A QUICK LOOK INTO THE AAPG 2015 ULTIMATE CAREER ADVANCEMENT RESOURCE GUIDE

2015 EDUCATION PROGRAM

Take a glance inside and choose your favorites now!

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AAPG

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AAPG WORLD-CLASS EDUCATION CONFERENCE

STAND-ALONE SHORT COURSES

STAND-ALONE SHORT COURSES

AAPG GRADUATE STUDENT ASSISTANT PROGRAM

Want to attend an AAPG School or Short Course but don't have the funds to register? By participating in AAPG's Grad Student Assistant Program, you'll be doing us a favor, and in return, you'll be able to attend one or two courses at no charge. This Program is open to anyone currently enrolled in graduate school, studying for either a Master's degree or Ph.D. in a geoscience or related field.

Here's how it works:

- You look over the schedule of AAPG Short Course offerings and choose one or two that you would like to attend.
- Contact us, and we'll let you know if we still need an assistant for that course – there is one slot available for most courses, and it is filled on a first-come, first-served basis.
- As grad student assistant, your duties include operating the projection equipment, sound and light controls, and assisting the speaker and the AAPG representative in making the course run smoothly.
- In return for these responsibilities, you attend the course free of charge, receive all of the course materials, and receive $25 per day to help defray expenses.
- Travel and lodging expenses not included.

Please contact Debbi Boonstra in the AAPG Education Department at 918-560-2630 (fax 918-560-2678; e-mail dboonstra@aapg.org) if you are interested in participating in this program. This program does not apply to field seminars or field courses.

FULL-TIME STUDENT MEMBERS OF AAPG RECEIVE REDUCED TUITION

- Current full-time AAPG student members who want to attend an AAPG Course - Tuition $115.00.
- AAPG members of an AAPG Student Chapter – Tuition $75.00.
- Three spaces are allotted for each Short Course and students will be accepted in the order of receipt of their paid registrations.
- Tuition reduction does not apply to Field Seminars.
- Attendance is required to receive course material.
- Student rate at Education Conferences is $125 for the week, five spaces available.

Spaces are limited, so online registration for student member and/or Student Chapter slots is not available. You must contact the AAPG Education Department directly to apply for available slots.

EARLY BIRD DISCOUNTS IN EFFECT FOR 2015 AAPG COURSES

Sign up early for AAPG short courses and field seminars and save $200. That's right. Those registering prior to the individual course deadline will pay the discounted rate shown. After that deadline all registrants will pay an additional $200 for tuition.

CONTINUING EDUCATION UNITS (CEUs)

AAPG awards Continuing Education Units (CEUs) for its training functions. Included in this program are short courses, schools, field seminars, online courses and e-symposia. The CEU content is noted on each offering included in this catalog. This is a nationally recognized unit of achievement that is based on 10 contact hours being equivalent to one CEU. The CEUs are customarily awarded by organizations that have a continuing education program under responsible sponsorship, capable direction and with qualified instruction. AAPG meets these requirements.

For AAPG members, CEU records have been kept since January 1, 1989, for all AAPG courses taken. The release of CEU information will only be granted by authorization of the member. These records provide evidence of personal and vocational growth and adjustment to meet changing career demands. They also demonstrate a conscious, persistent and voluntary effort toward personal development and growth. This record is available to any member upon request.

If you are interested in adding CEU credits awarded by other organizations to your AAPG member record, please send your course certificate or other documentation of earned CEUs to the AAPG Education Department.

ONLINE COURSES

CAN'T GET AWAY FROM THE OFFICE TO TAKE A SHORT COURSE? IS THERE NO CLASS IN THE SUBJECT YOU WANT OFFERED IN YOUR AREA? AAPG OFFERS THE SOLUTION WITH A GREAT SELECTION OF ONLINE HELP. THE ONLINE COURSES OUTLINED HERE RANGE FROM SHORT MODULES, TO HELP YOU BRUSH UP ON YOUR SKILLS, TO MONTH-LONG COURSES WITH WRITTEN ASSIGNMENTS EACH WEEK. WE ALSO HAVE OUTSTANDING COURSES IN THE MAKING, SO KEEP YOUR EYES OPEN FOR FUTURE ANNOUNCEMENTS.

E-SYMPOSIA

AAPG's exciting e-symposia program consists of monthly live 1-hour webinars on up-to-date topics of interest to most geoscientists. Extended independent study packages for CEU credit are also available with each e-symposia. CEUs are available if you attend the e-symposium, read the independent study materials, and return a questionnaire. Once registered, you will be contacted by our technical support facilitator with FTP information. After the initial live webinar, most e-symposia are archived and still available in recorded form.

We have over 60 titles now and the list is still growing. Please check our website at **www.aapg.org/career/training/online/e-symposia** for all of our archived and upcoming webinars.

ONLINE CERTIFICATE COURSES

These courses are offered at the beginning of every month. You may sign up for them at any time, and your course will begin the first day of the upcoming month. These courses are designed to be equivalent to a 3 credit-hour graduate-level seminar. They are 4-week online courses which consist of 4 one-week units that involve readings, multimedia, guiding questions, and assignments for you to do and to email to your instructor. You will receive feedback from your instructor, and upon successful completion of the course, you will receive a certificate. Required Work: for each unit, one research project and a short paper that builds on results of the research project, for a total of four brief research projects and four papers.

RENEWABLE ENERGY CERTIFICATE COURSES

As part of our five-course Certificate in Renewable Energy program, if you complete all five courses in this series, you will receive 5 course certificates and a program certificate.

GEOTHERMAL ENERGY BASICS: A RENEWABLE ENERGY CERTIFICATE COURSE

Dates: *Ongoing, course is offered at the beginning of every month. You may sign up for it at any time, and your course will begin the first day of the upcoming month.*
Tuition: *Member: $695.00 • Nonmember $795.00. Please note: There is a discount of $100 off this course if you sign up for all 5 courses in the AAPG Renewable Energy Certificate Course Program.*
Limit: *100*
Content: *4.8 CEU*
Instructor: *Mike Sullivan, Groundwater Services International, Harrisburg, PA*

Who Should Attend

This course is ideal for individuals who want to learn about geothermal energy, current trends, technologies and applications, particularly as integrated with oil and gas.

Objectives

By the end of the course, participants should be able to:

- Define key aspects of the growing geothermal industry, including different locations and scales of production.
- Describe the current use of geothermal energy.
- Identify and list past and current incentives for using and producing geothermal energy.
- Recognize companies developing and investing in geothermal energy, as well as estimate the business benefits of such investments.
- Identify the scientific fundamentals of the exploration, development, and distribution of geothermal power.
- Describe the scientific, technological, and business components of geothermal energy, e.g., land-based versus ocean sources, drilling techniques, and current storage/distribution of geothermal energy.
- Cite current applications of geothermal power in the energy industry.
- Discuss and analyze case studies involving the integration of geothermal power and non-renewable sources of energy.
- Devise methods for the integration of geothermal power in order to anticipate future changes in the energy market.

Content

Geothermal Energy Basics is an online course that enables participants to review, analyze, and evaluate opportunities in the rapidly expanding market for geothermal energy. In addition to gaining a working knowledge of the scientific, technological, and business aspects of geothermal energy, participants will also learn techniques for the integration of geothermal energy and existing non-renewable resources on a variety of levels, from small-scale use in commercial structures to large-scale distribution. The course blends theory and practice, and culminates with a project requiring the learner to develop a step-by-step plan for a geothermal energy installation.

With direct contact with your professor, who will answer questions and review your work via e-mail, you will have a chance to learn about geothermal energy in a personalized setting. You may also have an opportunity to interact with other professionals in the field who will be available for your questions. A discussion board will be available for interaction with peers.

This course is part of a 5-course series: Certificate in Renewable Energy. The goal of the series of courses, and the Renewable Energy program is to equip earth scientists with knowledge to enable them to take the lead in integrated energy projects and programs. An earth scientist's unique training and understanding of the big picture — the global picture — provides unmatched abilities to design, oversee, and promote integrated energy solutions which require bringing together fossil energy, geothermal, solar, biomass, and others.

- Unit 1 (Week 1): Scientific and Technology
- Unit 2 (Week 2): Exploration and Development
- Unit 3 (Week 3): Investment Models and Benefits
- Unit 4 (Week 4): Integration Techniques

WIND ENERGY BASICS: A RENEWABLE ENERGY CERTIFICATE COURSE

Dates: *Ongoing, course is offered at the beginning of every month. You may sign up for it at any time, and your course will begin the first day of the upcoming month.*
Tuition: *Member: $695.00 • Nonmember $795.00 Please note: There is a discount of $100 off this course if you sign up for all 5 courses in the AAPG Renewable Energy Certificate Course Program.*
Limit: *100*
Content: *4.8 CEU*
Instructor: *Mike Sullivan, Groundwater Services International, Harrisburg, PA*

Who Should Attend

This course is ideal for all energy professionals who have an interest in wind energy operations, ranging from small use-specific operations to large contributors to the regional grid. Individuals and companies interested in integrating energy generation from multiple sources (wind, oil and gas, etc.) will find the information very useful for adding revenue sources and increasing efficiency.

Objectives

By the end of the course, participants should be able to:

- Define key aspects of the growing wind industry, including different locations and scales of production.
- Describe the current use of wind energy.
- Identify and list past and current incentives for using and producing wind energy.
- Recognize companies developing and investing in wind energy, as well as estimate the business benefits of such investments.
- Identify the scientific fundamentals of the exploration, development, and distribution of wind power.
- Describe the scientific, technological, and business components of wind energy, e.g., turbine manufacturing and installation, wind farm management, purchasing and distribution of wind energy.
- Cite current applications of wind power in the energy industry.
- Discuss and analyze case studies involving the integration of wind power and non-renewable sources of energy.
- Devise methods for the integration of wind power in order to anticipate future changes in the energy market.

Content

Wind Energy Basics is an online course that enables participants to review, analyze, and evaluate opportunities in the rapidly expanding market for wind energy. In addition to gaining a working knowledge of the scientific, technological, and business aspects of wind energy, participants will also learn techniques for the integration of wind energy and existing non-renewable resources on both a large-scale production level and smaller-scale use in commercial and public structures. The course blends theory and practice, and culminates with a project requiring the learner to develop a step-by-step plan for a wind energy installation.

With direct contact with your professor, who will answer questions and review your work via e-mail, you will have a chance to learn about wind energy in a personalized setting. Resources will include texts, articles, podcasts, presentations, and video. You may also have an opportunity to interact with other professionals in the field who will be available for your questions. A discussion board will be available for interaction with peers.

This course is part of a 5-course series: Certificate in Renewable Energy. The goal of the series of courses, and the Renewable Energy program is to equip earth scientists with knowledge to enable them to take the lead in integrated energy projects and programs. An earth scientist's unique training and understanding of the big picture — the global picture — provides unmatched abilities to design, oversee, and promote integrated energy solutions which require bringing together fossil energy, geothermal, solar, wind, biomass, and others.

- Unit 1 (Week 1): Scientific and Technology
- Unit 2 (Week 2): Exploration and Development
- Unit 3 (Week 3): Investment Models and Benefits
- Unit 4 (Week 4): Integration Techniques

SOLAR ENERGY BASICS: A RENEWABLE ENERGY CERTIFICATE COURSE

Dates: *Ongoing, course is offered at the beginning of every month. You may sign up for it at any time, and your course will begin the first day of the upcoming month.*
Tuition: *Member: $695.00 • Nonmember $795.00 Please note: There is a discount of $100 off this course if you sign up for all 5 courses in the AAPG Renewable Energy Certificate Course Program.*
Limit: *100*
Content: *4.8 CEU*
Instructor: *Susan Nash, AAPG Education Director, Tulsa, OK*

Who Should Attend

This online course is ideal for individuals who want to learn about renewable energy, current trends, technologies and applications.

Objectives

By the end of the course, participants should be able to:

- Define key aspects of the growing solar industry, including different locations and scales of production.
- Describe the current use of solar energy.
- Identify and list past and current incentives for using and producing solar energy.
- Recognize companies developing and investing in solar energy, as well as estimate the business benefits of such investments.
- Identify the scientific fundamentals of the exploration, development, and distribution of solar power.
- Describe the scientific, technological, and business components of solar energy, e.g., turbine manufacturing and installation, solar farm management, purchasing and distribution of solar energy.
- Cite current applications of solar power in the energy industry.
- Discuss and analyze case studies involving the integration of solar power and non-renewable sources of energy.
- Devise methods for the integration of solar power in order to anticipate future changes in the energy market.

Content

Solar Energy Basics is an online course that enables participants to review, analyze, and evaluate opportunities in the rapidly expanding market for solar energy. In addition to gaining a working knowledge of the scientific, technological, and business aspects of solar energy, participants will also learn techniques for the integration of solar energy and existing non-renewable resources. Both large-scale solar farm structures and small-scale use in commercial and public structures will be addressed. The final project will involved developing a plan for a solar energy installation.

With direct contact with your professor, who will answer questions and review your work via e-mail, you will have a chance to learn about solar energy in a personalized setting. You may also have an opportunity to interact with other professionals in the field who will be available for your questions. A discussion board will be available for interaction with peers.

This course is part of a 5-course series: Certificate in Renewable Energy. The goal of the series of courses, and the Renewable Energy program is to equip earth scientists with knowledge to enable them to take the lead in integrated energy projects and programs. An earth scientist's unique training and understanding of the big picture — the global picture — provides unmatched abilities to design, oversee, and promote integrated energy solutions which require bringing together fossil energy, geothermal, solar, solar, biomass, and others.

- Unit 1 (Week 1): Scientific and Technology
- Unit 2 (Week 2): Exploration and Development
- Unit 3 (Week 3): Investment Models and Benefits
- Unit 4 (Week 4): Integration Techniques

BIOMASS ENERGY BASICS: A RENEWABLE ENERGY CERTIFICATE COURSE

Dates: *Ongoing, course is offered at the beginning of every month. You may sign up for it at any time, and your course will begin the first day of the upcoming month.*
Tuition: *Member: $695.00 • Nonmember $795.00 Please note: There is a discount of $100 off this course if you sign up for all 5 courses in the AAPG Renewable Energy Certificate Course Program.*
Limit: *100*
Content: *4.8 CEU*
Instructor: *Susan Nash, AAPG Education Director, Tulsa, OK*

Who Should Attend

Ideal for individuals who want to learn about renewable energy, current trends, technologies and applications.

Objectives

By the end of the course, participants should be able to:

- Define key aspects of the growing biopower and biofuel industry, including different locations and scales of production.
- Describe the current use of biomass-generated energy.
- Identify and list past and current incentives for using and producing biomass energy.
- Recognize companies developing and investing in biomass energy, as well as estimate the business benefits of such investments.
- Identify the scientific fundamentals of the exploration, development, and distribution of biopower and biofuel.
- Describe the scientific, technological, and business components of energy from biomass sources, e.g., the six types of biopower systems (direct-fired, cofiring, gasification, anaerobic digestion, pyrolysis, and small, modular) and sources of biofuel, e.g. ethanol, biodiesel, and methanol.
- Cite current applications of biopower and biofuels in the energy industry.
- Discuss and analyze case studies involving the integration of biopower/biofuel and non-renewable sources of fuel and energy.

- Devise methods for the integration of biopower/biofuel and non-renewables in order to anticipate future changes in the energy market.

Content

Biomass Energy Basics is an online course that enables participants to review, analyze, and evaluate opportunities in the rapidly expanding market for biopower and biofuel. In addition to gaining a working knowledge of the scientific, technological, and business aspects of biomass energy/fuel, participants will also learn techniques for integration with existing non-renewable resources, including using bioenergy and fuel to heat and/or power commercial structures, private homes, and public buildings. You will have a chance to plan a biomass operation for your final project.

With direct contact with your professor, who will answer questions and review your work via e-mail, you will have a chance to learn about renewable energy in a personalized setting. You may also have an opportunity to interact with other professionals in the field who will be available for your questions. A discussion board will be available for interaction with peers.

This course is part of a 5-course series: Certificate in Renewable Energy. The goal of the series of courses, and the Renewable Energy program is to equip earth scientists with knowledge to enable them to take the lead in integrated energy projects and programs. An earth scientist's unique training and understanding of the big picture — the global picture — provides unmatched abilities to design, oversee, and promote integrated energy solutions which require bringing together fossil energy, geothermal, solar, wind, biomass, and others.

- Unit 1 (Week 1): Scientific and Technology
- Unit 2 (Week 2): Exploration and Development
- Unit 3 (Week 3): Investment Models and Benefits
- Unit 4 (Week 4): Integration Techniques

RENEWABLE & NON-RENEWABLE RESOURCES - OVERVIEW & INTEGRATION : A RENEWABLE ENERGY CERTIFICATE COURSE

Dates: *Ongoing, course is offered at the beginning of every month. You may sign up for it at any time, and your course will begin the first day of the upcoming month.*
Tuition: *Member: $695.00 • Nonmember $795.00 Please note: There is a discount of $100 off this course if you sign up for all 5 courses in the AAPG Renewable Energy Certificate Course Program.*
Limit: *100*
Content: *4.8 CEU*
Instructor: *Susan Nash, AAPG Education Director, Tulsa, OK*

Who Should Attend

This online course is ideal for individuals who want to learn about renewable energy, current trends, technologies and applications.

Objectives

By the end of the course, participants should be able to:

- Define key aspects of the growing renewable resource industry, including different types of energy sources and locations.
- Describe the current use of wind, geothermal, solar, and biomass energy.
- Identify and list past and current incentives for using renewable energy, including tax credits, grants, cost savings, and more.
- Recognize companies developing and investing in renewable energy, as well as estimate the business benefits of such investments.
- Identify the scientific fundamentals of the exploration, development, and distribution of different sources.
- Describe the technological components of different sources, e.g., commercial and small-scale wind turbines, photovoltaics and CSP, and biomass.
- Cite current applications of renewable resource technologies within the energy industry.
- Compare and contrast the scientific, technological, and business components of renewable and non-renewable energy sources.
- Discuss and analyze case studies involving the integration of renewable and non-renewable energy.
- Devise methods for the integration of renewable and non-renewable sources in order to anticipate future changes in the energy market.

Content

Renewable & Non-Renewable Resources is an online course that enables participants to review, analyze, and evaluate opportunities in the rapidly expanding market for renewable energy. In addition to gaining a working knowledge of the scientific, technological, and business aspects of sources of renewable energy, participants will also learn techniques for integration with existing non-renewable resources, both on a large production scale and a smaller scale for use in commercial, public, and private structures. The final project involves planning an installation requiring renewable and non-renewable energy integration.

With direct contact with your professor, who will answer questions and review your work via e-mail, you will have a chance to learn about renewable energy in a personalized setting. You may also have an opportunity to interact with other professionals in the field who will be available for your questions. A discussion board will be available for interaction with peers.

This course is part of a 5-course series: Certificate in Renewable Energy. The goal of the series of courses, and the Renewable Energy program is to equip earth scientists with knowledge to enable them to take the lead in integrated energy projects and programs. An earth scientist's unique training and understanding of the big picture — the global picture — provides unmatched abilities to design, oversee, and promote integrated energy solutions which require bringing together fossil energy, geothermal, solar, wind, biomass, and others.

- Unit 1 (Week 1): Scientific and Technology
- Unit 2 (Week 2): Exploration and Development
- Unit 3 (Week 3): Investment Models and Benefits
- Unit 4 (Week 4): Integration Techniques

5-COURSE SET - ONLINE RENEWABLE ENERGY CERTIFICATE COURSES

Tuition: *Member: $2,975.00 • Nonmember $3,475.00*
Limit: *100*
Content: *24.CEU*
Instructors: *various - see individual course descriptions*

Who Should Attend

Ideal for individuals who want to learn about renewable energy, current trends, technologies and applications.

Content

Courses included are (See individual courses for complete descriptions):

- Geothermal Energy Basics - Launch: September 1, 2009
- Wind Energy Basics - Launch November 1, 2009
- Solar Energy Basics - Launch February 1, 2010
- Biomass Energy Basics - Launch April 1, 2010
- Renewable Energy Integration - Launch June 1, 2010

These courses are being offered at the beginning of every month. Sign up for these 5 courses as a package at any time, and the courses will begin the first day of the upcoming month. Length for each course is 4 weeks and each course is designed to be equivalent to a 3 credit-hour graduate level seminar.

GIANT OIL AND GAS FIELDS CERTIFICATE COURSE

Dates: *Ongoing, course is offered at the beginning of every month. You may sign up for it at any time, and your course will begin the first day of the upcoming month.*
Tuition: *Member: $695.00 • Nonmember $795.00*
Limit: *100*
Content: *4.8 CEU*
Instructor: *Susan Nash, AAPG Education Director, Tulsa, OK*

Who Should Attend

This course is ideal for geologists, geophysicists, engineers, and other energy professionals who want to learn about giant and super-giant fields, their reservoirs, and production history.

Objectives

Upon successful completion of this course, you will be able to analyze, compare, and contrast giant petroleum fields of the world. You will be able to describe the fields, the reservoirs, and their production history.

