



# Houston's Hometown Petroleum Engineering Program

18 Sep 2013

Ryder Scott Reserves Conference

Tom Holley

Director of Petroleum Engineering

UNIVERSITY of **HOUSTON**

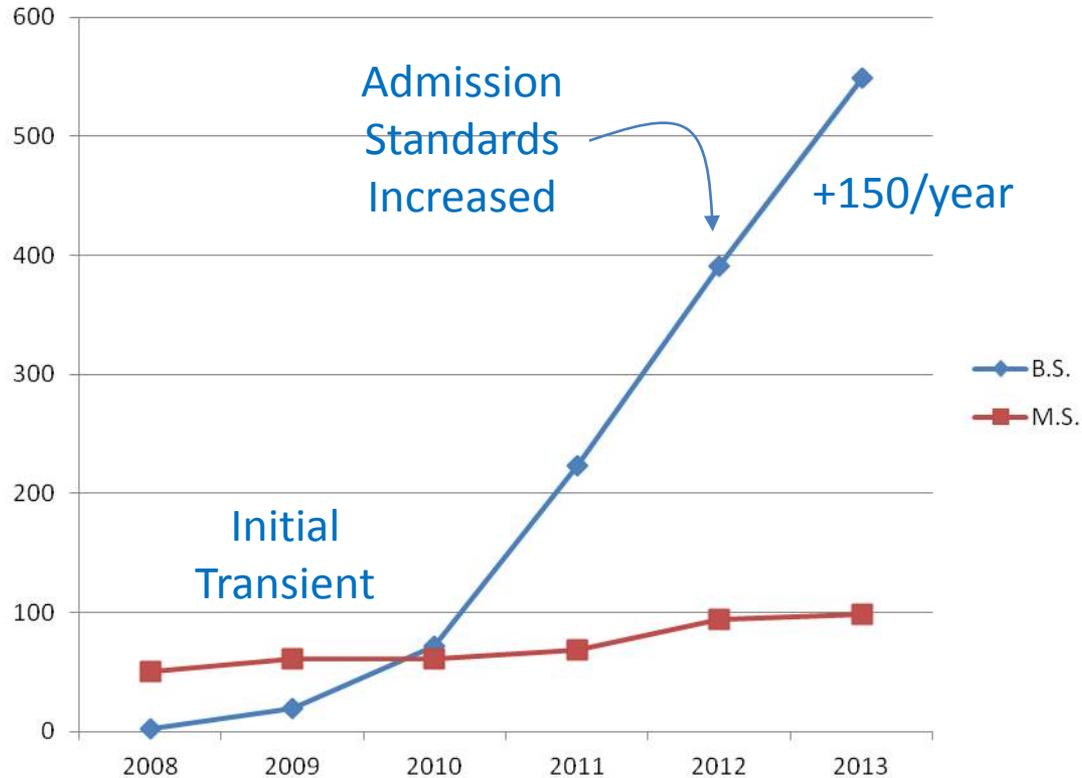
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CULLEN COLLEGE of ENGINEERING

Petroleum Engineering

The B.S. in Petroleum Engineering  
at University of Houston was  
“spudded” in 2009. Consider the  
“decline” curve.

