T12 and L1

### Insertion:

- Superior pubic ramus
- Medial to iliopsoas tendon

### Actions:

- Posterior pelvic tilt
- Anterior translation of the ribcage

Psoas minor is absent in approximately 60% of the population.

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## Deep Anterior Hip Muscle Movements

Muscles	Hip Actions			Pelvic Actions	
	Flexion	Adduction	Lateral rotation	Anterior pelvic tilt	Posterior pelvic tilt
Iliacus	X	X	X	X	
Psoas major	X	X	X	X	
Psoas minor					X

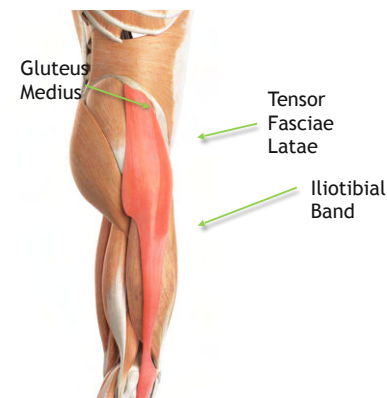
## Abductors and Lateral Thigh

Gluteus Minimus

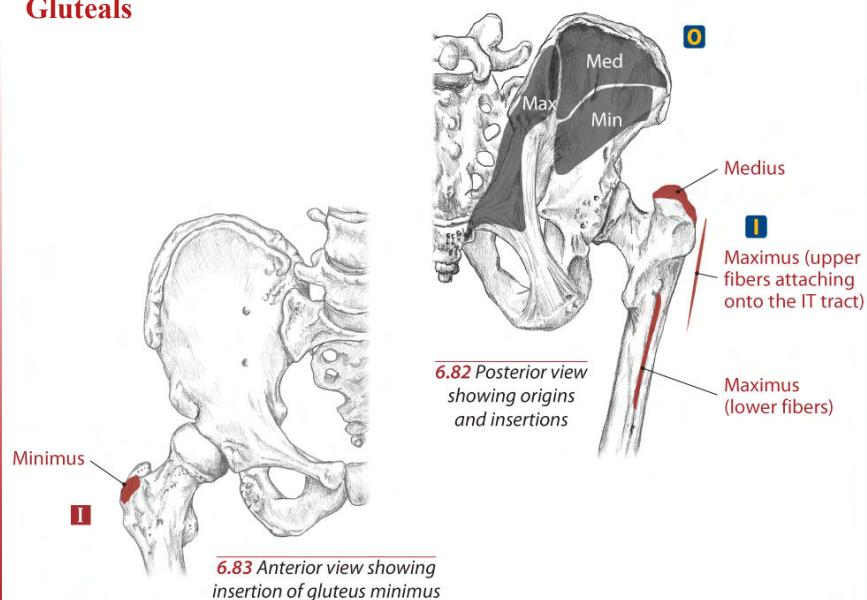
Gluteus Medius

Iliotibial Band

Tensor Fasciae Latae



## Gluteals



## Gluteus Minimus



### Origin:

- Gluteal surface of the ilium between the anterior and inferior gluteal lines

### Insertion:

- Anterior aspect of greater trochanter and hip joint capsule



### Actions:

#### Fixed Pelvis

- Abducts the hip
- Hip flexion
- Medially rotates a flexed hip
- Stabilizes the hip

#### Fixed Leg

- Anterior pelvic tilt
- Pelvic down slip
- Pelvic out flare



## Gluteus Medius



### Origin:

- External surface of ilium between iliac crest and posterior gluteal line

### Insertion:

- Lateral surface of greater trochanter of femur



### Actions:

#### Fixed Pelvis

- Hip abduction, flexion, and medial rotation

#### Fixed Leg

- Anterior pelvic tilt

#### Fixed Pelvis

- Hip abduction, extension and lateral rotation

#### Fixed Leg

- Posterior pelvic tilt
- Pelvic down slip

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## Iliotibial Band (ITB)



### Origin:

- High point of iliac crest, over greater trochanter.

### Insertion:

- Lateral anterior tibia.

### Actions:

- Acts as an attachment for Tensor Fascia Lata and Gluteus Maximus.
- Stabilizes lateral leg.

The Iliotibial Band is a thick band of connective tissue originating on lateral iliac crest and inserting onto lateral side of the tibia. It is not a muscle!

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## Tensor Fascia Lata



### Origin:

- Anterior part of iliac crest
- Outer surface of ASIS and proximal part of IT band

### Insertion:

- Into IT Band at proximal and middle third of thigh

### Actions:

- Abduction and medial rotation when the hip is flexed
- Stabilize lateral knee through IT band

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## Gluteus Maximus



Deep Fibers



Superficial Fibers

### Origin:

- Posterior gluteal line of ilium and a portion of bone superior and posterior to it
- Posterior surface of lower part of sacrum, side of coccyx
- Aponeurosis of erector spinae, sacrotuberous ligament and gluteal aponeurosis

### Insertion:

- Deep fibers insert into the gluteal tuberosity of femur
- Proximal and superficial fibers inserts into iliotibial tract of fascia lata

### Actions:

- Fixed pelvis - Hip extension, lateral rotation, adduction and abduction
- Fixed leg - Posterior pelvic tilt

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## Lateral Hip and Thigh Muscle Movements

Muscle	Hip Actions, Pelvis stable					Pelvis Actions, femur stable	
	Abduction	Flexion	Extension	Medial Rotation	Lateral Rotation	Posterior Tilt	Anterior Tilt
Gluteus minimus	X	X		X			X
Gluteus medius (anterior fibers)	X	X		X			X
Gluteus medius (posterior fibers)	X		X		X		
Gluteus Maximus	X		X		X	X	

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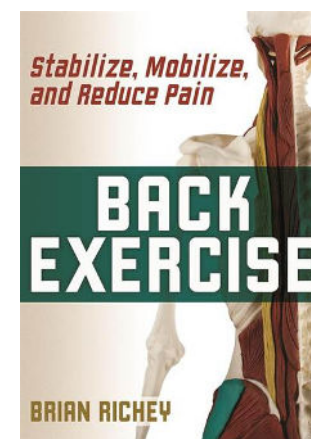
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Richey at

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