Key Concepts:

- Giant petroleum fields
- Tectonic settings of giant fields
- Giant field trends
- Deepwater discoveries
- Stratigraphic controlled giant fields
- Salt domes
- Deltaic reservoirs
- Carbonate reservoirs
- Deep Marine clastics reservoirs
- Basin modeling
- Unconventional resources
- Fractured reservoirs
- Hydraulic fracturing
- CO_2 enhanced oil recovery
- Reservoir characterization and 3D seismic
- Seismic imaging and reservoir/stratigraphic definition
- Offshore seismic data acquisition techniques

Content

There are approximately 1,000 oil and gas fields in the world that have been classified as "giant," containing more than 500 million barrels of recoverable oil and/or 3 trillion cubic feet of gas. Giant Oil and Gas Fields is an online course that enables participants to study the structure, stratigraphy, and production history of the fields and an analysis of effective exploration, production, and enhanced oil recovery methods.

With direct contact with your professor, who will answer questions and review your work via e-mail, you will have a chance to learn about giant oil fields in a personalized setting. You may also have an opportunity to interact with other professionals in the field who will be available for your questions. A discussion board will be available for interaction with peers.

- Unit 1 (Week 1): Definition of Giant Oil and Gas Fields
- Unit 2 (Week 2): The First Giant Oil and Gas Fields
- Unit 3 (Week 3): Expanding Onshore and Offshore
- Unit 4 (Week 4): New Technologies, New Giants

INTRODUCTION TO SHALE GAS CERTIFICATE COURSE

Dates: *Ongoing, course is offered at the beginning of every month. You may sign up for it at any time, and your course will begin the first day of the upcoming month.*
Tuition: *Member: $695.00 • Nonmember $795.00*
Limit: *100*
Content: *4.8 CEU*
Instructor: *Susan Nash, AAPG Education Director, Tulsa, OK*

Who Should Attend

This course is ideal for geologists, geophysicists, engineers, and other energy professionals who want to learn about the basics of shale gas plays, and ongoing exploration in such plays as the Barnett, Marcellus and Woodford basins.

Objectives

Upon successful completion of this course, participants will be able to define shale gas, explain theories relating to its origin, discuss the attributes of major and emerging plays, describe challenges in horizontal drilling, and discuss geological considerations in hydraulic fracturing.

Content

This course covers the fundamentals of shale plays, from the origins and geochemistry of shale gas, to profiles of shale gas exploration and production, including the Barnett, Fayetteville, Marcellus, Woodford, and Antrim. Reservoir considerations such as natural fracturing are covered, as well as completion issues involving hydraulic fracturing processes and procedures. Course

includes interaction with your instructor, a log of the articles and reports provided for the course, responses to discussion questions and problem sets, and case study analyses.

INTRODUCTION TO UNCONVENTIONAL RESOURCES CERTIFICATE COURSE

Dates: *Ongoing, course is offered at the beginning of every month. You may sign up for it at any time, and your course will begin the first day of the upcoming month.*
Tuition: *Member: $695.00 • Nonmember $795.00*
Limit: *100*
Content: *4.8 CEU*
Instructor: *Susan Nash, AAPG Education Director, Tulsa, OK*

Who Should Attend

This course is ideal for geologists, geophysicists, engineers, and other energy professionals who want to learn about the basics of various unconventional resources, such as coalbed methane, shale gas, shale oil and tar sands.

Objectives

Upon successful completion of this course, participants will be able to define unconventional resources, explain theories relating to their origin, discuss the attributes of major and emerging plays, describe challenges in exploring for and developing the resources, and discuss technologies that are helping make unconventional plays economic.

Content

This course covers the fundamentals of unconventional resources, including coalbed methane, shale gas, shale oil, and tar sands. The course presents the key defining characteristics of the different unconventional resources, and it discusses methods for exploring for and producing them. Examples of the main plays will be profiled, including coalbed methane in Wyoming, the Bakken formation, the Eagle Ford, and tar sands in Alberta. Emerging plays and technologies that make the resource plays economic will also be covered. Course includes interaction with your instructor, a log of the articles and reports provided for the course, responses to discussion questions and problem sets, and case study analyses.

ONLINE COURSES – TRADITIONAL FORMAT

STRATEGIC DECISION-MAKING: CURRENT ISSUES IN THE OIL INDUSTRY

Dates: *Begins the first of each month. Includes Online resources, course website, videos, packet of independent study reading materials. Materials will also sent by e-mail. You may start the course at any time and work at your own pace. This course is designed to be completed within 4 weeks. You will have one year from the date you register to complete the course.*
Tuition: *$395.00AAPG members, $495.00 for non-members*
Content: *4.0 CEU*
Instructor: *Susan Nash, AAPG Education Director, Tulsa, OK*

Who Should Attend

This course will help energy professionals, investors, geoscientists, engineers, business owners, managers, and service providers a clear view of many of the issues that accompany the rapid expansion of oil and gas supplies. It will place them within a strategic context that will help identify specific opportunities, and also places where changes can be made.

Learning Goals

Upon successful completion of this course, the student will be able to list current issues that can impact growth and sustainability of oil and gas ventures. They will also be able to explain the reasons for the potential problems, and evaluate possible solutions.

Overview

The future of oil and gas ventures is complex due to a number of challenges facing the industry. Although demand for oil and gas remains high, especially in the new giants, India and China, complications have emerged, particularly in the U.S., where the "shale revolution" has resulted in an oversupply of natural gas, and plunging natural gas prices. In the meantime, lack of infrastructure in some of the major plays (the Bakken in North Dakota, the Eagle Ford in south Texas), has made it necessary to employ expensive methods of transporting liquids-rich petroleum such as hauling via truck and rail, vs. pipelines. Further, the lack of natural gas processing and transportation infrastructure (gathering systems, pipelines, compressors, conditioning) has made it difficult to get natural gas to market. Water management remains a challenge as well, particularly in times of drought and public sensitivity to environmental issues.

At the same time, enormous opportunities abound, primarily due to the emergence of transformational technologies, which have allowed previously unproductive and unproducible resources to be exploited. Further, new technologies are making it possible to return to mature fields and to recover oil and gas that has been left behind.

In order to make strategic decisions in all industries, it is very important to have an understanding of the issues facing the energy sector.

Background and Contexts

Technological breakthroughs which have enabled companies to recover oil and gas that was previously unrecoverable have transformed the U.S. energy industry, and have helped lower dependence on imported oil. Some economists have predicted energy independence by 2020 (Citigroup, 2013, Energy 2020: North America, the New Middle East?). We can already see a change: in 2005, the U.S. imported 60% of its oil, while in 2012, only 40% was imported (U.S. Energy Information Administration, August 2013).

Understanding the opportunities and gaining knowledge of the multiple challenges that accompany the goal of sustainable expansion of oil and gas supplies (via exploration, production, transportation) and the appropriate / effective use of new technologies are vital.

Course Units (Issues):

Participants will select four issues from the list below and be given access to those readings and course materials. They then read the materials and respond to the Guiding Questions by writing responses, supporting their ideas with information from the readings and also by conducting their own research using reliable sources.

1. Current oil and gas exploration / production efforts hampered by insufficient cash / undercapitalization.
2. Skyrocketing costs in energy technology.
3. Environmental challenges.
4. Shortages of qualified personnel.
5. Bubble Economies and Carbon Economies / Fire sales and "vulturing".
6. Alternative Energies: Easy-to-find, cheap-to-produce oil no longer exists.
7. Health and safety issues are increasingly complicated.
8. "Green" energy must combine with oil and gas.
9. Geopolitical power shuffles.
10. Non-renewables are "dirty" and difficult;
11. Renewables are expensive.
12. Global outlook: Sustained, worldwide growth.

TECHNICAL WRITING

Dates: *Begins the 2nd of every month, 10-week course (can be accelerated). Exercises and Exams administered by instructor via email.*
Tuition: *$300 (includes textbook)*
Content: *5.4 CEU*
Instructor: *Susan Nash, AAPG Education Director, Tulsa, OK*

Who Should Attend

This course is ideal for scientists, managers, and professionals for whom English is a second language, with personalized grammar and vocabulary review. This course is highly recommended for scientists and technical professionals seeking to develop a mastery of the communication skills required in an increasingly digital age.

Objectives and Content

In addition to providing a solid foundation with templates and flowcharts for reports, technical documents, summaries, recommendations, annual reports, and more, the course provides one-on-one mentoring in collaborative work, presentations, emails, discussion board postings, web logs, website analysis and design, and more. Also, the course looks at ethical issues in digital and print communication, and provides support and effective techniques for collaborative and individual revision activities. This course is newly revised (2005), and gives users access to Dr. Nash's Writing Survival Guide. This course is particularly useful for professionals involved in writing research papers, proposals, dissertations, theses, and technical monographs.

- Abstracts / Technical Papers
- Grammar / Style / Revision
- Proposals
- Technical correspondence
- Reports

PROFESSIONAL ENGLISH

Dates: *Variable, completely self-paced online. Exercises and Exams administered by instructor via email.*
Tuition: *$300 (includes textbook)*
Content: *5.4 CEU*
Instructor: *Susan Nash, AAPG Education Director, Tulsa, OK*

Who Should Attend

This course is ideal for individuals seeking to develop highly effective documents for their companies, personal businesses, and associations.

Objectives and Content

Upon completion of this course, students will have gained an ability to develop and organize documents both printed and on the Internet which are read by individuals outside their company. If you are responsible for creating or maintaining any of the following, this course will be beneficial for you:

- Memoranda, PowerPoint Presentations, Meeting Documents
- Quarterly and Annual Reports
- Reports and Presentations to Investors, Shareholders, Stakeholders
- Websites, Promotional Items
- Resumes
- Directories of Services, Virtual Information Libraries

LEADERSHIP AND STRATEGIC THINKING IN THE OIL AND GAS INDUSTRY

Dates: *Begins the first of each month. Includes course materials and direct interaction with the instructor via e-mail. You may start the course at any time and work at your own pace. This is a four-module course designed to be completed within 4 weeks.*
Tuition: *$395.00 AAPG members, $495.00 for non-members*
Instructor: *Susan Nash, AAPG Education Director, Tulsa, OK*

Who Should Attend

Geoscientists, engineers and all decision-makers involved in the energy industry, with emphasis on oil and gas.

Objectives and Content

Times of rapid technological innovation, financial turmoil, new plays and markets, distributed teams and workforces, difficult-to-control social media, shortages of technical expertise, and time pressures involved in achieving operational objectives have come together to create new challenges and opportunities for leadership. How the issues relate to the oil and gas business (exploration, development, oilfield services, support services, financial sector) constitutes the core of this course, along with ways to transform challenges into opportunities, and to develop effective strategic thinking.

Key Topics Covered in the Course

- Leadership theories: profiles, comparisons, applications.
- Management theories and application to oil and gas industry.

- Creative problem-solving: internal, external, public presence.
- Dealing with rapid change.
- Impact of technological innovation.
- Dealing with rapidly changing regulatory environment.
- Environmental issues: operations, procedures, perception and reality.
- Social network power & potential pitfalls.
- Impact of social networking on organizational structure and integrity.
- Diversity in the global context / distributed workplace.
- Team-building across disciplines.
- Dealing with "game-changers" (resource plays, new ways of structuring deals, capital from national oil companies, international partnerships).
- Key articles / thinkers / emergent ideas.

MBA in Energy Leadership: This course can be taken alone, or in conjunction with the AAPG's partnerships in Energy Leadership. If you are considering applying for the Texas A&M Texarkana MBA in Energy Leadership, this course is required.

This is a four-module course designed to be completed within 4 weeks. You may start the course at any time and work at your own pace. You will have direct interaction with the instructor via email and will receive materials through a course website. For each unit, you will be required to complete a brief report.

PETROLEUM EXPLORATION & PRODUCTION: AN ONLINE OVERVIEW

A joint course with AAPG and The University of Tulsa Continuing Engineering and Science Education Department

Please note - if paying with a check, please make check payable to University of Tulsa, CESE (applies to this course only)

Dates: *Variable, completely self-paced online.*
Tuition: *$795.00/person. Upon registration, each student will receive a login and password, good for 30 days of anytime, anywhere access. Your computer will need to have Internet access and be able to run QuickTime, Flash and Java Runtime. Certificate of Completion, a geological time card and a reference handbook are also included.*
Instructor: *Norman J. Hyne, The University of Tulsa, Tulsa, OK*

Who Should Attend

This course is for anyone needing an overall perspective of petroleum exploration, drilling, and production in order to become more knowledgeable and productive in your job. This will include, but not be limited to: new employees, Administrative Assistants, Landmen, Accountants, Managers, Marketing/Sales Personnel, Attorneys, Finance Personnel, Geotechs, etc.

Objectives

This online course provides an overview of the petroleum industry from what is natural gas and crude oil to how to explore, drill, and produce oil and gas. It is a technical program presented on a non-technical level, through audio visuals, graphics, texts and examples. No previous technical training is necessary to take this course.

This program offers a perspective that leads to increased job productivity. It is designed for anyone who works directly or indirectly with the petroleum industry and who is not a petroleum geologist or petroleum engineer.

The course is provides individuals and companies with an easily accessible training tool to educate interns and employees on the language and processes of the oil and gas industry. In addition, we want to provide participants with an interactive, flexible and exciting way to learn.

Content

1. The Nature of Oil & Gas
2. The Earth's Crust — Where We Find Oil and Gas
3. Generation, Migration and Accumulation of Petroleum
4. Deformation of Sedimentary Rocks
5. Petroleum Traps
6. Petroleum Exploration; Seismic Exploration
7. Drilling Preliminaries; Drilling a Well; Drilling Problems and Techniques
8. Testing a Well; Completing a Well
9. Offshore Exploration and Production
10. Petroleum Production

Course Highlights

1. Narrated by Norm Hyne - his enthusiasm of this topic will keep your interest!
2. Animated illustrations
3. Easy to navigate your way thru the course
4. Designed in short segments making it easy to stop after each section. Or you can finish the course all at once. You make the decision based on your schedule.
5. Turn the audio on or off any time throughout the course.
6. Highly interactive
7. Immediate feedback exercises
8. Glossary of terms provided with the click of a mouse
9. Links to additional information on the web
10. Picture gallery of various subjects

Technical Requirements

Your computer will need to have the following:

1. Internet access (Internet Explorer or Firefox)
2. QuickTime: www.quicktime.com
3. Flash: www.adobe.com/shockwave/download/
4. Java Runtime: www.java.com

THE WORLD-CLASS EDUCATION CONFERENCE

ENJOY FIVE GREAT DAYS OF THE FINEST GEOSCIENCE TRAINING, INCLUDING SOME OF THE BEST SHORT COURSES THE AAPG HAS TO OFFER.

Schedule for AAPG World-class Education Conference » 2015 Houston				
Monday - 3/2	**Tuesday - 3/3**	**Wednesday - 3/4**	**Thursday - 3/5**	**Friday - 3/6**
Deepwater Reservoir Connectivity (Lesli Wood)		Exploration for Deep-Water Sands Using Seismic Sequence Methodology (John Armentrout)		
Carbonate Reservoir Geology: Understanding Depositional and Diagenetic Factors Controlling Porosity (Peter & Dana Scholle)		Carbonate Depositional Systems (Art Saller)	Microbial Carbonate Reservoir Characterization (Ernie Mancini)	
Basic Seismic Interpretation (Don Herron and Bob Wegner)		Seismic Amplitude Interpretation (Fred Hilterman)	3D Seismic Attributes for Unconventional Resources (Kurt Marfurt)	
Discovery and Recovery Thinking in Shales (Creties Jenkins)		Introductory Geochemistry for Condensate-rich Shales and Tight Oil (Christopher Laughrey)	Log Analysis of Shaly Sand Reservoirs (George Asquith)	Log Analysis of Hydrocarbon-Bearing "Shale" Reservoirs (George Asquith)
Small bookstore open during breaks each day				

AAPG WORLD-CLASS EDUCATION CONFERENCE

Dates: March 2-6, 2015
Location: Houston, TX
Tuition: $1895, AAPG members, $2195, non-members (increases to $2095/$2395 respectively on 2/02/2015.) Registration is for entire week, and badge is transferable. Includes refreshments and buffet lunch each day in addition to digital course notes and printed exercises. Courses also priced individually at $550/course day (increases to $600/course day on 2/02/2015.) No refunds for cancellations after 2/02/2015.

DEEPWATER RESERVOIR CONNECTIVITY

Dates: March 2-3, 2015
Tuition: $1100, if purchased separately (increases to $1200 on 2/02/2015)
Content: 1.5 CEU
Instructor: Lesli Wood, Bureau of Economic Geology, Austin, TX

Who Should Attend

This course is for engineers, geologists and geophysicists who are responsible for economically positive exploration and development of deep-marine reservoirs. In addition, any individuals who might be evaluating prospects or proposals from other individuals dealing with deepwater assets or developments will benefit. It is particularly appropriate for geologist-engineer teams who are responsible for building reservoir development models in these complex systems.

Objectives

By the end of the course, participants should be able to accomplish the following:

- Recognize the major architectural elements of the deepwater reservoir systems, how to interpret them, their geometries, petrophysics, and stratigraphic relationships (connectivity) between each other and with surrounding elements
- The ability to assess sand presence in deepwater reservoir elements
- Differences in connectivity due to changes in net:gross of a system
- Recognize, interpret and understand the impact of debrites and other forms of mass failures on your reservoirs and their performance
- Be aware of previous successes and failures of connectivity and production planning in deepwater reservoir systems.

Content

Connectivity in deepwater deposited reservoirs is often times something you don't know for certainty until you have a well down and flowing. However, with careful understanding of the architecture of the reservoir section (i.e., facies distributions, element sizes and distributions, shale thicknesses and lengths, erosional events versus depositional events, etc.) we can reach toward reducing uncertainty in our production projections. This course will discuss predicting sands in seismic analysis of deepwater intervals, connectivity in various types of deepwater reservoir systems, and production case histories, both successful and less so. We will do some seismic, outcrop and subsurface based exercises and discuss the implications of various correlation and interpretation scenarios. Finally we will finish with a look at building training images and reservoir models in deepwater systems.

CARBONATE RESERVOIR GEOLOGY: UNDERSTANDING DEPOSITIONAL AND DIAGENETIC FACTORS CONTROLLING POROSITY

Dates: March 2-3, 2015
Tuition: $1100, if purchased separately (increases to $1200 on 2/02/2015)
Content: 1.5 CEU
Instructors: Peter Scholle and Dana Ulmer Scholle, Scholle Petrographic, LLC, Magdalena, NM

Who Should Attend

Exploration and development geologists working on carbonate reservoirs; petroleum engineers and geophysicists with some carbonate geology background and an interest in understanding the causes and patterns of reservoir heterogeneity.

Objectives

By the end of this course, participants should understand the major factors of importance in controlling porosity in carbonate rocks along with:

- sedimentary facies and sediment textures through time;
- primary mineralogy variations and their influence on porosity preservation or development;
- early diagenetic history of cementation and/or exposure-related porosity development; and
- burial diagenesis from early to late stages including brine reflux, hydrothermal water movement, timing of hydrocarbon entry and others.

Participants should also be able, at the end of the course:

- to understand porosity evolution and the techniques available to evaluate reservoirs, especially petrographic and geochemical methods — both their advantages and limitations; and
- to independently evaluate their own samples based on an understanding of the geologic and diagenetic histories of their units. Carbonate petrography may seem overwhelming at first, but if it is focused on rocks of a specific age and a specific region, the task is well within the achievable skill set of any geoscientist.

Content

The course consists of a series of PowerPoint presentations. We will start with predictable patterns of

carbonate deposition as a function of geologic time and move on to an examination of selected modern depositional settings that serve as excellent analogs for ancient sediments (focusing mostly on the less commonly presented, but very important analogs from the Persian Gulf and Australia).

Moving on to diagenesis, we will discuss patterns of alteration in marine, subaerial exposure/meteoric environments, and deeper burial settings, integrating core, petrographic and geochemical observations. We will then examine a series of case histories of reservoirs from Paleozoic and Mesozoic basins, especially those in the southwestern US. We will also cover unconventional carbonates with a discussion of chalk reservoirs and their porosity patterns.

BASIC SEISMIC INTERPRETATION

Date: *March 2-3, 2015*
Tuition: *$1100, if purchased separately (increases to $1200 on 2/02/2015)*
Content: *1.5 CEU*
Instructors: *Donald A. Herron and Robert C. Wegner, Consultants, Houston, TX*

Who Should Attend

New hires, experienced geologists, and geoscience technicians who work with seismic data and wish to learn and develop basic seismic interpretation skills.

Objectives

Upon completion of this course, participants will:

- Understand basic concepts and practices of seismic interpretation.
- Be able to interpret seismic data and recognize interpretation problems.
- Understand the importance of seismic interpretation in a business context.

Content

The course consists of lectures on fundamental topics including basics of petroleum geology, seismic response, velocity, resolution, seismic migration, seismic correlation and mapping techniques, and quantified interpretation. Lectures are supported by hands-on exercises, and the second day of the course includes two practical correlation and mapping projects. Each participant receives a copy of SEG Geophysical Monograph Series #16, First Steps in Seismic Interpretation, by Donald A. Herron.

Outline (Day 1)

- Introduction to Petroleum
- Petroleum Geology
- What is Seismic Exploration
- Introduction to Seismic Interpretation
- Seismic response
- Velocity
- Resolution
- Seismic migration

Outline (Day 2)

- Fault interpretation
- Horizon interpretation
- Correlation and mapping exercise (3D seismic grid)
- Quantified interpretation
- Bright Spot Interpretation
- Course summary

DISCOVERY AND RECOVERY THINKING IN SHALES

Date: *March 2-3, 2015*
Tuition: *$1100, if purchased separately (increases to $1200 on 2/02/2015)*
Content: *1.5 CEU*
Instructor: *Creties Jenkins, Rose & Associates, Santa Barbara, CA*

Who Should Attend

Geoscientists, petrophysicists, engineers, and managers who are seeking to improve their effectiveness in exploring, appraising, and developing shale reservoirs.