# UH PETR Enrollment

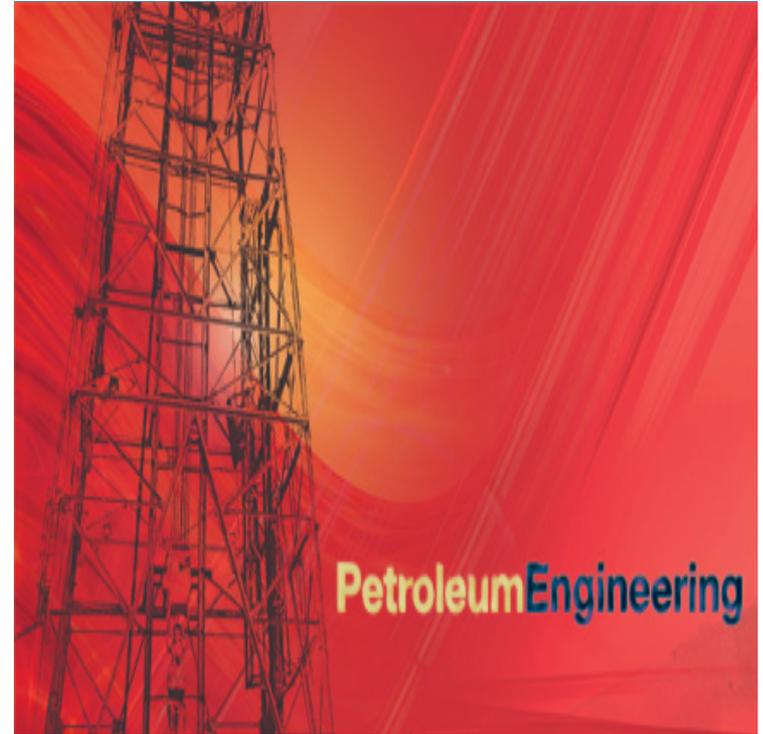


# Brief History

- Feb 2001: Ron Harrell, then chairman of the Ryder Scott, was invited to form the UH Petroleum Engineering Advisory Board by Christine Economides. Dean Rietz was a charter member. Wide industry support.
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- Years of program development (Ali Daneshy, Director), lobbying by the PEAB and the University, fundraising, and cascaded approvals.
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- 2008: New UH President Renu Khator arrives and supports PETR
- Early 2009: B.S. finally approved by the Texas Higher Education Coordinating Board.
- Administration by UH Chemical Engineering (Mike Harold, Ramanan Krishnamoorti, Mike Harold)
- Fall 2009: First 20 students
- Spring 2011: First class in Bldg 9 of UH Energy Research Park

# The 5 Year Plan

- Fall 09: First BS PE students
- Spring 2013: First BS graduates
- 6 permanent tenure-track faculty members (3 by end 2012), plus non-tenured/adjunct faculty and support staff
- Expanded MS, MPE programs and higher standards
- New PhD program
- Expanded research
- New Petroleum Engineering Department



***Ultimately – A top tier program with 12-15 tenure-track faculty members, 50+ BS, 20 MS, 6 PhD graduates per year***

# Current Undergraduate BS Programs

- Curriculum is classical upstream petroleum engineering (drilling, petrophysics, production, and reservoir engineering) with increasing connections to geoscience and business
- Undergraduate admission is not currently capped but admission requirements were tightened for Fall 2012.
- First graduates 11 May 2013
- Strong student organizations (SPE, AADE)

# Inaugural PETR Graduating Class of 2013



Note: Ryder Scott as a company, and many individuals within the Ryder Scott family, have been strong supporters of these students.

# Active Student Organizations

- **Society of Petroleum Engineers**
  - SPE UH-Rice Student Chapter was named the world-wide chapter of the month for April 2010 from 190 student chapters. First SPE PetroBowl team in 2011. Golf tournament raised \$7K for student scholarships.
  - Rice and UH Chapters are now both growing separately
  - 60 UH SPE students will attend SPE ATCE 2013 in New Orleans
- **American Association of Drilling Engineers**
  - AADE chapter initiated by students in Spring 2010



[http://www.petro.uh.edu/people/student\\_organizations](http://www.petro.uh.edu/people/student_organizations)

# PE Internship Program

- UH advantage: year round internships are possible
- Provide an early link between these students and oil and gas companies in the Houston metropolitan area
- Attract top quality engineering students into the PE program
- Give companies an extended careful look at candidates for future employment, e.g., “extended interview”
- Provide financial assistance to students



# Graduate Programs

- Long standing successful Masters of Petroleum Engineering
  - 36 credit course-based Masters (~ 2 years)
  - Classes taught in the evening by professionals for professionals
  - Taught by 12 Adjunct Faculty, most themselves working professionals,  
e.g., Shell, Halliburton, Ryder-Scott (Dean Rietz), Xgas
  - Graduate ~10 per typical semester
- Growing MS in Petroleum Engineering (thesis)
- Beginning approval process for Ph.D.
- Other professional instruction in progress or under consideration
  - MS in Subsea Engineering (Mechanical Engineering Department)
  - Certificate programs planned,  
e.g., Reserves Estimation; Tight Gas; Natural Gas Engineering

# Research Summary

The UH Petroleum Engineering Program has embarked on a new multi-faceted research program on the fundamental physics of low permeability reservoirs.

