The Swiss Association of Petroleum Geologists and Engineers (VSP/ASP)
presents, as part of the AAPG Distinguished Lecture Programme 2009,

Prof. Kenneth E. Peters
Schlumberger and Stanford University California

Exploration Paradigm Shift: The Dynamic Petroleum System Concept

Tuesday, 7 April 2009, 18h00
University of Geneva, Department of Geology, Auditorium 1
13, Rue des Maraichers
1205 Genève

This should be a very informative lecture not only for those working on basin- and prospect evaluation in the oil and gas industry, but also for all academics interested in the geochemical evolution of the earth.

You are cordially invited to attend (non-VSP/ASP guests most welcome)

Peter Burri
President VSP/ASP

Schweiz. Vereinigung von Petroleum-Geologen und –Ingenieuren

Association Suisse des Géologues et Ingénieurs du Pétrole

Associazione Svizzera dei Geologi e Ingegneri del Petrolio

Swiss Association of Petroleum Geologists and Engineers

2008-09 AAPG Distinguished Lecture

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The traditional approach to exploration and production is based on finding and exploiting subsurface traps for petroleum. This static view ignores the fact that petroleum systems consist of complex elements and dynamic processes that control whether present-day traps are barren or filled with oil and gas. This presentation describes recent advances in geochemistry and a paradigm shift from static to dynamic understanding of petroleum systems, which we call the 'Dynamic Petroleum System Concept'.

Basin and petroleum system modeling (BPSM) recreates basin history, but the primary goal is to quantify petroleum systems, including the extent of petroleum generation, migration, and accumulation. BPSM began with geochemical research in the 1970s and 1980s, which showed that petroleum accumulations result from the dynamic interplay of multiple elements and processes, as defined by the petroleum system concept. One of the first breakthroughs in quantifying petroleum systems was the finding that petroleum-generating reactions in source rock are irreversible and obey rate laws that can be quantified for both laboratory experiments and natural burial maturation. Recognition of this fundamental relationship paved the way for the development of the thermal algorithms used in numerical BPSM models.

In order to use this fundamental finding as a predictive tool to quantify petroleum systems, subsurface temperatures had to be reconstructed through space and time. Many of the concepts and data necessary to achieve this objective were already available in the 1970s. For example, knowledge of basin evolution and tectonics, crustal heat flow, heat transfer and porosity/permeability properties of sedimentary rocks, and geochemical calibration tools (e.g., vitrinite reflectance and corrected bottomhole temperatures) can be used to verify postulated thermal effects and fluid flow through rocks. However, all of this information was widely disseminated throughout the geosciences and had not yet been linked or organized into a coherent exploration tool.

Since the late 1980s, steady progress was made toward development of quantitative BPSM software. Current BPSM software attempts to systematically account for all petroleum system elements and processes ranging from generation-migration from the source rock to accumulation-preservation in the trap. These software packages use stratigraphy, subsurface maps, and basic well log, lithologic, paleontologic, and geochemical data to construct 1D, 2D, and 3D (one-, two-, and three-dimensional) models of petroleum systems through time that predict the extent of source-rock thermal maturity, petroleum migration paths, and the volumes and compositions of accumulations. The models are dynamic rather than static and they account for changes in trap configuration, seal capacity, and other factors during the thermal evolution of the petroleum.

Biography

Education:

1978 Ph.D. Geochemistry, University of California at Los Angeles, USA
1975 M.S. Geology, University of California at Santa Barbara, USA
1972 B.A. Geology, University of California at Santa Barbara, USA

Industry Experience:

2008-present: Business Development Manager, Integrated Services for Exploration, Schlumberger, Mill Valley, California.
2002-08: Senior Research Geologist, U.S. Geological Survey, Menlo Park, California.
2000-02: Senior Research Associate, Hydrocarbon Systems Analysis Division, ExxonMobil Upstream Research Company, Houston, Texas.
1993-2000: Senior Geochemical Research Advisor, Basin Analysis Group, Mobil Technology Company, Dallas, Texas.
1990-93: Biomarker Coordinator, Chevron Overseas Petroleum Inc., San Ramon, California.
1989-90: Geochemical Coordinator, Chevron U.S.A., San Ramon, California.
1978-89 Senior Research Geochemist, Chevron Oil Field Research Company, La Habra and Richmond, California.

Teaching Experience:

2007-present: Consulting Professor, Stanford University, Department of Geology & Environmental Science (Graduate Course GES 255, Basin and Petroleum System Modeling)
2005-06: Consulting Professor, Stanford University, Department of Earth & Environmental Science, (Graduate Course GES 249, Petroleum Geochemistry in Environmental and Earth Science).
2001-02: Chief Instructor, ExxonMobil Upstream Research Company (1D Thermal Modeling School)
2001-02: Chief Instructor, ExxonMobil Upstream Research Company (Petroleum Geochemistry School)
1996-2000: Instructor, Oil and Gas Consultants International (OGCI; Modern Geochemical Tools).
1992-93: Consulting Professor, Stanford University, Department of Applied Earth Science (Graduate Course GES 278, Petroleum Geochemistry)
1986-88: Visiting Assistant Professor, Department of Geology and Geophysics, U.C. Berkeley (Graduate Course 290, Organic Geochemistry and the Formation of Petroleum)
1983-85: Adjunct Professor, Department of Geology and Geophysics, Cal State University, Long Beach (Graduate Course 570, Organic Geochemistry).

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