Objectives

Upon completion of this course, participants will:

- Be able to identify those rock and fluid properties that are most critical to characterize
- Know how to quantify the uncertainty associated with these properties
- Understand how to use decision trees and value of information techniques to improve your workflow and assessment

Content

This course will contain the following topics presented in a mixture of lectures and hands-on exercises:

Day 1

1. Critical Geoscience and Engineering Aspects
   - Geology: Stratigraphy, mineralogy, pore geometry, containment
   - Geochemistry: organic richness, thermal maturity, fluid windows
   - Geophysics: Geohazards, natural fractures, microseismic, structure
   - Petrophysics: Permeability, saturations, porosity, hydrocarbons-in-place
   - Geomechanics: Static and dynamic properties, stress magnitudes and orientations
   - Drilling/Completions: Drilling hazards, wellbore integrity, fracture stimulation
   - Well Performance: well testing, flow regimes, diagnostics, decline curves
2. Exercise: Application of technical fundamentals to analyzing case study posters.

Day 2

3. Quantifying Uncertainty
   - Estimating the range of uncertainty
   - Statistics and distributions
   - Using log probit plots
4. Decision Trees and Value of Information
   - The shale project decision tree
   - Quantifying key risks
   - Determining the chance of success
   - Using VOI to decision data acquisition
5. Application of Probabilistic Methods
   - Spatial compositing of mapped data
   - Forecasting production and EURs
   - Sequential accumulation plots
   - Using aggregation to book more reserves
6. Exercises: Generating log probit plots, decision trees, composite maps, and seq. accum. plots

EXPLORATION FOR DEEP-WATER SANDS USING SEISMIC SEQUENCE METHODOLOGY

Dates: *March 4-6, 2015*
Tuition: *$1650, if purchased separately (increases to $1800 on 2/02/2015)*
Content: *2.25 CEU*
Instructor: *John Armentrout, Cascade Stratigraphics, Damascus, OR*

Who Should Attend

Geologists, geophysicists and engineers involved in exploration for or production from deep-water sand reservoirs will benefit from this practical, hands-on seminar. Participants should have a basic knowledge of stratigraphic principles and fundamentals of sedimentologic processes.

Objectives

By the end of the course participants should be able to:

- Make a 'quick-look' evaluation of seismic profiles for probable exploration targets within passive margin, cratonic basin, forearc and growth-fault systems.
- Select the most appropriate 'preliminary' depositional model as an interpretation template for seismic analysis.
- Plan an interpretation strategy to optimize identification of deep-water sand systems including channel, channel-complex, lobe and sheet facies.
- Identify reservoir connectivity issues for channel-complexes and sheet-sands and outline a strategy for testing predicted connectivity.
- Identify the most critical issues of play-risk for each depositional element of deep-water sand systems.

Content

A succession of exercises and complementary lectures will expose the participants to deep-water depositional systems, facies analysis, chronostratigraphic framework, comparison of local to global depositional patterns, and application of an integrated approach to stratigraphic analyses using multiple data sets. The exercises use 2D seismic profiles, wireline logs, and biostratigraphic data. Interpretation strategies using 3D seismic volumes will be illustrated. The study areas include the late Neogene of Nigeria and the Gulf of Mexico, Mesozoic facies of the North Slope of Alaska, Great Valley of California and West Siberia, and the Paleozoic of West Texas.

CARBONATE DEPOSITIONAL SYSTEMS

Dates: *March 4, 2015*
Tuition: *$550, if purchased separately (increases to $600 on 2/02/2014)*
Content: *.75 CEU*
Instructor: *Art Saller, Cobalt International Energy, Houston, TX*

Who Should Attend

This course is for earth scientists and engineers involved in exploration or production from carbonate rocks. This is an introductory course that assumes no pre-existing knowledge. It moves from basic principles to advanced ideas and case studies that will also help experienced geoscientists with practical aspects of carbonate depositional systems.

Objectives

This course will give participants a working knowledge of carbonate depositional systems. By the end of the course, participants will able to:

- Describe carbonate rocks according to depositional texture and grain types
- Interpret carbonate depositional environment from core descriptions and other data
- Know the characteristics of modern and ancient carbonate depositional environments
- Understand the relationship between depositional environments and carbonate grain types and textures
- Use depositional environments and facies data to understand variations in subsurface reservoir properties like porosity and permeability
- Predict the spatial distribution of different depositional environments in the context of reservoir development
- Understand different types of carbonate depositional systems (ramps, shelves, isolated platforms, and buildups), and their implications to reservoir development
- Predict changes in depositional systems and facies during basin evolution and sea level fluctuations, including differences between "greenhouse" (small amplitude sea-level fluctuations) and "ice-house" (high amplitude sea-level fluctuations) times

Content

This course will alternate between lectures and practical exercises involving cores, logs and seismic data.

The course starts with an introductory lecture that summarizes key differences between carbonate and siliciclastic depositional systems, followed by a review of the Dunham classification of carbonate rocks and grain types. An exercise involving outcrop samples will allow participants to describe samples and relate them to depositional environments.

The second lecture is on carbonate depositional

environments, and it will systematically examine modern environments, outcrop equivalents, and subsurface reservoir examples of each environment. An exercise involving cores and logs will illustrate ramp depositional environments and their effect on reservoir architecture during "greenhouse" times. Carbonate sequence stratigraphy will be discussed in theory and practice. A core-log-seismic exercise will show how predictable variations in reservoir development occur during ice-house cycles on a shelf and isolated platform.

This course will conclude with a discussion summarizing prediction of depositional facies, stratigraphy and reservoir development in a variety of different settings.

SEISMIC AMPLITUDE INTERPRETATION

Dates: *March 4, 2015*
Tuition: *$550, if purchased separately (increases to $600 on 2/02/2015)*
Content: *.75 CEU*
Instructor: *Fred Hilterman, Geokinetics, Houston, TX*

Who Should Attend

This course is intended for geologists, geophysicists and engineers who integrate and/or interpret seismic data as part of their workflow to characterize a reservoir. In particular, the course will assist geoscientists who need to identify a reservoir's lithology, pore-fluid and net-to-gross using seismic amplitude.

Objectives

Upon course completion, participants should be able to select the appropriate techniques for pore-fluid and lithology prediction from seismic data. To accomplish this, the participants will:

- Qualitatively relate a rock's velocity and density to porosity, lithology and hydrocarbon content,
- Relate a reservoir's AVO class to seismic velocity,
- Identify seismic attributes that recognize hydrocarbon signatures in different rock-property (seismic velocity) environments,
- Compare the sensitivity of seismic attributes for variations in mineral content, porosity, and water saturation that are relative to the reservoir's geologic setting,
- Select the appropriate seismic attributes to crossplot and then interpret regions on the seismic data that indicate most likely increases in porosity, hydrocarbon and net-to-gross,
- Prepare the necessary information and data needed to predict lithology and pore-fluid content from seismic data, and
- Evaluate the chances of a successful amplitude interpretation which leads to a successful reservoir characterization.

As a metric to the success of the learning objectives, a checklist for a reservoir-characterization study will be presented to the participants for evaluation and future application.

Content

The goal of seismic amplitude interpretation and this course is the validation of reservoir composition. This characterization has matured from the 1970 Bright Spot analyses to amplitude-versus-offset (AVO) and inversion techniques. Along the way, many seismic amplitude attributes related to rock proprieties have been proposed.

The course introduces the empirical and theoretical rock-physics basis for reservoir characterization and catalogs rock properties to expected seismic signatures. Techniques for recognizing hydrocarbons and quantifying the reservoir's properties in different rock-property settings, which are often referred to as Class 1-4 AVO, are introduced and subsequently illustrated with numerous field examples. Seismic amplitude attributes for distinguishing lithology and pore fluid along with their applicability and robustness in different environments are introduced.

Rock-property and AVO PC modeling programs are supplied to each participant to assist in the classroom and later work-related exercises involving seismic discrimination of lithology and pore-fluid. Case histories involving Class 1-4 AVO anomalies are presented along with numerous rock-property studies.

INTRODUCTORY GEOCHEMISTRY FOR CONDENSATE-RICH SHALES AND TIGHT OIL

Date: *March 4, 2015*
Tuition: *$550, if purchased separately (increases to $600 on 2/02/2015)*
Content: *.75 CEU*
Instructor: *Christopher D. Laughrey, Weatherford Labs, Golden, CO*

Who Should Attend

Geoscientists and engineers who need to integrate basic petroleum geochemistry data with other geologic and engineering data for shale-gas and tight-oil unconventional resource play evaluation. Technicians performing many of these fundamental geochemical measurements in commercial, government, and university laboratories also benefit from this course. Participants should have a solid background in petroleum geology.

Objectives

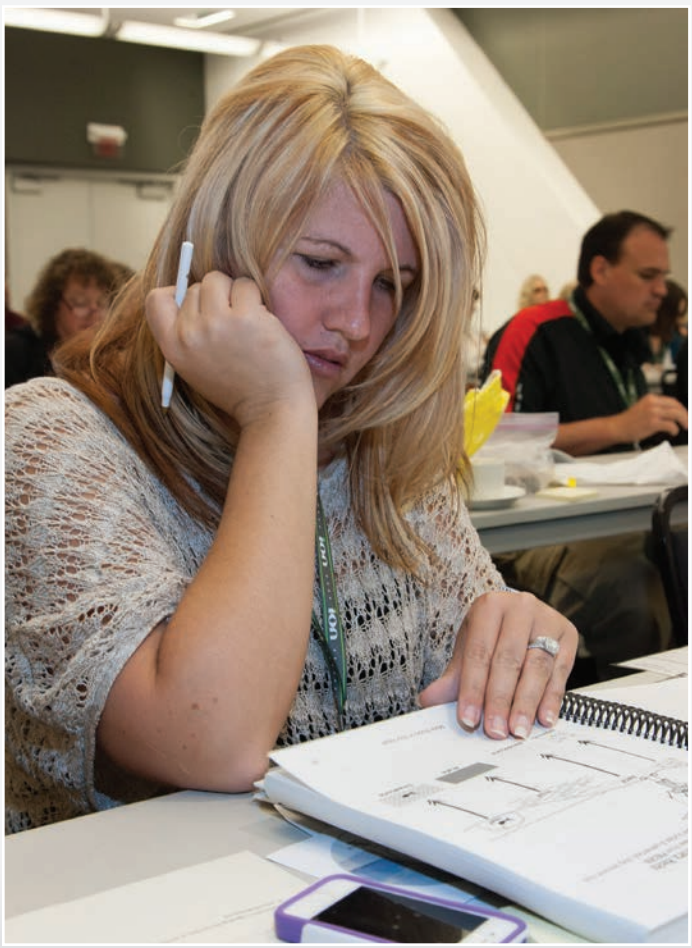
Participants should be able to accomplish the following by the end of the course:

- Select and use the basic geochemical screening tools designed for initial petroleum source rock evaluation: total organic carbon (TOC), programmed pyrolysis, vitrinite reflectance/visual kerogen analysis, and gas chromatography of source-rock extracts.
- Apply these basic screening tools to shale-gas and tight-oil reservoir evaluation.
- Select and use more advanced geochemical techniques for shale-gas and tight-oil reservoir analyses: organic petrography, canister gas content analyses, stable-isotope geochemistry, crude oil screening, Gas Chromatography-Mass Spectrometry, biomarker analyses, C_7 hydrocarbons, Diamondoids, and fluid inclusions.

- Estimate oil and cracked gas yields from basic geochemical data and correlate these results to production data.
- Use mass balance equations to calculate the original total organic carbon and hydrogen index of thermally mature and post mature source rocks.
- Understand the role of oil fingerprinting technology in evaluating reservoir connectivity and allocating comingled oil production in unconventional reservoirs.
- Integrate geochemical data with geological, petrophysical, and geophysical data for comprehensive shale-gas and tight-oil reservoir evaluation.

Content

The course is a practical and applied introduction to geochemical techniques routinely employed in shale-gas/condensate and tight-oil reservoir assessment. Class emphasis is on explaining which tools and techniques can best address specific questions, what caveats must be kept in mind when employing these tools, what are the strengths and limitations of petroleum geochemistry in resource plays, and how to interpret conflicting data from different analyses. Theory is kept to a minimum and select practical exercises help participants learn to review geochemical data, recognize problems with the data, and begin to cultivate a feel for interpreting geochemical data and integrating these interpretations with other geological information.



The following analytical techniques will be discussed: Leco TOC, Source Rock Analyzer (SRA) and Rock-Eval programmed pyrolysis, Dean Stark and Soxhlet extraction, liquid and gas chromatography, gas chromatography-mass spectrometry, organic petrology using reflected light microscopy, fluorescence microscopy, and advanced scanning electron microscopy (SEM).

Several interpretive approaches will be discussed including routine parameters for TOC, programmed pyrolysis, extract composition and quantities, and organic petrology. Special emphasis is given to the many caveats associated with assessing thermal maturity in resource plays. Participants will complete exercises interpreting pyrograms, gas chromatograms, and elementary Gas Chromatography – Mass Spectroscopy (GCMS) data. The class will employ various cross plots and simple mathematics to interpret stable isotope data, calculate original TOC, hydrogen index, and oil and cracked gas yields, and interpret gas chromatography data for an oil fingerprinting exercise.

MICROBIAL CARBONATE RESERVOIR CHARACTERIZATION

Dates: March 5-6, 2015
Tuition: $1100, if purchased separately (increases to $1200 on 2/02/2015)
Content: 1.5 CEU
Instructor: Ernest A. Mancini, University of Alabama, Tuscaloosa, AL

Who Should Attend

The course is designed for geologists and geophysicists involved in the exploration for carbonate reservoirs and geoscientists and petroleum engineers engaged in the development of fields producing from microbial carbonate reservoirs. Participants should have a basic knowledge of stratigraphic and sedimentologic concepts.

Objectives

By the end of the course participants should have an increased understanding of:

- Geologic, sequence stratigraphic, and depositional settings for the development of microbial carbonate buildups and reservoirs.
- Processes governing the development of microbial carbonate buildups and reservoirs.
- Spatial distribution of microbial carbonate and associated facies.
- Origin of primary porosity in microbial carbonates.
- Post-depositional processes, fracturing and diagenesis, in preserving, enhancing and creating porosity in microbial carbonates.
- Geologic, sedimentary and petrophysical properties that contribute to hydrocarbon productivity in microbial carbonate reservoirs.
- Methodologies to improve hydrocarbon recovery from fields producing from microbial carbonate reservoirs.
- Strategies to facilitate exploration for microbial carbonate buildups and associated reservoirs.

Content

This short course is designed to provide information to facilitate exploration for microbial carbonate buildups and associated reservoir facies and to assist with the formulation of development plans for fields producing from microbial carbonates. The course consists of a series of seven lectures supplemented by core samples.

The first lecture reviews the stratigraphic occurrence of microbial carbonates through geologic time and the geographic distribution and depositional settings of present-day microbialites. The physical, biological and biochemical characteristics of microbes and classification schemes utilized to identify and describe microbialites are discussed. Travertines, tufas and abiotic carbonate precipitates are not studied in this course.

Lecture 2 focuses on outcrop sections to demonstrate their applicability as reservoir analogs for microbial carbonate reservoirs. Sequence stratigraphic and depositional settings of microbial carbonate buildups are outlined. The processes governing the origin, development, spatial distribution and thickness of the microbialtes are discussed. Observed microbial carbonate textures, growth forms and fabrics are emphasized. Sedimentary characteristics of potential microbial carbonate reservoir facies and associated facies are identified.

Lecture 3 examines subsurface examples of microbial carbonates from wire-line logs, cores and thin sections. The sequence stratigraphic and depositional settings of microbial carbonate buildups are categorized. Observed microbial carbonate textures, growth forms and fabrics are emphasized. Sedimentary characteristics of microbial carbonate reservoir facies and associated facies are recognized. The spatial distribution and thickness of microbial and associated facies are identified using core, well log and seismic data. Microbial reservoir core samples are provided for examination.

Lecture 4 explores the origin, distribution and preservation of primary (depositional) porosity and permeability in microbial carbonate reservoirs. The application of established porosity classifications to describe porosity in microbial carbonates is evaluated.

Lecture 5 analyzes the impact of secondary (diagenetic and fracture) porosity and permeability in microbial carbonate reservoirs. Post-depositional processes controlling the enhancement (dissolution, dolomitization and fracturing) or occlusion (compaction and cementation) of porosity and permeability are emphasized. Depositional and post-depositional factors influencing reservoir heterogeneity, connectivity, quality and productivity are examined.

Lecture 6 includes field and reservoir case studies to demonstrate the hydrocarbon productivity of microbial carbonate reservoirs. Geologic and reservoir models developed from outcrop, seismic, well log, core, thin section and petrophysical data and subsurface mapping are reviewed. The significance of the unique nature of porosity types, pore systems and flow units of microbial carbonates relative to the hydrocarbon productivity of these reservoirs is emphasized. Strategic in-fill drilling, pressure maintenance and water and gas injection technologies and techniques are evaluated as methodologies to improve hydrocarbon recovery from microbial carbonates.

Lecture 7 integrates the information presented in preceding lectures with tectonic and carbonate systems settings to construct geologic models related to sequence stratigraphy, depositional conditions and reservoir porosity to assist in the development of exploration strategies for microbial carbonate buildups and potential reservoir facies. These models include: sequence stratigraphic framework model to predict the probable occurrence and distribution of microbial buildups and facies; depositional models for recognized tectonic and carbonate systems settings that support the development of microbialites; and reservoir porosity classification model that has utility in assessing reservoir architecture, pore systems, connectivity and quality.

The course concludes with a summary of the salient points discussed.

3D SEISMIC ATTRIBUTES FOR UNCONVENTIONAL RESERVOIRS

Dates: *March 5-6, 2015*
Tuition: *$1100, if purchased separately (increases to $1200 on 2/02/2015)*
Content: *1.5 CEU*
Instructor: *Kurt Marfurt, University of Oklahoma, Norman, OK*

Who Should Attend

This course is for geologists, geophysicists, engineers and other geoscientists who need to understand how seismic attributes are being used to map reservoir quality and evaluate completion quality in unconventional resource plays.

Objectives

Upon completion of this course, participants will:

- Gain an intuitive understanding of the kinds of seismic features identified by 3D seismic attributes;
- Understand the sensitivity of seismic attributes to seismic acquisition and processing;
- Understand how "independent" seismic attributes are coupled through geology.

Content

Seismic attributes are routinely used to map seismic geomorphology and reservoir quality. With the more recent focus on unconventional resource plays, seismic attributes are also being used to evaluate completion quality. Geometric attributes such as coherence and curvature are invaluable in identifying geohazards from 3D seismic data. Curvature and reflector rotation are direct measures of strain, which along with thickness and lithology control the location and intensity of natural fractures. Prestack inversion for Young's modulus and Poisson's ratio (or equivalently for $\lambda\rho$ and $\mu\rho$) can be used (when calibrated against core and ECS logs) to estimate TOC and "brittleness". A more quantitative estimate of brittleness and completion quality requires the use of microseismic and production log data. Velocity and amplitude anisotropy, calibrated against image logs and microseismic data provide

measurements of open natural fractures and the present day direction of maximum horizontal stress that can be used to guide the placement of lateral wells.

Much of today's resource play drilling activity focuses on evaluating properties and holding acreage. As resource plays mature, we will want to identify bypassed pay and evaluate the benefits of restimulation. Even with access to such modern data, geology, and hence seismic data and seismic attributes are only one of the components necessary to predict EUR.

Attributes are only as good as the data that goes into them. For this reason, we will also address components of seismic acquisition, reprocessing, and data conditioning. We will review a sufficient amount of theory for inversion, bandwidth extension, cluster analysis, and neural networks to elicit the implicit assumptions made using this these technologies. Advanced knowledge of seismic theory is not required; this course focuses on understanding and practice.

Concepts and algorithm description will be general, but workflows will be illustrated through application to the Barnett Shale, Woodford Shale, and Mississippi Lime resource plays.

Course Outline

- Spectral decomposition: A very brief overview of spectral decomposition, which is commonly used in conjunction with elastic inversion attributes to break out lithofacies. I will also summarize assumptions made in bandwidth extension, and Q estimation.
- Geometric attributes: A summary of volumetric coherence, amplitude and structural curvature, reflector shapes, lineaments, reflector rotation and convergence
- Seismic Data conditioning: Poststack footprint suppression and prestack data conditioning for inversion and anisotropy analysis
- Attribute prediction of fractures and stress: Use of curvature, impedance, and seismic anisotropy to natural fractures.
- Inversion for acoustic and elastic Impedance: A hierarchal overview of inversion - emphasizing the assumptions and interpreter input to each process. If the audience is intimate with inversion, this part will be greatly compressed.
- Interactive multiattribute analysis: Review of multiattribute display, crossplotting, and geobodies
- Statistical multiattribute analysis: Fundamentals of geostatistics, including colocated cokriging
- Unsupervised multiattribute classification: Clustering algorithms including k-means, self-organizing maps (e.g. Stratimagic's "waveform classification") and generative topographic maps
- Supervised multiattribute classification: A simple overview of neural networks
- Attributes and hydraulic fracturing of shale reservoirs: Review of microseismic method and the relationship of microseismic events to surface seismic measurements
- Attribute applications to the Mississippi Lime: Recent work in mapping the unconventional Mississippi Lime play in OK and KS

LOG ANALYSIS OF SHALY SAND RESERVOIRS

Plus a Gas-Bearing Shale Case Study

Date: March 5, 2015
Tuition: $550, if purchased separately (increases to $600 on 2/02/2015)
Content: .75 CEU
Instructor: George B. Asquith, Texas Tech University, Lubbock, TX

Who Should Attend

The course is designed to be of benefit to geologist, engineers and technical support people who are involved in oil and gas exploration and production in shaly sandstone reservoirs. As the title states this is a guide that concentrates on methods used to analyze shaly sandstones reservoirs. It is an advanced course and assumes the course participants are already well informed about basic well logging principles.