Current emphasis is on well performance, reserves estimation, simulation, and rock and fluid properties.

# W. John Lee



## Professor of Petroleum Engineering and Hugh Roy and Lillie Cranz Cullen Distinguished University Chair

- Elected to the U.S. National Academy of Engineering
- Honorary Member of AIME/SPE (highest recognition)
- SPE DeGolyer Distinguished Service Medal (top award)
- AIME/SPE Anthony F. Lucas Gold Medal (top technical award)
- Past member of SPE Int'l Board of Directors
- U.S. Securities & Exchange Commission Engineering Fellow  
2007-08  
(reserves reporting rules modernization)
- Russian Academy of Natural Sciences
- Author of three textbooks published by SPE  
(*Well Testing*, *Gas Reservoir Engineering*, & *Pressure Transient Testing*)

# Scope of Recent Projects in Shales

- Production forecasting using production trend analysis with strong fundamental basis
- Assessment of uncertainty in production forecasts
- Development of methodology to assure compliance with industry and government reserves definitions and disclosure requirements

# Data-driven Numerical Modeling and Simulation for Efficient Unconventional Reservoir Development

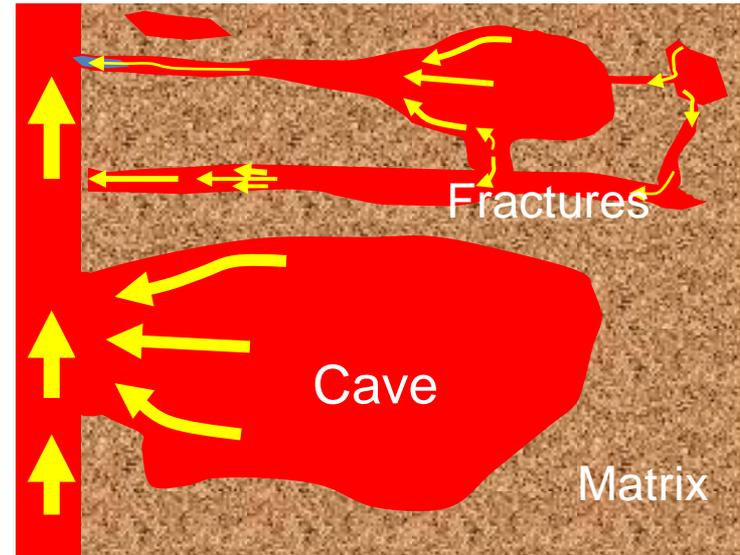


**Prof. Guan Qin**  
**Associate Professor of Petroleum Engineering**  
**and**  
**Gulf Coast Chapter of the Society of Petroleum**  
**Engineers Professor**

# Mathematical Challenges

- **Modeling:**

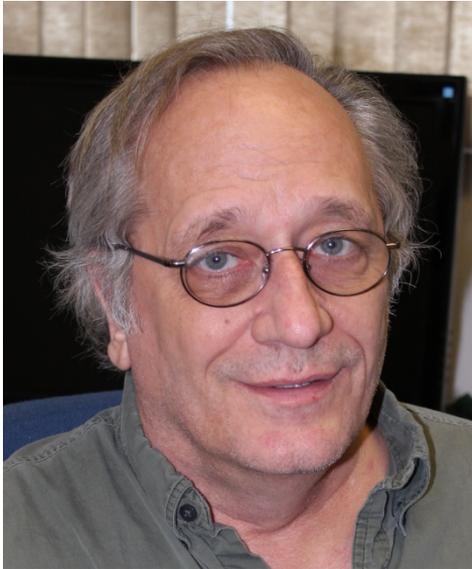
- Complex geology introduces huge uncertainties: heterogeneity and anisotropy in rock properties at multiple length-scales
- Different flow physics: Non-Darcy vs. Darcy
- Different scales: wellbore flow vs. reservoir flow