Objectives

At the conclusion of the one day course the participants should be able to do the following:

- Scan a well log to determine zones that potentially could be hydrocarbon productive.
- Be able to examine pre-processed and calculated well log data and be able to answer the following questions.
  - Is the sandstone a shaly sandstone?
  - Is the reservoir water-wet or oil-wet?
  - Is the reservoir potentially hydrocarbon productive?

Once the above four questions are answered the participants should be able to determine a strategy to improve the calculations of the reservoir's effective porosity (Φe) and effective water saturation (Swe).

CONTENT

The course begins with a short review of the basic principles of well logging. Next are a series of lectures on the calculation of volume of clay/shale (Vcl), using the Vcl to correct the reservoir's total porosity (Φtotal) to effective porosity (Φe). Then we'll discuss the ability to apply a shaly sandstone producibility plot (Q-PLOT) to determine if the shaly sandstone is a reservoir. The next step is to determine using log data if the reservoir has effective or non-effective clay present and what shaly sandstone model can be used to convert total water saturation (Swtotal) to effective water saturation (Swe). Several models will be presented for determining Swe. A flow chart is provided that will aid the participants in understanding the sequence that I use in analyzing sandstone and shaly sandstones. At conclusion, ten examples will be presented that will be analyzed by the participants. The course will end with a case study of log analysis gas-bearing Woodford shale.

LOG ANALYSIS OF HYDROCARBON-BEARING "SHALE" RESERVOIRS

Date: *March 6, 2015*
Tuition: *$550, if purchased separately (increases to $600 on 2/02/2015)*
Content: *.75 CEU*
Instructor: *George B. Asquith, Texas Tech University, Lubbock, TX*

Who Should Attend

The course is designed to be of benefit to geologist, engineers and technical support people who are involved in oil and gas exploration and production in hydrocarbon-bearing shale reservoirs. As the title states this is a guide that concentrates on methods used to analyze potential "shale" reservoirs. It is an advanced course and assumes the course participants are already well informed about basic well logging principles.

Objectives

At the conclusion of the one day course the participants should be able to do the following:

- Apply numerous QUICK-LOOK Methods to evaluate and map potential "shale" reservoirs.
- Be able to determine thermal maturity from well log data.
- Determine total organic carbon (TOC) by several methods including Schmoker, Passey, etc.
- Determine volume of clay (Vcl), total porosity (Φtotal), effective porosity (Φe), water saturation (Sw), permeability (ka) in a "shale" reservoir using both a standard logging suite and with GEOCHEM logs.
- Be able to calculate OGIPscf and OOIPstb utilizing both a standard well logging suite and using GEOCHEM log data.
- Determine formation water resistivity (Rw) in a shale.

Content

This one day course will include background material on hydrocarbon-bearing shales, methods of evaluation, and case studies of both gas and oil bearing shales. The course begins with a quick review of general information about hydrocarbon-bearing shales that will include: 1) areal distribution, 2) classification, 3) hydrocarbon resources, 4) key geological and engineering parameters, 5) a comparison of the mineralogy of an average shale to a hydrocarbon-bearing shale, 6) shale porosity and permeability, and 7) an expected shale production model. Next the log parameters [Rt, GR, ρb, ΦNls, and Pe] used for a quick log scan evaluation are presented along with the standard quick-look methods [Ro, Rwa, and Φw]. All of these quick methods are designed so that the geologist or engineer can evaluate the potential shale to determine if a more detailed log analysis is required. The parameters included in a more detailed log analysis include the determination of: 1) total organic carbon (TOCwt%), 2) effective porosity (Φe), 3) effective water saturation (Swe), 4) hydrocarbon-filled porosity (Φgas or Φoil), and 5) permeability (k in nannodarcies). There is also a section that reviews the methods that can be used to determine formation water resistivity (Rw) in shales.

The methods for determining the thermal maturity of organic shales will include: 1) vitrinite reflection (Ro), 2) coloration of spores and conodonts, and 3) determination of thermal maturity from log data [Maturity Index (MI; Zhao & others, 2007)]. The determination of thermal maturity is an important step in the analysis of an organic shale, because the level of maturity (i.e. oil or gas) determines how the log data will be analyzed. The next step is the determination of TOC(wt%) from log data. The methods outlined are Passey & others (1990), the Schmoker Equation, and uranium content from spectral gamma ray logs.

If the potential shale is a gas reservoir the next step is the determination of the adsorbed gas content (gc in SCF/ton). The two methods for determining adsorbed gas content that will be outlined are the Langmuir Isotherm and the TOC versus gc (SCF/ton) methods. A flow chart is provided to guide the geologist/engineer through the analysis. For example if the TOC(wt%) is greater than 2% the analysis should proceed to the next step the determination of: 1) volume of kerogen (Vke), 2) Volume of clay (Vcl), 3) volume of quartz (Vqtz), and total porosity (Φtotal) using the simultaneous equation method developed by Rick Lewis w/ Schlumberger.

Using the results from the simultaneous equations the total porosity (Φtotal) in corrected to effective porosity (Φe) using the volume of clay (Vcl) and the porosity of the clay (Φclay), and the effective water saturation (Swe) is calculated.

Then if the potential is a gas reservoir adsorbed gas content (gc SCF/ton) is converted to gc in SCF/Area and free OGIPscf (gas) or OOIPstb (oil) is calculated using the effective water saturation (Swe) and effective porosity (Φe). Permeability (k in nannodacies) is calculated using hydrocarbon-filled porosity (Φgas or Φoil).

There is a review of the application of non-standard well logs to the log analysis of hydrocarbon-bearing shales that includes Nuclear Magnetic Resonance (NMR) imaging logs, Geochemical logs, and SWS Multi-Frequency Polarized Dielectric Scanner. Next is a review of the Array Sonic logs, and their use in the evaluation of horizontal stresses and orientations [maximum (σHmax) and minimum (σHmin)] and fracture orientations, and the calculation of Brittleness Index.

Six case studies including the Devonian Woodford Shale [GAS], Jurassic Haysville Shale [GAS], two Permian Leonard shales [OIL], and two Permian Wolfcamp shales [OIL] are presented to illustrate the methods outlined in the course. OOIPstb or OGIPscf values in wells with GEOCHEM Log data will be compared to OOIPstb or OGIPscf determined using only a standard logging suite. At the end of this section is a list of an ideal data base (logs and core data) for hydrocarbon shale analysis.

SHORT COURSES

SHORT COURSES ARE THE BEST WAY TO LEARN ABOUT THE INDUSTRY AND ARE PACKED WITH INFORMATION. VALUABLE MATERIALS, HANDS-ON EXERCISES AND DIRECT INTERACTION WITH INSTRUCTORS AND FELLOW ATTENDEES – THERE'S NO BETTER WAY TO LEARN! WITH SO MANY TO CHOOSE FROM, THERE'S SOMETHING FOR EVERYONE.

STAND-ALONE SHORT COURSES

BASIC PETROLEUM GEOLOGY FOR THE NON-GEOLOGIST

A joint course with AAPG and University of Tulsa Continuing Engineering and Science Education Department

Dates and Locations:
March 3-5, 2015 in Oklahoma City, OK
April 14-16, 2015, in Houston, TX
June 23-25, 2015 in Denver, CO
August 18-20, 2015 in Houston, TX
October 6-8, 2015, in Tulsa, OK
December 1-3, 2015, in Houston, TX

Tuition: *$1,995.00 (increases to $2295 one month prior to course date), includes the textbook "Nontechnical Guide to Petroleum Geology, Exploration, Drilling and Production", course notes, a common rock and mineral kit, a petroleum glossary, a wallet card listing geological times and various map symbols, and four large colored wall charts: 1) Petroleum Basin Map of the United States, 2) Drilling Rig Component Diagram, 3) Well Log Response Chart and 4) Oil and Gas Field Classifier. Daily morning and afternoon refreshments are provided. Please Note - if paying with a check, please make check payable to University of Tulsa, CESE (applies to this course only.) Special pricing if sending 3 or more persons from the same company - ask for details!*

Limit: *50 people*

Content: *2.1 CEU*

Instructor: *Norman J. Hyne, University of Tulsa, Oklahoma*

Who Should Attend

Train your staff! This course is for anyone who could benefit by an overall perspective of petroleum geology, exploration, drilling and production to be more productive in their job. It is a non-technical course, anyone can take this course. There are over 25,000 past participants that have included information technology personnel, managers, accountants, landmen, draftsmen, attorneys, secretaries, clerks, geological and geophysical technicians, investors, petroleum service personnel, petroleum banking and financial ventures personnel, business administrators and executives, human resources personnel, geophysicists without geological training, land personnel, economists and engineers.

Objectives and Content

In just three days, you will learn the fundamentals and language of petroleum geology, exploration, drilling and production. This understanding will enable you to communicate more efficiently and perform your job more effectively. The course introduces the tools and techniques that geologists and geophysicists use to locate gas and oil, that drillers use to drill the wells and that petroleum engineers use to test and complete the wells and produce the gas and oil. Exercises throughout the course provide practical experience in well log correlation, contouring, interpretation of surface and subsurface, contoured maps, seismic interpretation, well log interpretation, and decline curve analysis. You will learn how to identify the most common rocks and minerals.

In taking this course, you will learn:

- How to identify the most common rocks and minerals.
- The different types of crude oils and natural gasses and their measurements.
- The basic processes in the formation and deformation of sedimentary rocks.
- The formation of natural gas and crude oil.
- The occurrence and distribution of crude oil and natural gas.
- The characteristics of petroleum traps.
- The use of geological and seismic data in petroleum exploration.
- How to drill a well, the language, technique and equipment.
- How to test a well and qualitatively interpret well logs.
- How to complete a well, the language, techniques and equipment.
- The challenge of offshore exploration, drilling and production.
- How to produce crude oil and natural gas, calculate reserves, stimulate wells and improve oil recovery.

This course is extremely well illustrated with PowerPoint presentations and hands-on samples such as a drill bit, Landsat pictures, microfossils and crude oil specimens. Every student that completes this course will receive a certificate with the continuing education units on it. This course is approved continuing education units for landmen and accountants and for attorneys in most states.

Please Note: Online Registration not available for this course through AAPG. Please contact AAPG Education Department directly at (918) 560-2650 or educate@aapg.org for registration instructions.

RESERVOIR CHARACTERIZATION AND PRODUCTION PROPERTIES OF SOURCE ROCK RESERVOIRS

Dates: *March 23-24, 2015*

Location: *Tulsa, OK*

Tuition: *$995, AAPG members, $1195, non-members (increases to $1195/$1395 on 2/23/2015); includes digital course notes and refreshments. No refunds for cancellations after 2/23/2015.*

Content: *1.5 CEU*

Instructor: *Randall S. Miller, Core Labs, Houston, TX*

Who Should Attend

Geologists, petrophysicists and engineers interested in learning the state-of-the-art techniques for characterizing source rock reservoirs and the parameters that influence production properties. The course is geared to address both exploration and exploitation of shale reservoirs.

Objectives

The objective of the course is to provide training in the various aspects of reservoir characterization of shale reservoirs and to increase the knowledge of how these reservoirs may behave based on their key reservoir properties. Participants will learn how to make sure they are "targeting the right shale" and what type of production levels can be expected. By the end of the course participants should be able to accomplish the following:

- Know what the important shale reservoir parameters are and how to determine them
- Understand what makes a good shale reservoir in terms of productivity
- Have a command of the variability in shale reservoirs
- Be able to identify shale reservoirs from open-hole logs and determine OGIP and OOIP
- Identify the issues in hydraulic fracturing of shale reservoirs
- Gain a knowledge of exploration techniques useful for screening potential shale reservoirs

Content

This course is an introductory course in shale reservoir evaluation. It includes reservoir geology in terms of depositional facies, mineralogy, fractures, and rock type delineation. Organic geochemistry of shale reservoirs is presented in terms of organic content, Kerogen types, maturity, hydrocarbon generation, and secondary porosity development. Core analysis methods and interpretation techniques for petrophysical properties are presented and compared among various shales. The core analysis data are correlated and used to calibrate open-hole logs for reservoir properties and calculation of hydrocarbons in place. Several examples are presented and compared. Laboratory measurements in support of completion and stimulation are reviewed and these include geomechanical properties, fluid sensitivity, and fracture conductivity. Completion and stimulation techniques will be presented in terms of where to target the horizontal, lateral length, stages, perf clusters, and proppant-fluid carrier systems. Production analysis techniques to evaluate the stimulation and well performance will be presented using various case histories.

DESCRIPTION AND INTERPRETATION OF SHALE FACIES

Dates: March 25-26, 2015
Location: Tulsa, OK
Tuition: $995, AAPG members, $1195, non-members (increases to $1195/$1395 on 2/23/2015); includes digital course notes and refreshments. No refunds for cancellations after 2/23/2015.
Content: 1.5 CEU
Instructor: Juergen Schieber, Indiana University, Bloomington, IN

Who Should Attend

Geologists and petroleum engineers that work in the exploration and production of unconventional hydrocarbons from shales and mudstones (fine grained sediments). Participants should have a working knowledge of sedimentary rocks, sedimentology, and stratigraphy, but no specialized knowledge about shales and mudstones is required.

Objectives

By the end of the course participants should be in a position to:

- Have a basic understanding of sedimentary settings and processes that deposit fine grained sediments
- Identify common physical sedimentary structures
- Identify visible diagenetic features
- Identify bioturbation features of various subtlety
- Describe and name fine grained rocks on the basis of hand specimen derived properties

Content

This course is an introduction to the heterogeneous nature of shales and mudstones and provides guidance on how to work effectively with these complex lithologies. It will expose the participants to a descriptive and interpretative methodology that benefits from the experience gained by the instructor over the course of 35 years of research with these rocks.

Through a combination of lectures that explain fundamental concepts (such as provenance, sedimentary processes, bioturbation) and hands-on exercises that utilize an extensive collection of polished shale slabs and test specimens (for scratching, acid squirting, etc.) from multiple shale successions and facies types, theory and practice are brought together for a deeper learning experience. Lectures and exercises alternate in order to reduce fatigue, give time for reflection, and to illustrate lecture introduced concepts with actual rocks.

The course manual contains the slides from the lectures, as well as work sheets for all of the rock specimens used in the exercises.

BASIC WELL LOG ANALYSIS

Dates: April 20-24; July 13-17, 2015
Location: Austin, TX (April); Golden, CO (July)
Tuition: $1750, AAPG members, $1950, non-members (increases to $1950/$2150 on 3/23/2015 for April course, and on 6/15/2015 for July course), includes digital course notes, printed exercises, refreshments, and a copy of Basic Well Log Analysis by George Asquith and Daniel Krygowski, with Neil Hurley and Steve Henderson. No refunds for cancellations after 3/23/2015 for the April course, or 6/15/2015 for the July course.
Content: 3.75 CEU
Instructors: George Asquith, Texas Tech University, Lubbock, TX; Daniel A. Krygowski, The Discovery Group, Denver, CO; Richard E. Lewis, Schlumberger, Denver, CO

Who should attend

Geologists, engineers and technicians who work with openhole logs and who want to understand the fundamentals of what the measurements are, what affects them, and how they are used to estimate the properties of interest in the

subsurface. This basic course will be useful to new personnel in the oil and gas industry as well as to more experienced professionals that want a review.

Objectives

By the end of the course, participants should be able to:

- Describe the acquisition process for both wireline and LWD measurements.
- Scan a well log to determine zones that potentially could be hydrocarbon productive, and to check for log quality.
- Convert formation and drilling fluid properties for temperature, and make other basic well log environmental corrections.
- Determine porosity using one or more logs;
- Infer lithology from the logs, and know how the logs are affected by lithologic changes.
- Understand how the Archie parameters are obtained, so that together with log data, water saturation and hydrocarbon saturation can be derived.
- Understand how pattern recognition and graphical techniques can be used to determine computation parameters as well as properties of interest.
- Understand how to judge the reservoir and completion qualities of shale gas reservoirs using basic logging techniques and more advanced measurements, as well as the value of other measurement types in an integrated interpretation.

Content

The course assumes no logging knowledge and seeks to establish an understanding of basic petrophysical measurements and interpretation techniques which can be applied to routine tasks, and upon which more complex and advanced information and interpretive techniques can be built.

Course

- Uses a "hands-on" approach to basic openhole well log analysis and interpretation, where common sets of logs are used in ongoing exercises and final problems to illustrate complete and coherent interpretations.
- Focuses on the traditional interpretation targets of lithology, porosity, and fluid saturation, but also touches on other applications of the measurements.
- Introduces a variety of interpretation techniques: numerical to visual (pattern recognition), and the use of some older techniques in the context of the availability of newer, more extensive, data.
- Introduces the participants to the evaluation of shale gas reservoirs through the concepts of reservoir and completion quality, using common logging suites and more advanced measurements.

The course strives to provide a strong and coherent foundation for the understanding of other, specialized interpretation techniques involving well log data, which are not covered here.

PETROPHYSICAL ANALYSIS AND INTEGRATED APPROACHES TO THE STUDY OF CARBONATE RESERVOIRS

Dates: April 21-23, 2015
Location: Austin, TX
Tuition: $1275, AAPG members, $1475, non-members (increases to $1475/$1675 on 3/23/2015; includes digital course notes, printed exercises and refreshments. No refunds for cancellations after 3/23/2015.
Content: 2.25 CEU
Instructors: Lynn Watney, Kansas Geological Survey, Lawrence, KS; Michael Holmes, Digital Formation, Inc., Denver, CO

Who should attend

This course is for geologists, geophysicists, engineers and multi-disciplinary team members needing to learn more about exploration in carbonate reservoirs. The course is designed to be cross disciplinary, and of interest to anyone involved in reservoir description. For geologists/geophysicists the interest will be the contribution petrophysics has to understand the variability of carbonate facies in a reservoir context. For engineers, the course will give insight as to the geological and petrophysical attributes controlling reservoir variability.

Objectives

Upon completion of this course, participants will be able to:

- Determine lithology
- Compare moldic porosity with intercrystalline/interparticle porosity
- Determine the influence of gas on porosity log responses
- Determine rock typing with correlations to facies descriptions
- Define mobile from capillary bound water, changing rock quality by level, and changing porosity permeability relations
- Make use of a method to quantify adsorbed and free hydrocarbons in shale reservoirs
- Use rock physics modeling to differentiate brittle from ductile sequences
- Evaluate the role of structural reactivation and apply to refining location and properties of carbonate reservoirs
- Apply process-based analogs and interpretations to improve geomodels
- Use petrofacies approach to better define key properties of complex carbonate reservoirs (e.g., water saturations, volumetrics, ROIP, establishing permeability correlations and predicting fluid flow)
- Use an integrated approach for more accurate and valid geomodels

Content

This course is divided into two parts. The first part, on Petrophysical Analysis, is designed to encompass the spectrum of information that can be derived from examination of standard open-hole logs. Basic petrophysical interpretation to calculate porosity, shale volume, fluid saturation, grain density, and permeability will be covered. Advanced analysis

will include detailed examination of porosity log responses, relations between porosity and water saturation, and a discussion of capillary characteristics.

The second part, on Integrated Approaches, provides an overview of key factors controlling oil and gas distribution in carbonate reservoirs in the greater Midcontinent USA. A top down approach is taken starting with regional structural and tectonic framework followed by sequence stratigraphic framework and reservoir architecture through analysis of core, well, and seismic data. A description of common reservoir lithofacies and their recent analogs is followed by a review of petrofacies concept and pore typing using petrophysical techniques grounded on core studies.

Case studies will demonstrate integrated approaches to reservoir characterization and modeling of 1) ooid and grainstone shoals; 2) phylloid algal mounds and related lithofacies; 3) low resistivity microporous chert and dolomitic reservoirs, and 4) karst and fracture modified reservoirs. Methodologies and workflows reviewed in these case studies include geosteering and evaluation of horizontal wells and optimizing carbon storage utilization and management. The overall goal of this section is to provide tools for efficient and effective re-exploration and development.

SEQUENCE STRATIGRAPHY: PRINCIPLES AND APPLICATIONS

Date: Saturday & Sunday, May 30-31, 2015
Time: 8:00 a.m. to 5:00 p.m. each day
Location: Denver, CO, with AAPG Annual Convention & Exhibition
Tuition: $995 (increases to $1195 on 5/1/2015); $115, students (limited number); includes digital course notes and refreshments. No refunds for cancellations after 5/1/2015.
Instructor: Octavian Catuneanu, Univ. of Alberta, Edmonton, AB, Canada
Content: 1.5 CEU
Limit: 40 people

Who Should Attend

Geologists, geophysicists and reservoir engineers needing a working knowledge of Sequence Stratigraphy for petroleum exploration.