- **Numerical challenges:**

- Multi-scale behavior in both time and space:
  - high-frequency vs. low frequency behavior
  - coarse-scale vs. fine-scale behavior
- Tightly coupled system of nonlinear PDEs
- Total unstructured grid
- Parallel computing

# Assessment of Gas Permeability for Ultra-tight Rocks



**Prof. Michael Myers**  
**Associate Professor of Petroleum Engineering**

**Starting Spring 2013**



# Assessment of Gas Permeability for Ultra-tight Rocks

## Business Impact

- Comparison with existing vendor data has indicated as much as a 30% error in porosity and one to two orders of magnitude error in permeability.
- New measurement techniques allow an improved understanding of reservoir performance and impact business related decisions.

## How

- An apparatus optimized to measure permeability in this range has been built and tested.
- The equipment allows measurement of the stress dependence of samples in a low permeability range (below one nanoDarcy).
- A full nonlinear implementation of finite difference solutions for the flow equations has been completed and bench marked against reservoir simulators.

# Joint Faculty in ChBE + PETR

Joint appointments in PETR for chemical engineering, geoscience, and business faculty in preparation. First four chemical engineers appointed:



Krishnamoorti



Balakotaiah



Nikolaou



Conrad

Ramanan Krishnamoorti has already taught several semesters of PETR 3313 Reservoir Fluids, for example.

# Petroleum Engineering Advisory Board

- ~15 very active members
- Most major and some mid-size Houston petroleum companies are represented
- Active in obtaining state approval for BS program, fundraising, high school recruiting, and building our Petroleum Engineering community
- Critical to success of program
- The PEAB is considered the archetype for advisory boards in the UH Cullen College of Engineering
- Ron Harrell and Dean Rietz anchor the board

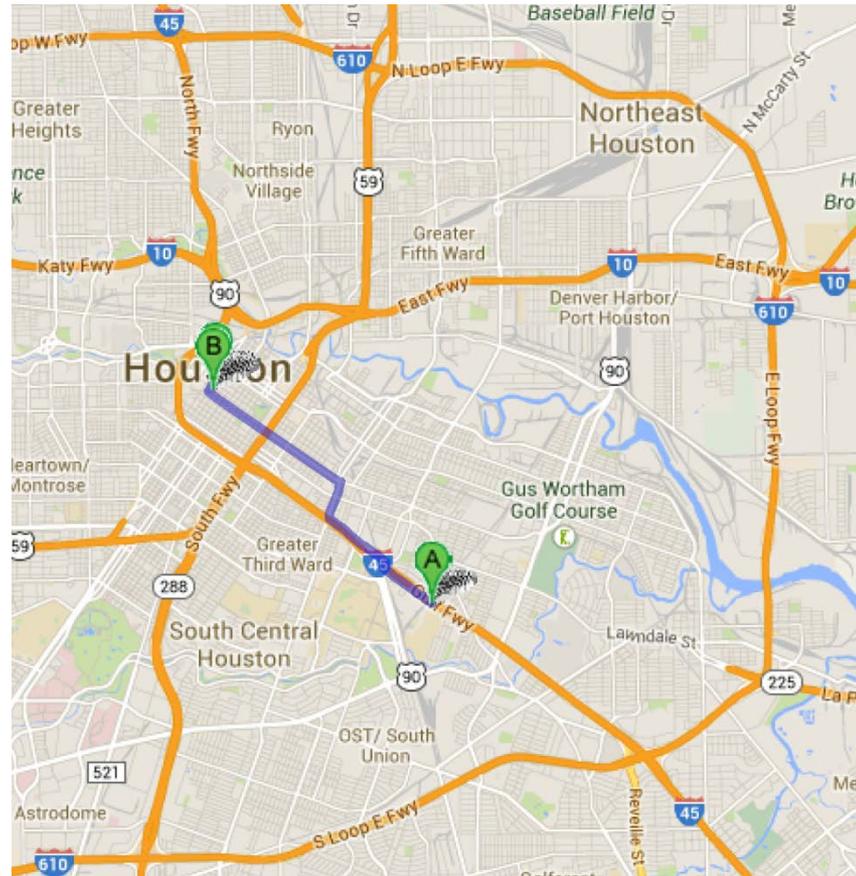
If you want to read more:

## Business and Higher Education Forum (BHEF) Report

UH PETR is cited as example of best practices for cooperation between universities and business

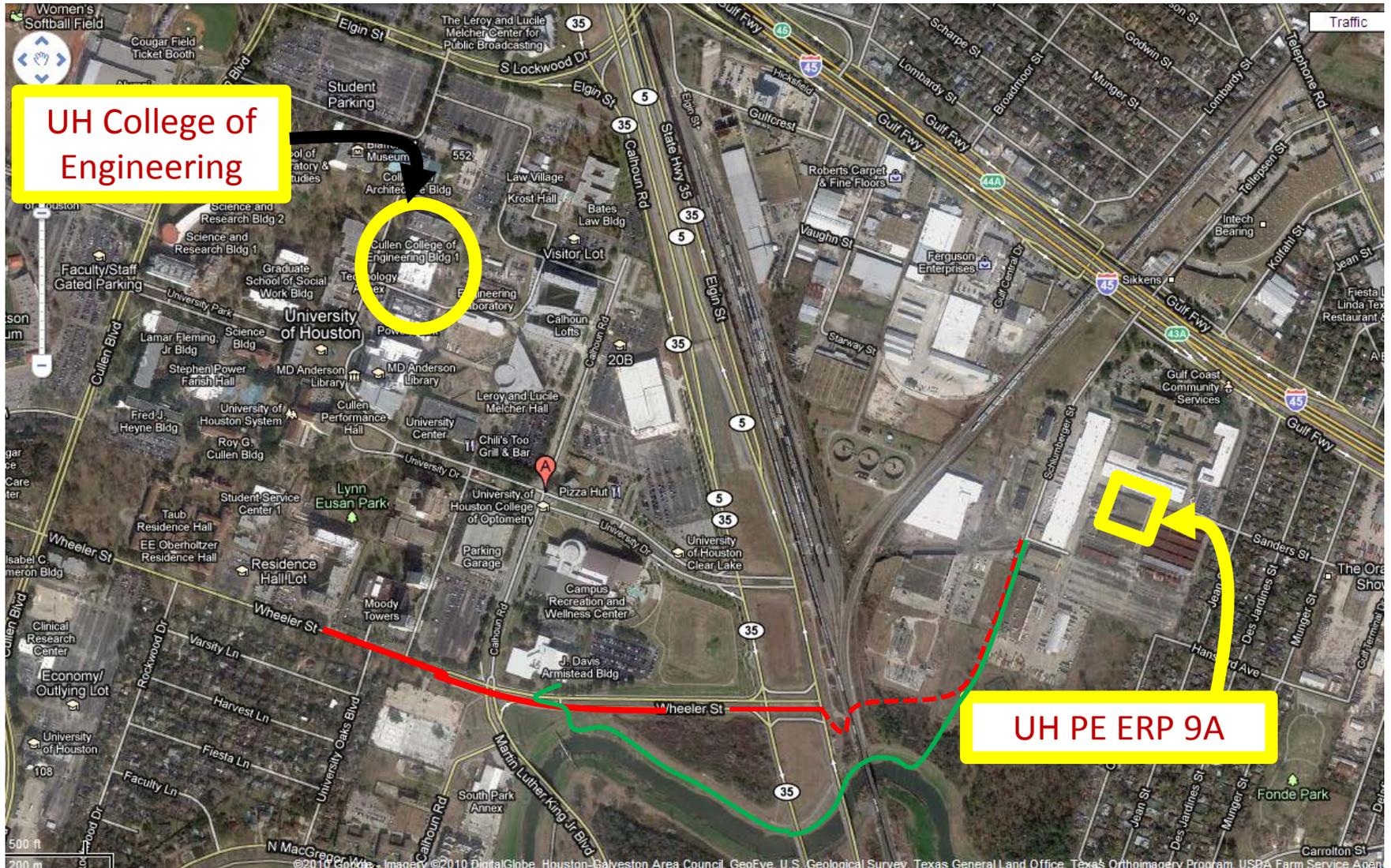
[BHEF UH Petroleum Case Study.pdf](#)