Objectives

Following the course, participants will have a clear understanding of the principles of sequence stratigraphy, the workflow of sequence stratigraphic analysis, and the difference between the various sequence stratigraphic approaches currently in use.

Description

This course presents the concepts and practical applications of sequence stratigraphy for petroleum exploration. The course involves both lecture and workshop formats. Workshop exercises emphasize the recognition and correlation of sequence stratigraphic surfaces on well log cross-sections, seismic transects, and outcrop profiles. Participants will be able to recognize and use sequence stratigraphic surfaces as the main correlation lines on their cross-sections and seismic data, and to use sequence stratigraphy for predicting facies reservoirs away from control points.

EXPLORATION IN THE BAKKEN PETROLEUM SYSTEM

Date: Saturday, May 30, 2015
Time: 8:00 a.m. to 5:00 p.m.
Location: Denver, CO, with AAPG Annual Convention & Exhibition
Tuition: $795, professionals (increases to $995 on 5/1/2015); $115, students (limited number); includes digital course notes and refreshments. No refunds for cancellations after 5/1/2015.
Instructor: Stephen A. Sonnenberg, Colorado School of Mines, Golden, CO
Content: .75 CEU
Limit: 40 people

Who Should Attend

Geologists, geophysicists, & engineers who are interested in exploring and developing resources in the Bakken and Three Forks formations. The course is intended to be an overview of the Bakken petroleum system.

Objectives

Upon completion of this course, participants should be able to:

- Understand factors related to tight oil production
- Recognize technologies available for tight reservoirs
- Identify the presence of natural fractures
- Determine if a pervasive hydrocarbon exists
- Determine the type of source rocks present and maturity
- Use geological and geochemical reconnaissance
- Understand the importance of mechanical stratigraphy
- Identify matrix porosity and permeability
- Identify reservoir drive mechanisms

Content

This course is an introduction to the Bakken/Three Forks resource play. The play has proven to be economic and successful for many operators. A wide range of topics will be covered to familiarize the participant with the important nuances of the Bakken and Three Forks.

The petroleum system approach will be used. A key emphasis of this course will be to show the important elements and processes for continuous oil and gas accumulations. The participant will learn screening techniques which may help identify "sweet spots" in the Bakken/Three Forks fairway. The lessons learned in the course can be applied to other tight oil plays.

INTEGRATING DATA FROM NANO- TO MACRO-SCALE: IMPROVING CHARACTERIZATIONS OF UNCONVENTIONAL PLAYS

Date: Sunday, May 31, 2015
Time: 8:00 a.m. to 5:00 p.m.
Location: Denver, CO, with AAPG Annual Convention & Exhibition
Tuition: $795, professionals (increases to $995 on 5/1/2015); $115, students (limited number); includes digital course notes and refreshments. No refunds for cancellations after 5/1/2015.
Instructors: Christina Calvin, Schlumberger, Houston, TX; Rick Lewis, Schlumberger, Denver, CO
Content: .75 CEU
Limit: 40 people

Who should attend

Geologists, geophysicists, petrophysicists and reservoir engineers looking for a detailed overview of data integration in unconventional analysis. This course exposes attendees to data from multiple disciplines using many examples and case studies to demonstrate the importance of sweetspot identification, reservoir quality and completion quality in successful exploitation of shale reservoirs.

Objectives

By the end of the course the attendees will have accomplished the following:

- An analysis of different scales of reservoir measurements and what these measurements reveal about the shale play.
- Reviewed case studies that integrate various data sets to develop a better understanding of the sweet spot.
- Worked through the definitions of reservoir quality and completion quality.
- Developed knowledge of the role of core analysis within the various shale plays and how to integrate that data within a larger study that includes petrophysical and seismic data.
- Learned how to integrate core photos and borehole images to provide additional information for petrophysical evaluations.
- Have seen numerous examples of the value of petrophysical evaluation for shale plays including examples for the class to take away and work through.
- From seeing case study examples, the attendee will have a greater understanding of the role of surface seismic in sweet spot identification as well as seismic applications for the identification of fracture networks.
- Understood the importance of well placement and the value of key measurements in the lateral for optimal geosteering and maximizing reservoir contact.

Content

Understanding how to integrate various data types into meaningful analysis of reservoir and completion quality is key to optimizing unconventional plays. This course will evaluate data from the nano- to macro-scale in order to show how different types of data can be integrated in the evaluation of sweet spots. By the end of the course attendees with have developed an understanding of how core data, petrophysical evaluations, and seismic surveys can be utilized to build a more complete understanding of a play. The integration of these different measurements will then be utilized to demonstrate planning a successful horizontal well and taking single well success to an optimized full field development plan.

PRACTICAL ASPECTS OF PETROLEUM GEOCHEMISTRY FOR RESOURCE PLAYS

Date: Sunday, May 31, 2015
Time: 8:00 a.m. to 5:00 p.m.
Location: Denver, CO, with AAPG Annual Convention & Exhibition
Tuition: $795, professionals (increases to $995 on 5/1/2015); $115, students (limited number); includes digital course notes and refreshments. No refunds for cancellations after 5/1/2015.
Instructors: John B. Curtis, Colorado School of Mines, Golden, CO; John Zumberge GeoMark, Houston, TX
Content: .75 CEU
Limit: 40 people

Who Should Attend

The content is designed for novice to intermediate level geoscientists or as a refresher for advanced students.

Objectives

Participants will finish the course with a better idea of how to use another tool – petroleum geochemistry – to answer their E&P questions and guide their efforts in resource plays.

Description

This course will address integration of source rock, produced oil and gas, and mud gas data to better understand and exploit 3-dimensional details of petroleum systems. Carbon isotope and oil biomarker geochemistry will be stressed as a way to determine quantity and type of generated hydrocarbons and migration distance and direction within source rock and tight oil plays. Course applications include exploration, completion, and field development. The course will focus on resource plays, with exercises and examples from the Bakken, Eagle Ford, Mowry, Niobrara, Lodgepole and Red River, and several emerging plays.

Topics to be covered include:

- Source Rock Evaluation - Quantity, quality & thermal maturity of organic matter to predict hydrocarbon type(s) & yield; Sampling considerations, TOC/Rock-EvalTM/ vitrinite reflectance measurements will be reviewed.
- Crude Oil Geochemistry & Correlation - Stable carbon isotope and oil biomarker geochemistry will be highlighted, with examples of cluster analysis/principal components analysis to identify petroleum systems, oil families, oil vitrinite reflectance equivalent (VRE) and source-reservoir relationships.

- Natural Gas Geochemistry - Use of produced and drilling gas molecular and isotopic data, with an emphasis on Mud Gas Isotope Analysis (MGIA) to identify source maturity, organofacies, and potential reservoir compartments and completion intervals.
- Production Engineering (PVT) - Basic concepts: phase equilibria, bubble point, dew point, multi-phase flow in reservoirs; Use of petroleum geochemistry to derive PVT relationships across a region; Undersaturation (headroom) & reservoir management considerations
- Integration of Rock, Oil and Gas Geochemical Data - Geochemical parameters required for successful resource plays, detailed examples and participant exercises

ASSESSMENT, FORECASTING, AND DECISION-MAKING IN UNCONVENTIONAL RESOURCE PLAYS

Dates: July 18-19, 2015
Location: San Antonio, TX, with URTeC meeting
Tuition: $995 (increases to $1195 on 6/19/2015); includes digital course notes and refreshments. No refunds for cancellations after 6/19/2015.
Content: 1.5 CEU
Instructor: William Haskett, Decision Strategies, Houston, Texas

Who Should Attend

This course is targeted towards Earth Scientists, Engineers, Economists, Landmen, and Managers who need to evaluate, plan and make decisions with regard to unconventional resource assessment, testing, and development program planning. Since this course goes well beyond tactical number-crunching into analysis, decisions, strategy, and portfolio management principles, a rudimentary understanding of risk analysis, including ranged or probabilistic input will be assumed.

Objectives

Upon completion of this course, participants will be able to:

- Develop methods for valid resource assessment
- Distinguish recovery from matrix and sorbed components
- Understand and apply liquids rich resource estimation methods
- Assess and work with production uncertainty
- Compare and contrast production profiles and apply them in decision-making
- Understand stochastic multi-phase flow forecasting
- Use field size and well data to predict field results
- Understand unconventional assessment within a decision context

Content

This course is oriented towards the recognition and characterization of uncertainty in unconventional reservoirs. Starting with resource/reservoir assessment methods, it moves through the full unconventional value-chain. This two-day exercise and example filled workshop provides participants with the techniques and reasoning needed to validly assess the merits of the search for, and development of, unconventional resource plays. In addition to basic evaluation of opportunities and reservoir production uncertainty, it highlights the major decision points and strategic options available to companies to increase the probability of profitable results, while identifying and limiting downside risk. The unconventional reservoir discussion is centered on tight gas sands, shale gas, with special attention given to liquids multi-phase flow.

In addition to the theory of resource and type-curve estimation, probabilistic methods and practical models are provided (to be retained by the course participants). No additional software will be required apart from Microsoft Excel.

Traditional application of volumetric chance and uncertainty must be modified to provide a valid assessment of the range of resource and flow potential unconventional assets. A primary difference between standard and unconventional assessment is the reduction of dependence on volumetric uncertainty and the highlighting of valid production profile range creation from base principles. Unconventional Plays are rate based. As such, unconventional play evaluation requires an understanding of production profile uncertainty through time. The valid creation and assessment of type curve distributions, a critical component in the estimation of project NPV, will be covered from an uncertainty context. The creation of P10-P50-P90 curve distributions take more care and attention than most companies are providing.

A prioritized learning plan is critical to the proper validation of the reservoir potential of the opportunity, or the validity of implementing new technology. Understanding how to handle the results from well planned pilots allows the efficient allocation of time, effort, and capital to the pilot phase of a project. This applies equally to the business/value indications as it does to the actual flow data.

Along the way, concepts covered will include the development of EUR Distribution Envelopes, Pilot Effectiveness and Pilot Optimization. These topics/skills combine subsurface resource and stimulation uncertainty to provide insight on performance learning and the optimal number of pilot wells and pads.

Key Topics discussed and included in exercises will include:

- Developing methods for valid resources assessment
- Distinguishing recovery from matrix and sorbed components
- Liquids rich resource estimation methods
- Assessing and Working with Production Uncertainty
- Production Profiles: Comparing and Contrasting Profile Aggregations with Profile Pathways (and applying them appropriately for decision-making)
- Stochastic multi-phase flow forecasting
- Field Size Distributions vs. Well Size Distributions – using well data to predict field results
- Dealing with Imperfect Data and value of information (VoI)
- Pilot Planning including Optimal Pilot Sizing
- Unconventional Assessment within a Decision Context
- Application of principles to workshop case studies

PLEASE NOTE: Participants in this course are strongly encouraged to bring a personal laptop computer for use with the simulations and teamwork exercises. People without computers will still get a lot from the course, but they won't get to take home the tools that we build or those that are used in the exercises. Participants will be supplied with Excel models for exercise and demonstration purposes (Microsoft operating system).

INTRODUCTORY GEOCHEMISTRY FOR CONDENSATE-RICH SHALES AND TIGHT OIL

Date: July 19, 2015
Location: San Antonio, TX, with the URTeC meeting
Tuition: $695 (increases to $895 on 6/19/2014); includes digital course notes and refreshments. No refunds for cancellations after 6/19/2014.
Content: .75 CEU
Instructor: Christopher D. Laughrey, Weatherford Labs, Golden, CO

Who Should Attend

Geoscientists and engineers who need to integrate basic petroleum geochemistry data with other geologic and engineering data for shale-gas and tight-oil unconventional resource play evaluation. Technicians performing many of these fundamental geochemical measurements in commercial, government, and university laboratories also benefit from this course. Participants should have a solid background in petroleum geology.

Objectives

Participants should be able to accomplish the following by the end of the course:

- Select and use the basic geochemical screening tools designed for initial petroleum source rock evaluation: total organic carbon (TOC), programmed pyrolysis, vitrinite reflectance/visual kerogen analysis, and gas chromatography of source-rock extracts.
- Apply these basic screening tools to shale-gas and tight-oil reservoir evaluation.
- Select and use more advanced geochemical techniques for shale-gas and tight-oil reservoir analyses: organic petrography, canister gas content analyses, stable-isotope geochemistry, crude oil screening, Gas Chromatography-Mass Spectrometry, biomarker analyses, C7 hydrocarbons, Diamondoids, and fluid inclusions.
- Estimate oil and cracked gas yields from basic geochemical data and correlate these results to production data.
- Use mass balance equations to calculate the original total organic carbon and hydrogen index of thermally mature and post mature source rocks.
- Understand the role of oil fingerprinting technology in evaluating reservoir connectivity and allocating comingled oil production in unconventional reservoirs.
- Integrate geochemical data with geological, petrophysical, and geophysical data for comprehensive shale-gas and tight-oil reservoir evaluation.

Content

The course is a practical and applied introduction to geochemical techniques routinely employed in shale-gas/condensate and tight-oil reservoir assessment. Class emphasis is on explaining which tools and techniques can best address specific questions, what caveats must be kept in mind when employing these tools, what are the strengths and limitations of petroleum geochemistry in resource plays, and how to interpret conflicting data from different analyses. Theory is kept to a minimum and select practical exercises help participants learn to review geochemical data, recognize problems with the data, and begin to cultivate a feel for interpreting geochemical data and integrating these interpretations with other geological information.

The following analytical techniques will be discussed: Leco TOC, Source Rock Analyzer (SRA) and Rock-Eval programmed pyrolysis, Dean Stark and Soxhlet extraction, liquid and gas chromatography, gas chromatography-mass spectrometry, organic petrology using reflected light microscopy, fluorescence microscopy, and advanced scanning electron microscopy (SEM).

Several interpretive approaches will be discussed including routine parameters for TOC, programmed pyrolysis, extract composition and quantities, and organic petrology. Special emphasis is given to the many caveats associated with assessing thermal maturity in resource plays. Participants will complete exercises interpreting pyrograms, gas chromatograms, and elementary Gas Chromatography – Mass Spectroscopy (GCMS) data. The class will employ various cross plots and simple mathematics to interpret stable isotope data, calculate original TOC, hydrogen index, and oil and cracked gas yields, and interpret gas chromatography data for an oil fingerprinting exercise.

FRACTURED RESERVOIRS: FROM GEOLOGIC CONCEPTS TO RESERVOIR MODELS – COURSE PLUS FIELD TRIP

Dates: August 24-28, 2015
Location: Casper, WY
Tuition: $2195, AAPG members, $2395, non-members (increases to $2395/$2595 on 7/27/2015), includes digital course notes, printed exercises, lunch and refreshments each day, box lunches and transportation on field trip day. No refunds for cancellations after 7/27/2015.
Content: 3.4 CEU
Instructors: John Lorenz, Scott Cooper, FractureStudies LLC, Edgewood, NM; Ahmed Ouenes, FracGeo, The Woodlands, TX

Who Should Attend

Geologists, geophysicists, reservoir engineers, and geomodellers who deal with fractured reservoirs and who need to develop them using all types of available data. The course will be very useful to all geoscientists involved in clastics, carbonates and shale plays where fractures play a major role.

Objectives & Description

This course provides a unique opportunity to learn all the aspects related to the understanding and modeling of fractured reservoirs. The unique feature of this course is the ability to take the geologic concepts and use them in reservoir modeling. Hands-on sessions are devoted to the examination of outcrop, core and log data and using that information and a software to create 3D fractured reservoir models. The first part of the workshop covers the geologic aspects which allow the geoscientist to recognize different types of fractures from outcrop, cores and boreholes. Once the fractures are recognized, their impact on the reservoir and its performance is examined. Six case studies are used to illustrate all the geologic concepts. The second part of the workshop covers all the aspects of modeling fractured reservoirs.

Using modeling software and actual data from Teapot Dome, (WY), the geoscientist will be able to construct fracture models that integrate geology, geophysics and reservoir engineering. Emphasis will be given to the critical use of seismic attributes derived from inversion, volumetric curvature and spectral imaging. Using actual Teapot Dome field data from the Tensleep and Niobrara Shale formations and a hands-on approach, the workshop allows the geoscientist to identify fractures and to construct predictive 3D fracture models that can be used to identify productive zones, plan wells and to create fracture porosity and permeability models for reservoir simulation.

Prior to starting the modeling exercises, a field trip to the Tensleep outcrop around Casper (WY) will provide to the students the unique opportunity to see the large scale features related to fractures.

The student can take the concepts learned in this class and use them to solve his own fractured reservoirs problems.

Content

Part 1: Geologic Aspects of Fractured Reservoirs

- Introduction: Fracture Types and Variability
- Fractures in Core: Natural Fractures
- Fractures in Core: Induced Fractures, Types and Uses
- Fracture Mechanics
- Fractures on Anticlines
- Fracture Spacings
- Fracture Effects on Reservoirs
- Case Histories

Part 2: Field Trip to Tensleep outcrops

Part 3: Modeling Fractured Reservoirs

- Introduction
- Factors Affecting Fracturing
- Methodologies to Characterize Fractured Reservoirs
- The Use of Seismic to Improve the Fracture Modeling
- Integrated Workflow Applied to Fractured Reservoirs
- Hands-on Application: 2 Different Datasets from the Teapot Dome (WY)

GEOCHEMISTRY AND MODELING OF UNCONVENTIONAL PETROLEUM SYSTEMS

Date: Sunday, September 13, 2015
Time: 8:00 am to 5:00 pm
Location: Melbourne, Australia, with AAPG/SEG ICE meeting
Tuition: US$895 (goes up to $1095 on 7/31/2015); includes digital course notes, lunch and refreshments. No refunds for cancellations after 7/31/2015.
Content: .75 CEU
Limit: 50 people
Instructors: Bjorn Wygrala, Schlumberger, Aachen, Germany; Ken Peters, Schlumberger, Mill Valley, California, USA

Who Should Attend

This course is designed for geologists, petroleum system modelers, and those who use geochemistry and modeling to explore and develop unconventional petroleum resources. No prior experience in basin and petroleum system modeling (BPSM) is necessary and the course minimizes mathematical content.

Objectives

Participants in this course will learn how BPSM contributes to understanding and successful exploration and exploitation of unconventional resources. By the end of the course they should be able to:

- Differentiate conventional from unconventional resources and understand the geological properties and processes that they have in common.
- Explain factors that control oil vs. gas and oil properties in shale plays, including geohistory and temperature/time.
- Understand factors that control expulsion vs. retention of oil and gas in shale plays, which are critical for in-place resource assessment.
- Recognize geochemical indicators of producible unconventional resources.
- Understand fundamentals of geohistory, rock stress, and rock failure analysis.
- List new geochemical tools that identify sweet spots, e.g., downhole spectroscopy, stable carbon isotope ratios.
- Describe new advances in model predictions of geochemical processes, e.g., biodegradation, thermochemical sulfate reduction, and saturate-aromatic-resin-asphaltene composition.
- Identify geochemical indicators of biogenic gas and gas hydrates.
- Give worldwide examples of successful applications of geochemistry and modeling to unconventional targets.

Content

This course is a non-numerical introduction to the use of geochemistry and BPSM to better understanding unconventional resources. The course manual is a permanent reference that describes industry challenges and opportunities, theoretical aspects of BPSM (e.g., effects of temperature/time, petroleum generation and migration), biogenic gas and gas hydrates, shale gas, and shale oil.

Worldwide case studies are used to illustrate BPSM workflows applied to unconventional resources. In summary, this course is designed to provide participants with new information on unconventional and sweet spot identification that is not normally available in routine service company courses. The instructors have combined experience of nearly 70 years in exploration geochemistry and BPSM.

PRACTICAL SALT TECTONICS

Dates: December 1-4, 2015
Location: Houston, TX
Tuition: $1475, AAPG members, $1675, non-members (increases to $1675/$1875 on 11/3/2013), includes digital course notes, printed exercises and refreshments. No refund for cancellations after 11/3/2014.
Content: 3.0 CEU
Instructor: Mark Rowan, Rowan Consulting, Boulder, CO

Who Should Attend

This course is intended for geoscientists, engineers, and managers who need an introduction to salt tectonics or an update in this constantly evolving field. It is appropriate for those working in any salt basin globally and assumes a basic familiarity with structural geology concepts and terminology.

Objectives

Participants completing this course should be able to:

- Understand the depositional setting of layered evaporites and the control on later deformation,
- Describe the mechanics of salt flow and identify the loading, extensional, and contractional triggers for salt movement,
- Interpret salt and stratal geometries associated with diapirs, salt welds, and minibasins,
- Illustrate the processes and geometries resulting from extensional or contraction reactivation of diapirs,
- Explain how diapir rise influences stratal geometries, faulting, and reservoir distribution in diapir-flank traps,
- Demonstrate how allochthonous salt is emplaced and how it subsequently evolves,
- Understand the role of salt in rift basins, passive margins, and convergent-margin fold-and-thrust belts,
- Determine the effect of salt on sediment transport and deposition,
- Appraise the influence of salt bodies and welds on hydrocarbon maturation, migration, and entrapment
- Assess more accurately the risks in the exploration of salt basins.

Content

This course is designed to give participants the basic working tools to explore and develop hydrocarbons in salt basins. Because no two basins are alike, the focus is on understanding the processes and styles of salt-related deformation using a combination of seismic data, outcrop examples, and experimental models.

The course will initially address layered-evaporite basins and what drives salt mobility. We will then shift to discussing, first, how salt flow, diapirism, and minibasin formation are triggered by early differential loading, extension, contraction, or strike-slip deformation, and second, how diapirs and minibasins evolve over time and can be reactivated during episodes of extension or shortening. Focusing in on the details around diapirs, we will examine how diapiric growth impacts folding, faulting, and reservoir distribution. Because salt often moves more laterally than vertically, we will explain how and why allochthonous canopies form and evolve, and what can be expected just below salt sheets.

Salt is found in a variety of tectonic settings. We will look at its role in facilitating and responding to deformation in rift basins, passive margins dominated by gravity-driven deformation, and convergent-margin fold-and-thrust belts, using examples for various salt basins around the world. Finally, because salt provides the framework for other aspects of the petroleum systems in these basins, we will examine the influence of salt bodies and salt welds on sediment transport and deposition, hydrocarbon maturation and migration, and seal of hydrocarbons.

The course will consist primarily of lectures but will be supplemented by exercises focused mainly on interpretation of both 2-D and 3-D, time- and depth-migrated seismic data.

FIELD SEMINARS

SEVENTEEN UNIQUE AND ENGAGING WAYS TO LEARN MORE ABOUT THE INDUSTRY. PLUS EACH AND EVERY ONE PROMISES TO BE AN EXPERIENCE YOU'LL NEVER FORGET.

2015 FIELD SEMINARS

PLEASE NOTE: Registrants in AAPG Field Seminars must complete and sign the Release and Indemnity Form on the bottom of the Registration Form. Your registration will not be complete until we have your signed form in our files.

FIELD SAFETY COURSE FOR FIELD TRIP LEADERS

Instructors: Kevin Bohacs, Dave Story, Pam Collins, ExxonMobil, Houston, TX; Robert Clarke, Consultant, Irving, TX
Dates: Wednesday and Thursday, March 18-19, 2015, 8:00 a.m. to 5:30 p.m. each day
Location: Houston, Texas
Tuition: $500 (increases to $550 on 2/18/2015); includes course notes, AAPG publication Field Safety in Uncontrolled Environments, other printed material, and classroom first aid supplies. No refunds for cancellations after 2/18/2015.
Limit: 24 Persons
Content: 1.5 CEU

NOTE: This 2-day course will be offered in mid-March, well before the AAPG Annual Convention (May 31-June 3, 2015), so that field trip leaders and other interested persons may attend the course prior to other 2015 field trips/field seminars.

Who Should Attend

This course is designed for anyone who leads or coordinates field activities such as Field Trips, Field Seminars, Field Camps, or general field work, for companies or student groups. Participants will acquire and practice strategies to prepare for and conduct safe and effective field activities.

Objectives

Upon completion of this seminar, participants will:

- Be better prepared to assess their safety responsibilities as leaders in preparing for, planning, and conducting a safe and effective field trip.
- Understand the value of having protocols and specific actions to execute a plan for responding to an emergency in the field.
- Be more aware of field hazards and means to assess what conditions to consider (topography, steep slopes, cliff faces, etc.), and what weather conditions might make a field stop a "no-go".
- See the value of conducting a short safety briefing before going to the field each day, allowing trip attendees to give feedback about their safety concerns from the previous field day, and understand the value of keeping an up-to-date daily Safety Logbook during the field trip.

Content

Field activities are normally safe, but accidents do happen with potentially serious consequences, so measures should be taken to reduce the risks. This field safety program is straightforward, widely applicable, and scaleable to a wide range of field activities, from short roadside stops to long,

backcountry expeditions. This course provides classroom activities on Day 1 with instructor talks, group problem solving, and hands-on basic first aid scenarios. Day 2 is a trip to a field location where, during 4 field stops, participants will practice many of the field-safety concepts discussed in the classroom. This course provides scenarios for implementing valuable field safety processes and a template for creating programs tailored to the needs of individual field trip leaders. We encourage all AAPG 2015 field trip/field seminar leaders to register for this course.

NOTE: Participant's experience with this course may be enhanced if they have previously taken a Basic First Aid or and/or Wilderness and Remote First Aid, which are both available from the American Red Cross.

MODERN TERRIGENOUS CLASTIC DEPOSITIONAL SYSTEMS

Leader: Walter J. Sexton, Athena Technologies, Inc., Columbia, SC
Dates: April 29-May 6; and September 8-15, 2015
Location: Begins in Columbia and ends in Charleston, South Carolina
Tuition: $3100 (increases to $3,300 on 4/1/2015 for the April trip, and on 8/11/2015 for the September trip); includes ground transportation to Charleston, water transportation, guidebook, modern core workshop, lunch on the fluvial day, and CD-ROM. No refunds for cancellations after 4/1/2014 (for April course) or after 8/11/2015 (for September course.)
Limit: 24
Content: 5.6 CEU

Who Should Attend

Petroleum geologists and engineers who desire to further their understanding of modern sedimentary processes, stratigraphy, and sedimentology. Geoscientists working in fluvial and shallow marine environments. Both exploration

and development geoscientists, log analysts (petrophysics) and managers will benefit from viewing the complexity of the facies architecture and scale.

Objectives

Upon completion of this field seminar, participants will be able to:

- Depict the facies architecture, heterogeneity and 3D geometry of modern clastic depositional environments deposited in alluvial, deltaic, estuarine, barrier island and tidal channel settings.
- Improve modeling skills by evaluating facies trends in the subsurface that will allow the potential to predict facies and reservoir trends.
- Identify potential mesotidal shoreline trap types.
- Express the impact of the hydrodynamic regime (i.e. waves and tides) on the geomorphology, lithology, and stratigraphy of clastic sediments.
- Comprehend the sedimentological processes responsible for the deposition of sedimentary rocks in the subsurface.

Content

The seminar study area is located on the trailing edge of the North American plate, the coastal plain of South Carolina. The study area is thoroughly documented and offers an excellent opportunity for the students to walk on a variety of modern terrigenous clastic depositional systems while observing sedimentary processes, modern sedimentary structures, and numerous trenches illuminating the three-dimensional architecture of each area. Genetically related depositional environments and their stratigraphic correlation are stressed during the seminar from the standpoint of subsurface interpretation for prospect evaluation and reservoir development. The emphasis of the trip will be on sediments deposited within the past 4,000 years. Field observations will be supported and expanded on by short and focused lectures each morning, a detailed guidebook, and numerous figures and diagrams (posters) used during each field day. In addition, a modern core workshop will be held where the cores will be logged and discussed by the students during class.

The focus of the seminar will be on the three-dimensional characteristics of modern depositional environments and their regional relationship with other depositional environments in the area. This focus will be used to demonstrate how these characteristics and relationships can be used to recognize and delineate similar depositional environments in ancient sedimentary rocks. Additionally, the evolution of Quaternary strata is presented in a chronostratigraphic context. Subsurface data provide lithologic interpretations for progradational (barrier island, deltaic) retrogradational (barrier island, estuarine), and aggradational (valley fill, barrier island) depositional styles. Lateral facies-association and lithofacies changes are discussed from the basin scale (exploration fairways) to the reservoir scale (permeability controls).

The six-day trip is carefully planned to maximize time in the field and participants will be encouraged to discuss the depositional settings encountered on each day. The first day in the field is devoted to examination of the modern aggraded fill in the alluvial valley formed during the most recent sea level cycle of the Congaree River during the Pleistocene/Holocene. The second day will be spent examining a mixed energy delta (Santee/Pee Dee) by boat, moving from the fluvial upper reaches of the delta system to the marine delta front. The third day will focus on mesotidal progradational/regressive barrier island/shoreface complexes, and tidal inlet deposition. This will include observing trenches and an explanation of the processes active in the system's sub-environments. The fourth day will be spent at Cape Romain focusing on

retrogradational/transgressive shorelines, lagoons/bays, inlet formation and closure, and wave-dominated deposition. The fifth day will be spent in Charleston with morning lectures followed by a half-day modern core workshop. During the workshop, groups of students will be assigned modern core samples to log followed by discussion on the environment of deposition, potential reservoir characteristics and exploration strategies. The sixth and final day will be spent in St. Helena Sound, the largest estuary on the southeastern coastline of the United States. The sub-environments of deposition to be visited in the incised valley fill will include: peat swamp, point bar, marsh, fine grained tidal flat, sand flat, barrier island, and linear sand ridge. This field day will demonstrate changes in deposition in the estuary from freshwater dominance to open marine conditions.

SEQUENCE STRATIGRAPHY, FACIES ARCHITECTURE AND RESERVOIR CHARACTERISTICS OF FLUVIAL, DELTAIC AND STRAND-PLAIN DEPOSITS (FORMERLY CLASTIC RESERVOIR FACIES)

Leader: *Edmund R. "Gus" Gustason, Enerplus Resources (USA) Corp., Denver, CO*
Date: *May 1-8, 2015*
Location: *Begins in St. George, Utah and ends in Salt Lake City, Utah*
Tuition: *$2,200 (increases to $2,400 on 4/03/2015); includes field transportation, lunches and beverages in the field, guidebook. No refund for cancellations after 4/03/2015.*
Limit: *12*
Content: *5.0 CEU*

Who Should Attend

This seminar is designed for geologists and engineers who explore for and/or develop oil and gas resources in fluvial, deltaic, and strand-plain deposits. The course will benefit participants by providing an opportunity to examine, describe, and better understand sequence stratigraphy, facies associations, and the 3-dimensional spatial distribution of reservoir flow units and heterogeneities in fluvial, deltaic, and strand-plain reservoirs. Although there are no prerequisites, a basic understanding of fluvial, deltaic and strand-plain (shoreface) sedimentology and stratigraphy is helpful. Engineers will find the experience complimentary to current surveillance and modeling challenges.

Objectives

The objectives of this field seminar are to provide geologists and engineers with a better understanding of the sequence stratigraphy, facies architecture and reservoir characteristics of fluvial, deltaic and strand-plain deposits and show how the integration of information from outcrop, cores, and wireline logs can add confidence and reduce the amount of uncertainty associated with correlation and prediction of the spatial distribution of reservoir elements, their bounding surfaces, and internal heterogeneities at interwell, reservoir, and basin scales. Upon completion of this course you will be able to:

- Distinguish a wide variety of fluvial, deltaic, and strand-plain facies and facies associations in outcrop.
- Recognize and characterize important reservoir flow units and heterogeneities that influence the behavior of fluids in fluvial, deltaic and strand-plain deposits.
- Recognize discontinuities that constitute flooding surfaces in shallow- and marginal-marine settings, as well as their landward expression in alluvial-plain environments.
- Define parasequences and parasequence sets based on their vertical facies successions and stacking patterns.
- Predict the spatial arrangement (stratigraphic or facies architecture) of fluvial channel deposits and predict whether shoreline parasequence sets will be strongly progradational, aggradational or retrogradational based on what part of the base level transit they were deposited. For example, particpants will observe that channel sandstone body density is low (low net-to-gross) where shoreline parasequence sets are retrogradational or aggradational and channel sandstone body density is high (high net-to-gross) where parasequence sets are strongly progradational.

May 1 is a travel day for participants - they need to arrive in St. George, Utah by late afternoon. A brief presentation on safety and an introduction to the course will be held that evening. Field work begins on May 2. The course ends in Salt Lake City late afternoon on Friday, May 8.

Content

Much of the world's conventional and unconventional oil and gas production is from fluvial, deltaic and shallow

marine clastic deposits that accumulated within foreland basin settings. The ability to accurately describe and predict the stratigraphic architecture that controls the behavior of fluids within these reservoirs greatly reduces risk in exploration and development decisions. This field seminar focuses on relevant, topical geological and engineering issues as expressed in world-class outcrop exposures of these reservoir types throughout Utah. The emphasis in this 7-day field seminar is on recognizing and learning how to predict facies and facies architecture (the geometry and spatial arrangement of sedimentary bodies) within a high-resolution, sequence stratigraphic framework. Participants will examine numerous outcrops along a proximal (west) to distal (east) transect that represent a variety of depositional environments deposited during low stand, transgressive, highstand, and late highstand (falling stage) phases of two third-order Cretaceous sequences: the Cenomanian-Turonian Greenhorn Sequence and the Turonian-Santonian Niobrara Sequence.

Participants will:

- Examine and describe the facies and facies associations of gravelly braided river, meandering river, tidal channel, ebb-tidal delta, tidal flat, salt marsh, bay, estuarine, swamp, wave-modified shoreface, wave-modified delta front, fluvial-dominated delta front, distibutary channel and mouth bar, offshore marine and prodelta deposits.
- Examine and describe the important surfaces that bound these facies, facies associations and facies assemblages.
- Define the criteria that can be used to recognize specific facies associations on wireline logs and in cores.
- Examine, describe, and understand the factors controlling stratigraphic architecture.
- Examine and describe the reservoir characteristics (flow units and heterogeneities) of these deposits.
- Develop depositional models that can be used to predict these variations in the subsurface.
- Examine core photos from wells drilled adjacent to the outcrop and analogous oil and gas fields, conduct core-to-log calibration and correlation exercises, and review techniques for integrating available data into a geological model, and discuss the uncertainties associated with building models.

This field seminar is a perfect follow-up course to the AAPG Modern Terrigenous Clastic Depositional Systems course. A remarkable comparison can be demonstrated between the modern South Carolina coastal plain and mid-Cretaceous sediments of southern and central Utah.

Outcrops visited are along the margins of the Kaiparowits, Paunsaugunt, Markagunt, Fish Lake, and Wasatch Plateaus, the Circle Cliffs Uplift, Waterpocket Fold, East Kaibab Monocline, and the Henry Mountains. The field seminar travels through spectacular natural scenery of the Colorado Plateau, including Zion, Bryce, and Capitol Reef National Parks, Grand Staircase-Escalante National Monument, and Glen Canyon National Recreational Area (Lake Powell).

Class size is kept small for mobility and to promote group and individual discussions with the instructor on the outcrop. A considerable amount of hiking is involved. Participants should be in good physical condition.

GEOLOGY OF GRAND CANYON, BRYCE CANYON AND ZION NATIONAL PARKS

Leader: Garry Hayes, Modesto Junior College, Modesto, CA
Date: May 23-29, 2015
Location: Begins and ends in Las Vegas, Nevada
Tuition: $3100 (increases to $3300 on 4/25/2015); includes lodging, van rental, fuel, field guide, park entrance fees. Does NOT include transportation to departure point at Las Vegas, meals or park overflights. $300 discount for double occupancy. No refunds for cancellations after 4/25/2015.
Limit: 15 persons
Content: 4.2 CEU

Who Should Attend

Geologists, educators and students of earth science who seek a working knowledge of the geological, archaeological and natural history of the Colorado Plateau as revealed at Grand Canyon, Zion, and Bryce Canyon National Parks and other localities on the Colorado Plateau.

Location

Begins and ends in Las Vegas, Nevada. It will be a 7 day road trip through Grand Canyon National Park (South Rim), Grand Staircase-Escalante National Monument, Bryce Canyon National Park, and Zion National Park.

Objectives

Participants will explore and investigate a number of classic geological sites on the Colorado Plateau, and by the end of the seminar will be able to:

- Identify the geologic principles derived from early studies on the Colorado Plateau by J.W. Powell, G.K. Gilbert, and others.
- Summarize the origin and history of the Proterozoic metamorphic complex of the Grand Canyon region and contrast these rocks with other western metamorphic terranes.
- Identify and analyze the depositional environments of the Paleozoic and Mesozoic rocks of the Colorado Plateau, as exposed at each of the parks and landscapes in between.
- Analyze and classify the faults and folds associated with Mesozoic and Cenozoic tectonic activity, including the unique monoclines that define sub-provinces within the plateau country.
- Assess and evaluate competing hypotheses concerning the erosional history of the Colorado River and the Grand Canyon.
- Analyze and assess of the history of land use on the Colorado Plateau from prehistoric time to the present, including water use, agriculture, and mineral/ energy development.

Content

A geological exploration of the Colorado Plateau is an opportunity to observe and understand many of the principles that established the science of geology. For those who have not visited the region previously (or have not had the chance to tour it in depth), this field seminar will provide a comprehensive journey into the geological story of this fascinating landscape. The arc of our trip, from Las Vegas to the Grand Canyon, Bryce Canyon, Zion Canyon and back, provides a remarkably detailed history of the North American continent from the Early Proterozoic to Holocene time. Few places provide the story in such scenic fashion.

As we leave Las Vegas and travel through the Lake Mead and Kingman area we will observe exposures of Paleozoic sedimentary rocks from the Grand Canyon sequence as well as other younger volcanic rocks, and see up close one of the largest engineering feats in history, Hoover Dam. At Diamond Creek (along the only road that reaches the bottom of the Grand Canyon), we will encounter the Proterozoic rocks of the basement complex that underlie much of the Colorado Plateau. The metamorphic rocks are overlain by the Cambrian Tonto Group along the "Great Unconformity". We will spend a day at the South Rim of the Grand Canyon to allow for a comprehensive look at the Paleozoic history by foot, car, or by air (optional).

Leaving Grand Canyon, we will visit the Little Colorado River and a corner of the "Painted Desert" to examine some of the tectonic structures that form the boundary of the Kaibab Plateau. Mesozoic terrestrial sediments dominate this landscape, and at Antelope Canyon we expect to explore a labyrinth that has been carved through the Navajo Sandstone. If the roads are passable, we will investigate exposures along the Cockscomb, a major Laramide monocline traversing Grand Staircase-Escalante National Monument, the spectacular span at Grosvenor Arch, and the odd sedimentary pipes at Kodachrome Basin State Park. We will be traversing outcrops of the late Cretaceous Mesa Verde Group, the source of coal reserves in the Colorado Plateau.

The Claron Formation, exposed in striking fashion at Bryce Canyon National Park, represents a major change of sedimentary deposition on the Colorado Plateau in early Cenozoic time. The freshwater sediments have been eroded into the tall hoodoos along the edge of the Paunsaugunt Plateau. We will then start moving down section into the Jurassic and Triassic sediments exposed in Zion National Park. Zion exposes an early Mesozoic sequence of terrestrial floodplain deposits and coastal dunes that have been eroded in spectacular fashion. Time will be set aside for an exploration of the upper canyon on foot or by tram.

Each participant will receive a field guide that includes a geological and cultural overview of the Colorado Plateau region, and a comprehensive road guide for the route traveled on the trip.

DEEP-WATER SILICICLASTIC RESERVOIRS, CALIFORNIA

Leaders: *Stephan Graham and Donald R. Lowe, Stanford University, Stanford, CA*
Date: *June 5-10, 2015 (following AAPG annual convention)*
Location: *Begins in Palo Alto and ends at the airport in San Francisco, California*
Tuition: *$3,000 (increases to $3,200 on 5/08/2015); includes lodging, transportation during the seminar, lunches, guidebook and group dinner (1 night). No refunds for cancellations after 5/08/2015.*
Limit: *20*
Content: *5.5 CEU*

Who Should Attend

Exploration and development geologists, geophysicists, log analysts, engineers, and managers working with deep-water reservoir systems in exploration and production settings. The field seminar will benefit all audiences, from experts to those unfamiliar with deep-water systems.

Objectives

Upon completion of this field seminar, participants will be able to:

- Recognize the spectrum of deep-water siliciclastic facies developed across the full range of deep-water environments, from upper slope to basin plain
- Understand the processes by which deep-water siliciclastic reservoirs are formed, and how to recognize them in core and in the field
- Appreciate the origins and nature of heterogeneity in deep-water reservoir facies
- Use deep-water facies in a predictive manner, while recognizing pitfalls and limitations

Content

This six-day field seminar is designed to provide participants with an appreciation of the broad range of

deep-water reservoir facies, the mechanisms by which they were deposited, their predictive attributes, their reservoir heterogeneity and their stratigraphic architecture. The field school emulates a voyage downslope in a deep-water sedimentary system, from submarine canyon head to mouth, to submarine fan valley, to outer fan, to basin plain, using many of the most outstanding deep-water facies outcrops California has to offer. The field seminar formed the basis for the AAPG Hedberg Conference in 2000.

The field seminar is designed to give participants an understanding of deep-water sedimentary processes and products, as well as a powerful visual impression of the scale and architecture of the full spectrum of deep-water deposits. After gathering on the first evening in Palo Alto, California for a welcome dinner, the second day of the trip brings participants to a common level of understanding of the bed-scale building blocks of deep-water systems through lectures and a core workshop held on the Stanford University campus, with the day ending in Half Moon Bay, California. The morning of the third day reinforces the second day's lectures by viewing a range of turbidite facies in coastal exposures of San Mateo County. The trip moves south in the afternoon to the Monterey-Carmel area to view the most proximal of deep-water deposits: upper submarine canyon fill exposed in sea-cliff outcrops in Point Lobos State Preserve. The night is spent in Monterey. The morning of the fourth day entails examination (and a field exercise) of a mid-submarine canyon channel-fill exposure at Wagon Caves Rock in the Santa Lucia Range west of King City. In the afternoon, the trip moves east from the Salinas basin, across the San Andreas Fault, to a dramatic mountainside cross sectional exposure of a submarine fan channel/levee complex at Juniper Ridge, near Coalinga in the San Joaquin basin. The Juniper Ridge field exercise affords participants an opportunity to understand channel-levee facies relations. After a night in the Coalinga area, the fifth day entails a drive north to see the outcrop sequence represented by the second day's core exercise in submarine fan-valley fill exposed at Monticello Dam, Lake Berryessa. The final night is spent in Davis, California. The sixth day consists of examination of outer fan and basin plain deposits along Cache Creek, in the Coast Ranges northwest of Davis. The group returns to San Francisco International Airport in the mid-late afternoon.