# New Home for UH PE



< 4 miles from where you are sitting

# New Home for UH PE



# UH Energy Research Park Bldg 9





Undergraduate laboratory



Inaugural petrophysics class Spring 2011



## PETROLEUM ENGINEERING PROGRAM

ABOUT

UNDERGRADUATE

GRADUATE

RESEARCH

PEOPLE

SUPPORT



### Latest News

James Hackett, CEO of Anadarko Petroleum Corp. speaks at the SPE Student Chapter 5th General Meeting

November 21, 2011

The 5th General Meeting of the SPE Student Chapter will be held

5:00-7:30PM Thursday 1 December 2011

Agnes Arnold Hall, Room 110

University of Houston

The featured speaker will be James Hackett, chairman and chief executive officer of Anadarko Petroleum Corp, one of the largest independent oil and natural gas exploration and production companies in the world.

Click [here](#) for more details.

Danier Yergin Speaks at Bauer College of Business

October 21, 2011

See [Calendar for 31 Oct](#) for more details.

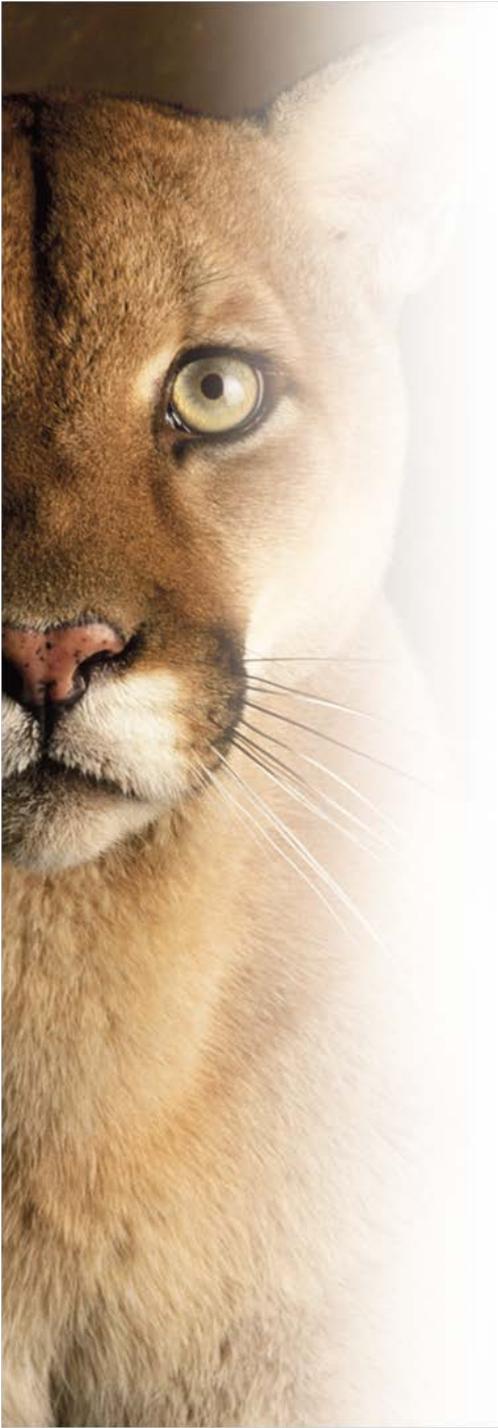
### EMERGENCY CONTACT INFORMATION

Security Guard Number: 713-928-5940

### MULTIMEDIA



[ConocoPhillips Donates \\$1 Million to the University of Houston and its Energy Research Park](#)



# Petroleum Engineering

- UH PETR is a key element of the UH Energy Research Park
- Long-standing successful MS program
- Explosive growth in new BS program
- New specialized MS programs
- New faculty hiring is difficult but off to excellent start
- Remodeled new facility
- Strong support from industry and alumni, *especially Ryder Scott (Thank you!)*