CARBONATE RESERVOIR ANALOGUES: PLAY CONCEPTS AND CONTROLS ON POROSITY

Leaders: *Evan K. Franseen, Robert H. Goldstein, University of Kansas, Lawrence, KS; Mateu Esteban, Consultant, REPSOL-YPF, Mallorca, Spain*
Date: *June 8-13, 2015*
Location: *Almeria Region, SE Spain, begins and ends in Almeria Airport, Spain. Fly from London/Barcelona/Madrid*
Tuition: *$3,500 (increases to $3700 on 4/27/2015); includes field transportation, all meals and lodging during trip, guidebook. No refunds for cancellations after 4/27/2015.*
Limit: *15*
Content: *4.8 CEU*

Who Should Attend

Petroleum geologists, engineers, and geophysicists who are involved in interpreting carbonate systems; geoscientists needing introduction or refresher course on carbonate sedimentology, stratigraphy, or diagenesis.

Objectives

The objectives of this field seminar are to provide educational opportunities on the following:

- Depositional and diagenetic models for carbonates that are good analogs to highly productive reservoirs in the Middle East, including Cretaceous and Tertiary carbonates from the Gulf (Iran, Iraq, U.A.E., Qatar, Oman), carbonates from SE Asia, including Indonesia, and potentially to offshore plays from Brazil.
- Lessons on carbonate systems that can be applied to carbonate reservoirs throughout the geologic record.
- Additions to sequence stratigraphy concepts through development of substrate paleoslope and climate controls on depositional sequence characteristics; a sequence stratigraphy approach that involves the innovative "pinning point" technique.
- Coverage of cool-water as well as warm-water carbonate facies models.
- Controls of paleotopography on shallow-water and deep-water carbonate reservoir systems.
- New and emerging carbonate reservoir play types. Includes outcrop exposure of play models related to meteoric, acid and hydrothermal karst, unconformities, deepwater carbonates, reef and forereef slope, sequence stratigraphic controls, dolomitization, moldic porosity, cool-water carbonates, oolite, bioclastic sand, and microbialite.

Content

During this seminar, leaders and participants together will:

- Examine a wide variety of carbonate facies types: coral reef platforms with continuous progradational talus slopes grading into basinal deposits; temperate-water carbonate systems; evaporites, microbial buildups (thrombolites, stromatolites) and oolitic shoals.
- Study and discuss various types of unconformities and associated paleokarst; evolution and distribution of porosity associated with meteoric, acid, and hydrothermal karst processes.
- Examine and discuss relationships and interaction with evaporites, volcanoes and volcaniclastics.
- Discuss large-to small-scale predictability of depositional facies and porosity trends important for estimating reservoir parameters.
- Compare and discuss methods, approaches, and results in using outcrops to build 3-D cellular reservoir-analog models.
- Relate field seminar topics and stops to play concepts in carbonates throughout the geologic record.

This field seminar is held in an area in which compressional, shear-zone and extensional tectonism created highly variable basement paleotopography and differing basin morphologies prior to Upper Miocene-Pliocene carbonate deposition. Superb 3-D exposures of Upper Miocene - Pliocene carbonates in SE Spain offer an unrivaled opportunity to learn from undisturbed depositional geometries. The area is a natural classroom for illustrating basic and advanced concepts of carbonate sequence stratigraphy, and evaluating the interaction of sea-level fluctuations, paleotopography, paleoclimate, and various diagenetic processes on reservoir character of a variety of carbonate systems. Outcrops in the region reveal evolution from heterozoan (temperate/cool water) carbonate systems to photozoan systems (coral reef-rimmed platforms) to an oolitic and microbialite (thrombolite, stromatolite) cyclic system.

The field seminar develops and evaluates the sequence stratigraphic framework and controls on location and reservoir character of Upper Miocene-Pliocene carbonate sequences from a variety of carbonate systems within the context of the regional paleogeography. Facies architecture of Upper Miocene carbonate complexes will be explored using sequence stratigraphy stacking patterns, controls of relative sea level, basement paleotopography, basin morphology, paleovalley systems, and climate. Diagenetic processes (including those related to karst and dolomitization) that affected the rocks are integrated to evaluate the controls on porosity distribution. Various forms of primary and secondary porosity exist in the outcrop. Particular emphasis is placed on applying principles from the field seminar and utilization of the excellent outcrops as analogs to a wide range of subsurface reservoir equivalents.

UTICA, MARCELLUS AND BLACK SHALES IN THE NORTHERN APPALACHIAN BASIN

A JOINT AAPG / UNIVERSITY AT BUFFALO FIELD SEMINAR

Leader: Robert Jacobi, State University of New York at Buffalo, Senior Geology Advisor at EQT, and consultant, Buffalo, NY
Date: June 15-19, 2015
Location: Watkins Glen, NY (please plan to arrive in Watkins Glen the evening of June 14)
Tuition: $1950 (Increases to $2150 on 5/18/2015). Includes course notes and field guide, and transportation during Field trips. Does not include hotels or meals. No refunds for cancellations after 5/18/2015.
Limit: 15
Content: 3.0 CEU

Who Should Attend

Oil/gas and environmental geoscientists who wish to learn about fracturing, faulting, and tectonics in the northern Appalachian Basin (including black shales). A BS in geology/geophysics is recommended, and a geology/geophysics MS is helpful, as is experience in the geosciences world.

Objectives

The attendee will gain a working knowledge concerning:

- How faults and fractures develop and their terminology
- Methodologies utilized in collecting and analyzing fracture data
- Characteristics of faults and fractures that affect the sedimentary units (including black shales) in the northern Appalachian Basin of NYS
- Tectonics that led to the formation of the structures in the northern Appalachian Basin and the adjacent Appalachian Orogen

Content

The course plan is a lecture in the morning, followed by field work in the afternoon that illustrates the elements of the morning lecture. The attendees will observe fracture and fault examples and collect fracture data to analyze. Longer field trips examine faults and fractures in the Utica, fractures in the Marcellus and a complete section of highly fractured Geneseo. This schedule is dependent upon the weather.

The course lectures are organized around three core areas: 1) Faults and their effects on shales in the Northern Appalachian Basin, 2) The development and characteristics of fractures in sedimentary section of the Northern Appalachian Basin, including black shales, 3) Tectonic context of the faults and fractures in the northern Appalachian Orogen. For Part 1 the attendee will learn the evidence for, and characteristics/motion histories of, faults in the Appalachian Basin of New York, Pennsylvania and West Virginia. In Part 2, the attendee learns details about stress and fracture development, faults and rock strength, rock failure types, fracture decorations, fluid/gas driven fracturing, fracture spacing, Fracture Intensification Domains, fracture intersections, and other fracture aspects. For Part 3 the attendee will see the connections among plate tectonics, faults/fractures and the development of the northern Appalachian Basin and selected reservoirs. The attendees will also learn information that promoted the advancement of Phanerozoic plate tectonic models of the Appalachian Orogen. Detailed examination of faults and fractures will be conducted in such black shale units as the Utica, Geneseo and Marcellus. Field trips will demonstrate in gray and black shales faults and fracture spacing, intersections, and decorations. These trips will also establish methodologies for characterizing and analyzing fractures.

The course is located in the center of the Finger Lakes Wine Region, one of the most beautiful areas in the country, and is a natural laboratory that has been central to many of the advances in fracture understanding.

THE LODGEPOLE-BAKKEN-THREE FORKS PETROLEUM SYSTEM: A FIELD SEMINAR FOR GEOLOGISTS, ENGINEERS, AND OPERATORS IN WESTERN MONTANA

Leaders: George W. Grader and P. Ted Doughty, PRISEM Geoscience Consulting, Spokane, WA
Date: June 24-26, 2015
Location: Begins and ends in Three Forks, MT
Tuition: $1,900 (increases to $2,100 on 5/27/2015); includes field trip guidebook, field transportation, lodging, field lunches and refreshments. Participants will pay for their breakfasts and dinners. No refund for cancellations after 5/27/2015.
Limit: 15
Content: 2.4 CEU

Who Should Attend

Oil and gas professionals who wish to learn about the geology, reservoir engineering, or operation aspects of the Lodgepole-Bakken-Three Forks Petroleum System.

Location

Begins and ends in Three Forks, MT. Plan to arrive/depart from Bozeman, MT

Objectives

The attendee will gain a working knowledge of the following in the Lodgepole-Bakken-Three Forks Petroleum System:

- Bakken and Three Forks reservoir sedimentology and facies
- Sequence stratigraphy and basin architecture of the Bakken-Sappington and Three Forks
- Characteristics of key sequence boundaries
- Geology and engineering aspects of Bakken-Three Forks reservoirs
- Geochemistry and depositional environments of Bakken source rocks and seals
- Lateral facies changes and reservoir changes along horizontal transects
- Late Devonian-Mississippian tectonics and basin histories of western North America
- Regional geology of western Montana
- Stratigraphy and petroleum geology of the lower Lodgepole (incl Scallion).

Content

The course begins with a ½ day introduction to Late Devonian-Mississippian basins and strata (Bakken-Sappington-Exshaw) in the northwestern U.S. and southern Canada. The lecture concludes with a detailed discussion of Sappington Formation stratigraphy and sedimentology—demonstrating that it is equivalent to the Bakken in nearly all respects and a nearly perfect analog. Day one concludes with a visit to the Sappington Three Forks Type section near Three Forks, MT.

Days two and three are spent entirely in the field examining sections of the Sappington and Three Forks Formations. Attendees may also examine the overlying Lower Mississippian Lodgepole Formation at most stops.

The field part of the course is organized so that each outcrop is examined and discussed in terms of its correlation with the productive Bakken and Three Forks Formations in the subsurface. Local well logs, outcrop gamma ray logs, detailed measured sections, and geochemical data are used at each section to support the field lectures and regional correlations.

Excellent outcrops illustrate how facies, reservoir properties and rock strength, can vary along a lateral well bore. Engineers, geologists, and operators will find this especially interesting.

The course is located just north of Yellowstone National Park in an area of world-famous geysers, wildlife, scenery, and fishing. The Three Forks-Bozeman area of Montana also is the classic type section for the Three Forks and Sappington Formations.

FRACTURES, FOLDS, AND FAULTS IN THRUSTED TERRAINS: SAWTOOTH RANGE, MONTANA

Leaders: *William B. Hansen, Jireh Consulting Services, Great Falls, MT; Steve Boyer, Consultant, Tacoma, WA; Chuck Kluth, Kluth & Associates, Littleton, CO; Jim Sears, University of Montana, Missoula, MT*
Date: *July 13-18, 2015*
Location: *Begins and ends in Great Falls, Montana*
Tuition: *$2,900 (increases to $3,100 on 6/15/2015); includes lunches, transportation, guidebooks, admission to Glacier National Park, and some additional meals. No refunds for cancellations after 6/15/2015.*
Limit: *20*
Content: *4.2 CEU*

Who Should Attend

Exploration and development geologists, geophysicists, log analysts, engineers, and managers working in structural geology and/or fractures who want a thorough understanding of the geology and geophysics utilized in E&P in thrust belts.

Objectives

Upon completion of this field seminar, participants will be able to:

- Identify natural fractures and discuss analogs
- Differentiate natural vs. induced fractures
- Make connections between structure & fractures & prolific oil fields in the region and new discovery potential
- Have a greater understanding source rock petroleum systems of a thrust belt, and its influence on adjacent forebulge resource oil plays
- Develop completion programs where fractures and structure play a major role in the reservoir

Content

During this seminar, leaders and attendees together will:

- Examine the mechanics of fracturing, folding, and faulting in thrust belt terrains.
- Identify and discuss new ideas regarding the geometry and kinematics of the development of thrust belts with examples from the spectacular Sawtooth Range of northwest Montana.
- Compare seismic interpretation with outcrop examples and review drilling practices in a "frontier" (Montana) exploration thrust belt province.
- Analyze stratigraphic concepts which are essential in the exploration of thrust belt targets.

This field seminar is unique in that it offers the participant the opportunity to interact with a number of instructors who have several decades of experience working in thrust belts of the world. It focuses on the practical issues of exploration and production of hydrocarbons in thrust belts, with the Montana Thrust Belt as the backdrop. It will explain how these concepts can be applied worldwide, where overthrust terrains are increasingly important exploration targets.

The course will integrate concepts of exploration, including a review of fractured reservoir models, structural geology, stratigraphy, and hydrocarbon assessment. The spectacular geology of the Montana Sawtooth Range (an exhumed duplex) will serve as the backdrop for this field seminar. Time in the field will be bolstered by periodic classroom sessions on structural geology concepts, fractured reservoirs, and other issues the explorationist can expect to encounter in thrust belt exploration.

The seminar will utilize traverses to examine multiple thrust sheets exposed in Sun River Canyon, the famous Teton Anticline, and an outstanding example of an exposed fractured reservoir along a fault-propagated fold in Mississippian carbonates as Swift Reservoir. Discussions will involve new ideas on the geometry and kinematics of thrust sheets and how they might influence exploration strategies in those settings.

Participants will discuss the Bakken/Exshaw petroleum system of the Montana Disturbed Belt, and its influence on the emerging resource oil play on the adjacent Sweetgrass Arch. The seminar will continue northward to Glacier National Park, with a cross-section view of the Lewis Thrust, the Chief Mountain klippe, discussions of horizontal Bakken oil drilling on the nearby Blackfeet Indian Reservation and the historical giant gas field production across the border in Alberta, and conclude with a geologic transect along the scenic Going-to-the-Sun Highway of Glacier National Park.

SEISMIC INTERPRETATION IN FOLD-AND-THRUST BELTS: FIELD TRIP TO THE SOUTHERN CANADIAN ROCKY MOUNTAIN FORELAND

Leaders: John H. Shaw, Harvard University, Cambridge, MA, & Frank Bilotti, Chevron, Houston, TX
Date: July 19-25, 2015
Location: Begins and ends in Calgary, AB, Canada
Tuition: $3,000 (increases to $3,200 on 6/19/2015); includes lodging in a field station (double occupancy), most meals (exception of 2 dinners), local transportation, boat and gondola fees, guidebooks, and supplies. No refunds for cancellations after 6/19/2015.
Limit: 20
Content: 4.2 CEU

Who Should Attend

This course is intended to assist geologists and geophysicists involved in the interpretation of seismic reflection data for trap delineation and reservoir characterization in both orogenic and passive margin fold-and-thrust belts. The course should also be a useful for supervisors who evaluate structural interpretations to assign and reduce drilling risks.

Objectives

Upon completion of this field seminar, participants will be able to:

- Recognize common types of structures in fold-and-thrust belts based on their expressions in outcrop and seismic data.
- Apply fault-related folding concepts to interpret these structures, characterizing fault and fold geometries and fault displacements.
- Identify petroleum traps and their major structural risk elements.
- Recognize similarities between styles of trap and reservoir-scale deformation.

Content

This structural field course in the Front Ranges of the Canadian Rockies focuses on relating outcrop to seismic expressions of compressive structural styles that are common in fold-and-thrust belts and deepwater passive margins (toe thrust belts) worldwide. Course topics include seismic interpretation of thrust and reverse faults, detachment surfaces, fault-bend folds, fault-propagation folds, detachment folds, growth structures, wedge structures, and imbricate structures. The course offers an extensive "atlas-style" guidebook with seismic examples from petroleum basin throughout the world, as well as instructional materials and exercises on quantitative structural interpretation of seismic data. Each day will be spent visiting three to five field locations, where new concepts will be introduced and applied in seismic interpretation projects.

Participants stay at the University of Calgary Kananaskis Field Station, in Kananaskis Country, Alberta, Canada, about an hour drive from Banff and two hours' drive from Calgary. The geology is extraordinary, and the scenery and wildlife are tremendous.

All participants are responsible for making their own travel arrangements to Calgary (you will be provided with arrival and departure details at least 30 days prior to the start of the trip).

GEOLOGY IN MONTANA ALONG THE MISSOURI RIVER: CANOEING WITH LEWIS & CLARK

Leader: William B. Hansen, Jireh Consulting Services, Great Falls, MT
Date: August 17-21, 2015
Location: Begins and ends in Great Falls, MT
Tuition: $2700 (increases to $2900 on 7/20/2015), includes all lodging, transportation, outfitter fees, meals, and museum entrance fees. No refunds for cancellations after 7/20/2015.
Limit: 25
Content: 3.6 CEU

Who Should Attend

Geologists and spouses, educators, and fans of Lewis and Clark who desire to become more familiar with the varied and complex geology along the Upper Missouri River in Montana that influenced the Lewis & Clark expedition. Many of the river landscapes seen by canoe are unchanged from the way Lewis & Clark saw them 210 years ago.

Location

Begins and ends in Great Falls, MT. Most days will be spent on short hikes and outfitted canoe/float trips on the Missouri River, within a day's drive of accommodations in Great Falls. Two of the days will be spent on the river on an outfitted canoe/camping trip, and conclude with a paddle into historic Fort Benton, the oldest city in Montana, where a luxurious stay at the newly-remodeled 1881 Grand Union hotel awaits us. The Missouri is a good river for canoeing, whether you are just beginning or experienced.

Objectives and Content

Participants will explore a number of classic geological sites that affected the Lewis and Clark expedition in Montana on this six day excursion, including the Gates of the Mountains canyon within the Montana Thrust Belt, Lewis' "Tower Rock" atop late Cretaceous volcanics, hikes to the Great Falls of the Missouri through Lower Cretaceous deltaic sediments, and the Marias/Missouri River "decision point". Although geology as a science was in its infancy when President Thomas Jefferson commissioned this expedition in the early 1800's, the progress of the "voyage of discovery" was heavily influenced by the geology encountered along the way. Lewis, who was schooled as a Naturalist, described the geological landscapes he saw in vivid detail throughout his daily journals. This excursion will also include visits to the Lewis & Clark Interpretive center, First People's Buffalo Jump, and the famous C. M. Russell western art museum.

DEVONIAN REEF FACIES MODELS, HYDROTHERMAL DOLOMITIZATION, AND TIGHT-CARBONATE RESERVOIR ANALOGUES – UPPER DEVONIAN STRATA IN THE NORTHWEST TERRITORIES, CANADA

Leaders: *Alex J. MacNeil, (Osum Oil Sands Corp., Calgary, AB, Canada; Brian Jones, Univ. of Alberta, Edmonton, AB, Canada*
Date: *August 31-September 4, 2015*
Location: *Begins and ends in Hay River, Northwest Territories, Canada*
Tuition: *US $2900 (increases to $3100 on 7/20/2015); includes field transportation, lunches/refreshments in the field, 4 nights lodging, guidebooks. Does not include breakfasts or dinners. No refunds for cancellations after 7/20/2015.*
Limit: *18*
Content: *4.0 CEU*

Who Should Attend

Petroleum geoscientists concerned with Devonian reefs, carbonate sequence stratigraphy, hydrothermal dolomitization, and tight platform carbonates. The course is designed to accommodate a range of experience, from project geoscientists who need just-in-time familiarization with Devonian reef facies to carbonate specialists working complex problems, and is a must for anyone modeling Devonian carbonate platforms.

Objectives

The Hay River region in the Northwest Territories is one of the best locations in North America for the examination of Devonian carbonates, and the Pine Point mine site is one of the best localities for viewing the fabrics and geometries associated with hydrothermal dolomitization.

Participants can expect to develop a working knowledge/deeper understanding of:

- Devonian reef facies models – recognition of facies associations from peritidal to fore-reef zones and the four key types of Devonian reef facies. Tight platform carbonates (reef to off-reef transitions) and their heterogeneity are also examined.
- How reef fabrics may directly tie to porosity development and reservoir quality. Participants will learn how to relate stromatoporoids and other reef builders to their environments of deposition.
- Predictive concepts of carbonate sequence stratigraphy and how to construct a sequence stratigraphic framework from the recognition of facies associations, stacking patterns, and key surfaces. These skills are particularly important for core-based reservoir studies and the construction of 3D geological models.
- Concepts of dolomitization with a focus on hydrothermal dolomitization.

Description

Participants are exposed to a wide range of Devonian carbonate facies and facies associations that span the spectrum of peritidal through to fore-reef and off-reef depositional environments by visiting a number of specific localities over three days in the field. The course utilizes a step-wise approach to teaching key skills and concepts, moving the participants from facies recognition to applying concepts of carbonate sequence stratigraphy as they reconstruct the evolution of the Alexandra Reef System (mid-Frasnian, Grosmont and Leduc time-equivalent) in a sequence stratigraphic framework. Three localities offer the opportunity to view reef-to-platform and platform tight-carbonate analogues for Slave Point and Swan Hills tight-carbonate light oil plays, which have emerged over the last decade. On the third day, upper Frasnian ramp and reefal strata of the Kakisa Formation (Nisku equivalent) are visited to broaden the scope of depositional facies and stratigraphic geometries that may be encountered in exploration and development situations.

The fourth day of the trip is spent visiting the abandoned Pine Point mine site, which was a world-class carbonate-hosted lead and zinc deposit. The ore was hosted in the middle Devonian Presqu'ile Dolomite, which overprinted parts of the Elk Point Barrier that restricted circulation into the Elk Point Basin, and was overlain by Slave Point carbonates. Fabrics of zebra dolomite, hydrothermal dolomite breccias, dolomite-ore mineralization, and transitions from porous hydrothermal dolomite to tight matrix dolomite or limestone are examined in pits that are easily accessible. The mine site is an excellent location for testing and debating various concepts of dolomitization, brecciation, and porosity development, while examining reservoir scale dolomite bodies.

Logistics and Itinerary

The course consists of an introductory classroom lecture followed by four days in the field. The course does not involve any serious hikes or elevation changes – it is suitable for all levels of hiking. The itinerary consists of:

- Monday August 31st – participants are responsible for their own travel into Hay River. They should plan to arrive in time for an evening lecture at the hotel.
- Tuesday September 1st – travel by SUV's to localities along Hay River and the Alexandra Reef System. An overview of the basin filling succession from shales of the Fort Simpson Formation to mixed siliciclastic and carbonate deposits of the Escarpment Formation and the basal Alexandra Formation is provided. Remainder of day is focussed on the Alexandra Reef System. Eleven field localities.
- Wednesday September 2nd – travel by SUV's to continue examination of the Alexandra Reef System. Nine field localities.
- Thursday September 3rd – travel by charter bus to Sambaa Deh Falls Territorial Park where the Trout River cuts down through the Trout River Formation (Famennian) and Kakisa Formation (uppermost Frasnian), exposing a stratigraphic succession from outer ramp through fore-reef and reef front debris aprons to stromatoporoid-dominated biostromes and shallow marine carbonates. This locality is one of the few places in western North America where the Frasnian-Famennian boundary is exposed.
- Friday September 4th – travel by SUV to Pine Point mine site. The day is spent examining selected pits from the abandoned mine that demonstrate a range of hydrothermal dolomite features. Return to Hay River mid-afternoon. Course ends in time to catch late afternoon flight out of Hay River.

INTERPRETATION OF THRUST BELTS AND FORELAND BASINS: MODELS FROM THE SPANISH PYRENEES

Leaders: *Antonio Teixell, Universitat Autònoma de Barcelona, Spain, and Antonio Barnolas, Instituto Geológico y Minero de España, Madrid, Spain*
Date: *September 14-18, 2015*
Location: *Begins and ends in Barcelona, Spain*
Tuition: *$2,600 USD (increases to $2,800 on 8/03/2015); includes guidebook and course materials, internal and roundtrip transportation from Barcelona, lodging, and all meals. No refunds for cancellations after 8/03/2015.*
Limit: *22*
Content: *3.5 CEU*

Who Should Attend

Exploration and development geologists and geophysicists interested in fold and thrust structures and tectonics-sedimentation interactions in compressional belts and foreland basins.

Objectives

As a result of taking this field seminar, participants should be able to:

- Interpret complex thrust structures and fault-related folds formed in diverse habitats, from deep basinal settings to the earth's surface.
- Identify and understand strain and fracture systems in fold-thrust belts
- Analyze patterns of growth strata in areas with synsedimentary folding
- Apply the basic principles of the architecture and kinematics of foreland basins
- Discuss and predict the basin-scale geometry and evolution of deep-water turbidite systems and proximal alluvial fans in relation with the active tectonic development

Content

The Spanish Pyrenees provide world-class models for thrust tectonics and synorogenic sedimentation. During the field seminar we will examine illustrative outcrops of thrusts, fault-related folds, stratal architectures and facies of depositional systems affected by growing structures, which

are good analogues for hydrocarbon reservoirs. The seminar will cover a transect of the southern Pyrenees, a Cenozoic belt where thrust-fold geometries are well exposed and suitable for conceptual discussion. Synorogenic sediments range from deep-water turbidites to shallow marine and terrestrial molasse. Turbidites include debris sheets ("megaturbidites") that have produced gas. Molasse sediments are perturbed by growth anticlines and exhibit intraformational unconformities related to observable thrust faults.

The field trip takes place in beautiful mountain scenery, which is a plus to the geology. During the days of the trip, lodging will be in a comfortable hotel in the touristic/historic town of Jaca, a famous center for winter and summer leisure activities. Accompanying guests may enjoy visits to the XI century Romanesque cathedral and the XVI century fortress.

The first day comprises the travel from Barcelona to Jaca and a general presentation to the seminar after the arrival, including the geology of the Pyrenees and an introduction to the concepts to be studied. In the next day, the field work is initiated in the Roncal valley, where we will study the internal thrust sheets of the Pyrenees that illustrate the process of inversion of the pre-orogenic extensional margin of the Iberian plate. Patterns of fractures and other minor structures related to thrusting will be discussed. The third day is centered on an itinerary on the scenic Aragüés valley, studying in detail thrust-fold geometries and examining deformed synorogenic turbidites. The fourth day is devoted to the classic turbidite and breccia deposits of the Hecho group in the Jaca basin, and to the analysis of growth strata and related unconformities at the internationally known example of the Pico del Aguila anticline. The last day involves a reconnaissance of the south Pyrenean mountain front at Riglos (Gallego gorge), analyzing interactions between growing thrust structures and proximal alluvial fan conglomerates, and concludes with the return to Barcelona in the evening.

The field work involves some walking in mountain terrain, always along safe and well-marked trails. On the third day we walk up a difference in elevation of 450 m. Good exposures of thrust faults and folds make the hike worth! The trail is well marked, and return to a hut or to the vans is always accessible. We recommend hiking boots, sun protection cream, and a hat.

LACUSTRINE BASIN EXPLORATION

Leaders: *Alan Carroll, University of Wisconsin, Madison, WI; Meredith Rhodes Carson, Geofuels LLC, Madison, WI*
Dates: *September 20-27, 2015*
Location: *Begins and ends in Salt Lake City, Utah*
Tuition: *$3,400 (increases to $3,600 on 8/21/2015); includes transportation, course materials, and lunches. Lodging NOT included in tuition. No refunds for cancellations after 8/21/2015.*
Limit: *20*
Content: *3.6 CEU*

Who Should Attend

Geologists, geophysicists, reservoir engineers, managers and anyone working with lacustrine petroleum source rocks, oil shale, lacustrine or fluvial reservoirs, and non-marine basin stratigraphy.

Objectives

Lake basins contain some of the most prolific hydrocarbon resources in the world, including super-giant fields in the South Atlantic, Caspian Sea, and in China and SE Asia. Even larger resources are associated with oil shale deposits in the western U.S. Despite their growing importance, the petroleum geology of lake basins has received far less attention than marine basins. This course therefore aims at developing an understanding of the unique aspects of lacustrine source rocks, reservoirs, and basin evolution that will aid future

exploration and development efforts. We will do so using the world-famous record of Quaternary Lake Bonneville to gain insight on controls on lacustrine deposition, and the similarly famous Eocene Green River Formation to examine the preserved deposits of a well-exposed ancient lake basin.

Specific topics to be emphasized in this field seminar include:

- Genetic controls on lake basin evolution
- Recognition of the three principal lacustrine facies associations, based on surface, subsurface, or geochemical data.
- Source rock characteristics associated with the three facies associations
- Carbonate reservoir characteristics in lacustrine basins
- Clastic reservoir (fluvial and deltaic) characteristics in lacustrine basins.
- Lacustrine stratal geometries and distribution patterns of source rock and reservoir facies.

Content

This 6-day Lacustrine Basin Exploration field seminar has been developed on a number of classic field localities in Utah and Wyoming. Localities outside of Salt Lake City, UT will be used to illustrate key geomorphic and stratigraphic features of pluvial lake Bonneville (Gilbert deltas and other shoreline features) and modern Great Salt Lake (playa-lake environments). These "actualistic" observations will help provide context for understanding the deposits of Eocene Lake Gosiute in Wyoming, where recent radioisotopic work has established a chronostratigraphic framework of unprecedented resolution. There we will focus on basin margin to basin center transects of the Bridger and Washakie basins, based on excellent exposures of fine-grained lacustrine carbonate mudstone facies and alluvial to deltaic sandstone facies. Participants will build two basin-scale cross sections of Lake Gosiute strata by recording their own guided outcrop observations on the chronostratigraphic framework provided.

At the outcrop scale, we will examine the heterogeneous reservoir architecture of alluvial, deltaic, and lake-marginal carbonate deposits associated with overfilled, balanced-fill, and underfilled lacustrine basins. These deposits range in style from classic Gilbert deltas to more "dryland" fluvial facies that are dominated by upper flow regime deposition, to mounded carbonate strata. Laterally equivalent mudstone facies are similarly heterogeneous, ranging from laminated oil shale with abundant fish fossils to pedogenically modified playa facies associated with nonmarine evaporites. Distinctive biological marker compounds (biomarkers) are associated with each of these facies, and can be used to help determine paleoenvironmental setting.

In addition to field studies, several classroom lectures will be used to illustrate the main course concepts and to provide geologic background information on the field areas. Because fine-grained rocks can appear rather different in core than in outcrop, we will also conduct a half-day core workshop based on representative examples of the major facies associations. We will spend some time developing criteria for subsurface recognition using wire-line logs, seismic, and organic geochemistry.

SEDIMENTOLOGY AND SEQUENCE STRATIGRAPHIC RESPONSE OF PARALIC DEPOSITS TO CHANGES IN ACCOMMODATION: PREDICTING RESERVOIR ARCHITECTURE, BOOK CLIFFS, UTAH

Leaders: *Keith W. Shanley, Consultant, Denver, CO; J. Michael Boyles, Shell Global Solutions, Houston, Texas*
Date: *September 23-30, 2015*
Location: *Begins and ends in Grand Junction, Colorado*
Tuition: *$2,900 (increases to $3,100 on 8/26/2015); includes ground transportation, lunches, and guidebook. No refunds for cancellations after 8/26/2015.*
Limit: *20*
Content: *5.6 CEU*

Who Should Attend

Geologists, geophysicists and reservoir engineers working marginal marine reservoir systems in exploration and production settings. Lectures cover all the concepts necessary for non-geologists to benefit greatly from the course. Geologists often wish that their reservoir engineer had also attended.

Objectives

Upon completion of this workshop, participants will:

- Be able to understand detailed facies analysis within fluvial, estuarine, shoreface, and shallow marine deposits.
- Be able to use parasequence stacking patterns to predict reservoir sand body occurrences.

- Be exposed to a consistent subsurface methodology to recognize sequence boundary unconformities, marine flooding surfaces, parasequence stacking patterns, and reservoir distribution within a sequence stratigraphic framework, resulting in a more robust subsurface stratigraphy.
- Be familiar with sequence stratigraphic concepts and be able to apply those concepts to their exploration and production assignments.

Content

World class exposures of Upper Cretaceous strata in the Book Cliffs of east-central Utah provide outcrops that demonstrate the 3D reservoir architecture of marginal marine strata. These strata were deposited by a variety of depositional settings ranging from fluvial to incised valley to shoreface and deltaic. For those more comfortable with systems tracts, we observe features common to highstand shorelines and contemporaneous alluvial deposits, late highstand and lowstand shorelines, and incised valleys. We illustrate through the use of spectacular outcrops, subsurface datasets, and stratigraphic modeling how these systems tracts and key surfaces (flooding surfaces and sequence boundaries) may be recognized. The outcrops have almost complete exposure of over 500 m of strata in both depositional strike and dip sections that extend for over 200 km. Well logs and cores from the nearby oil and gas wells provide the opportunity to learn how to recognize outcrop relationships in more traditional subsurface datasets. This field seminar demonstrates how well log and core data can be used to predict reservoir geometries at both the exploration and production scales.

During the seminar, a practical approach of using sequence stratigraphic concepts is developed through the use of lectures, computer modeling, outcrop exposures and is reinforced through subsurface exercises. Field observations and data sets drawn from a variety of subsurface examples are used to develop understanding of vertical facies relationships that can be used to predict subsurface reservoir architecture in a variety of basin settings. At the end of the course, participants will have an understanding of deltaic and fluvial facies and the nature of larger scale stratigraphic variations within these deposits. Participants will be able to use these facies relationships to understand stratal stacking patterns that can be used to estimate lateral extent of reservoir facies. Participants will learn a process of how to use subsurface data to gain an understanding of depositional systems and key sequence stratigraphic surfaces to assist in either exploration or production.

The field trip begins by looking at the sedimentological and stratigraphic aspects of the Panther Tongue and lower Blackhawk Formation exposures in the vicinity of Price, Utah. In this relatively high-accommodation setting, sequence boundary unconformities are not developed and marginal marine facies tracts are more fully preserved. The high-accommodation stratigraphy in the vicinity of Price is contrasted with observations from the stratigraphically younger Desert Member of the Blackhawk Formation and the Castlegate Sandstone in the vicinity of Green River, Utah. In these deposits, subsidence rates are diminished relative to those found near Price; resulting in progradation during relative sea level fall which generated well developed sequence boundary unconformities. The stratal architecture of these deposits is dramatically different from the architecture associated with the more high-accommodation deposits near Price, Utah.

COMPLEX CARBONATE RESERVOIRS: SEDIMENTATION AND TECTONIC PROCESSES. THE IMPACT OF FACIES AND FRACTURES ON RESERVOIR PERFORMANCE

Leaders: *Raffaele Di Cuia, G.E. Plan Consulting, Ferrara, Italy; Davide Casabianca, Marathon Oil International, Aberdeen, UK*
Date: *September 26-October 2, 2015 (begins the early afternoon of Sept. 26 and finishes the late afternoon of October 2.)*
Location: *Begins in Naples and ends at Rome International Airport (Italy)*
Tuition: *$3,200 (increases to $3,400 on 8/14/2015); includes guidebooks, transportation expenses during the field seminar, all meals during the course. Does not include lodging. No refunds for cancellations after 8/14/2015.*
Limit: *15*
Content: *4.2 CEU*

Who Should Attend

Petroleum geologists, reservoir engineers and geophysicists working for the exploration, appraisal and development of carbonate reservoirs. Ideally the components of a subsurface team would greatly benefit from participating together.

Objectives

The field seminar aims to demonstrate how to adequately describe facies distribution and faults and fractures

characteristics, within the relevant depositional and tectonic context. Outcrop data gathering will help participants to focus on the important aspects to consider when characterizing and modelling carbonate reservoirs. Uncertainty will be a central theme and scenario modelling will be advocated as a way of managing it.

By using the outcrops of the Apulian Carbonate Platform, data from equivalent reservoirs in the subsurface of southern Italy, and from carbonate reservoirs elsewhere, participants in this field seminar will be able to:

- Observe the structural organisation of the Southern Apennines geological units and infer the evolution of the thrust belt;
- Recognise facies types in the Apulian Rudist Carbonate platform and in the deeper water deposits resedimented into the adjacent basin areas;
- Understand the 3D organisation of sedimentary bodies from regional to reservoir scale;
- Understand the hierarchy, distribution and organisation of the fault and fracture networks and their consistency with the tectonic evolution of the region;
- Verify the relationships between sedimentary facies and fracture distribution ;
- Identify the main diagenetic processes that affected the platform and understand their impact on reservoir quality;
- Identify, describe and distribute reservoir porosity and permeability ensuing from sedimentary, diagenetic and tectonic processes;
- Understand the relationships between outcrop evidence (facies and structural analysis) and subsurface datasets (seismic, core, open hole logs, image logs, production logs and well tests) and discuss how to integrate both for reservoir description;
- Learn and compare methods for the description of reservoir uncertainty and understand the value of additional data acquisition for reducing these uncertainties in order to inform reservoir development and management decisions.

Content

This seminar will be like following the trajectory of a well drilled through the thrust belt to target a fractured carbonate reservoir. At the beginning, we will focus on the Allochthonous thrust sheets of the fold and thrust belt, in order to understand the regional geological and structural framework. We will then reach and observe the reservoir represented by the Cretaceous Apulian Platform Carbonates, which are currently being produced in the sub-surface of Southern Italy. The main part of the field seminar will focus on the description of the fractured carbonates and the extrapolation from the outcrop observations to the subsurface for building geologically plausible reservoir models.

The main advantage of using the example of the Southern Apennines is that we can run through the drilling trajectory of the hypothetical well, not o nly vertically (using subsurface data) but also horizontally by moving from west coast outcrops (Naples area) to the east coast outcrops (Apulia area). The final part of the field seminar, will be spent studying an exhumed anticline (in the Abruzzi region) where there are extensive outcrops of Apulian Carbonates equivalent to some of the major oil reservoirs exploited in Italy.

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Mail completed form with full tuition, or $50 deposit to cover processing fee, to the AAPG Education Department. Full tuition is due 4 weeks prior to commencement of course. Full tuition is due 6 weeks prior to all international courses.

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AAPG will refund the tuition, less the processing fee of $50, if request is received no later than 4 weeks prior to the course. Cancellations for international courses must be received no later than 6 weeks prior to the course. Cancellation must be made in writing; the registrar will accept cancellation notices by telephone, telex or fax, but all such notices must be followed up by mail. No refund will be made for cancellations received less than 4 weeks (6 weeks on international courses) prior to a course being given. Nonpayment of tuition does not constitute automatic cancellation. If no cancellation notice is received by 4 weeks prior (6 weeks on international courses) to course, participant is liable for full tuition. AAPG reserves the right to cancel a course if enrollment is insufficient to ensure proper effectiveness; in such cases, full refunds will be given. Substitutions for individuals can be made at any time. A paid enrollment may be transferred one time to a future course if the request is received prior to the 4 or 6 week cut-off period.

Complete and return the form with tuition to:
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Tulsa, Oklahoma 74101-0979 | Phone 918-560-2650
Fax 918-560-2678 | Email: educate@aapg.org

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I, _____, in consideration of the receipt by me of permission from the American Association of Petroleum Geologists ("AAPG") to participate in a Field Seminar entitled _____to be conducted on _____, 2015, and sponsored by AAPG, the receipt of such permission being hereby acknowledged, and being fully aware that the Field Seminar may involve hazardous and/or dangerous activities, and/or being in and/or around other hazardous and dangerous conditions, and recognizing and accepting the risks, known and unknown, involved in a Field Seminar, hereby release and will indemnify, defend and hold harmless AAPG, the agents, officers, servants, and employees of AAPG, and the leader or leaders of the Field Seminar (collectively "indemnitees") of and from any and all liabilities, claims, demands, actions, and causes of action whatsoever arising out of or relating to any loss, damage, or injury, including death, as may be sustained by me, and to any loss, damage, or injury to any property of mine, while involved in any way with the Field Seminar, including without limitation traveling to and from the site or sites of the Field Seminar (whether by air, water, or land transportation) and at and during all stops and layovers during the Field Seminar. This release and indemnity includes without limitation liabilities, claims, demands, actions, and causes of action to or by third parties as well as to or by me. This release and indemnity includes without limitation liabilities, claims, demand, actions, and causes of action arising out of or relating to any loss, damage, or injury caused in any way by the concurrent or contributory negligence of any indemnitee.

This release and indemnity includes without limitation liabilities, claims, demands, actions, and causes of action arising out of or relating to any loss, damage, or injury caused in any way by the sole negligence of any indemnitee. Having made all inquiries deemed by me to be appropriate, I hereby voluntarily assume all risks of loss, damage, or injury, including death, as may be sustained by me or any property of mine while involved in any way the Field Seminar.

In the event the release by me of any indemnitee of any liability, claim, demand, action, or cause of action described herein is determined to be invalid or unenforceable, I agree that my total recovery of damages from the indemnitees, or any of them, both actual and punitive, shall be limited to $100.00 or the cost of admission to the Field Seminar, whichever is less.

In the event any provision of this Release and Indemnity Agreement is determined to be invalid or unenforceable, all other provision hereof shall continue to be enforceable and shall be interpreted as though said invalid provision had never been contained herein.

This release shall be binding upon my distributes, heirs, next of kin, executors, administrators, and personal representatives.

IN SIGNING THIS RELEASE AND INDEMNITY AGREEMENT, I HEREBY ACKNOWLEDGE AND REPRESENT THAT I HAVE READ THE FOREGOING RELEASE AND INDEMNITY AGREEMENT, UNDERSTAND IT, AND I HAVE SIGNED IT VOLUNTARILY. I UNDERSTAND AND AGREE THAT I WOULD NOT BE ALLOWED TO PARTICIPATE IN THE FIELD SEMINAR IF THIS RELEASE AND INDEMNITY AGREEMENT WERE NOT SIGNED AND AGREED TO BY ME, AND THAT THE AGREEMENT BY ME TO THE TERMS AND CONDITIONS OF THIS RELEASE AND INDEMNITY AGREEMENT IS AN ESSENTIAL PART OF THE CONSIDERATION FROM ME FOR ME TO BE ALLOWED TO PARTICIPATE IN THE FIELD SEMINAR.

_____
Signature Date

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Canadian Government regulations require that participants who attend AAPG courses in Canada pay 7% Goods and Service Tax (GST). This has been included in the tuitions.

Cancellation Policy

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The general rule is that a taxpayer can deduct, as ordinary and necessary business expenses, expenses of education undertaken for the purpose of:

1. Maintaining or improving skills required in his employment or other trade or business,

or

2. Meeting the express requirements of his employer, or the requirement of applicable law or regulations imposed as a condition to the retention

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Check with your tax advisor for further information.

Please register early, as some classes fill up quickly. Please check with the AAPG Education Department for availability of openings if less than 30 days prior to the start of the course in which you're interested. Positions in the course cannot be guaranteed until the $50 deposit has been received.

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