

# PETROLEUM GEOLOGISCHE KRING

KONINKLIJK NEDERLANDS GEOLOGISCH EN MIJNBOUWKUNDIG GENOOTSCHAP



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## SEPTEMBER 1997 NEWSLETTER

### FORTHCOMING PGK EVENTS

Sept. 17	Janos Urai University of Aachen	The Sealing Capacity of Mudstones
Sept. 27 - 28	Leo Alblas PGK	Annual Field Seminar, The Geology of the Main Buntsandstein of the Eiffel Region: Outcrop Analogues for the Southern North Sea
Oct. 15	Hans Dronkert	The Petroleum Potential of Tajikistan
Nov. 19	Cees van Oosterom CONOCO	End of Harvest Mode

### PGK SEPTEMBER MEETING

The PGK **September** meeting will be held on **WEDNESDAY, September 17**, at 17:45 pm and will be preceded by aperitifs from 17:00 pm onwards. The lecture will be held at the KIVI building, Prinsessegracht 23, The Hague.

Janos Urai of the University of Aachen will speak about:  
**"The Sealing Capacity of Mudstones"**

*Many effective top seals for hydrocarbon accumulations comprise mudrocks because these lithologies possess very low permeabilities, high capillary entry pressures and are laterally continuous. Pristine layers of mud can seal hydrocarbon columns many hundreds of meters in height. In order for leakage through the seal to take place, a different mechanism must provide enhanced permeability in shales. Tectonically-induced faulting and fracturing is a likely mechanism.*

*The effectiveness of mudrocks as seals may be compromised by a number of factors such as leaking across at reservoir juxtapositions, tensile fracturing under extreme fluid pressure conditions, the formation of through-going permeable fractures as a result of dilatant behaviour during deformation and leakage via a network of small juxtaposed thin leaky beds across sub-seismic faults. Even in cases where high integrity top seals exist, mistakes in the determination of the fundamental geometry of the trap, due to sub-optimal depth migration of seismic horizons or poor appraisal seals, can undermine the estimation of trapped hydrocarbon volumes. Top seals can only be reliably appraised when basic geometries are accurately determined.*

*Fluid pressure is a proven risk in many exploration provinces, in terms of shale top seal leakage via mode I fractures. This natural hydrofracturing can take place if hydrocarbon buoyancy pressures, combined with fluid overpressures, exceed the minimum in-situ horizontal stress plus the tensile strength of the seal, leading to mechanical failure of the seal rock.*

*The rheology of a seal is another important factor as it determines the failure mode, i.e. whether the rocks are ductile and remain sealing after deformation or whether they deform in a brittle manner, creating permeable leak paths. Brittle shale is anomalously strong compared to normally consolidated rocks at the same depth.*

Several techniques have been developed to predict rock rheology, relying on uplift, sonic velocity and clay content. Burial curves can be used to determine uplift and overconsolidation of mudrocks as a first level approach. At the next level of complexity, extrapolated sonic velocity data from nearby wells can be used to estimate unconfined compressive strength (UCS) in mudrocks. The most direct method utilises relationship between shale friction angle, swelling clay content and shale surface area, measured from core or cuttings samples, to determine shale ductility.

Sub-seismic faults have recently been recognised as a quantifiably leak risk, due to advances in structural geological technology, which permits predictions of the numbers of sub-seismic faults in a trap. This information, combined with detailed top seal stratigraphic data, provides the power to screen traps for the risk of top seal leakage via sub-seismic fault juxtapositions within the seal.

A simple strategy incorporating these factors and linking them to other structural stratigraphic information, can contribute to reducing uncertainty about top seal leakage due to tectonic deformation.

### **OTHER EVENTS OF INTEREST TO PGK MEMBERS**

- September 15** DPS/SPE Mini Symposium, 'Recent Advances in Wireline Testing', Fac. of Applied Earth Sciences, Mijnbouwstraat 120, Delft. Please contact Petra Torremans, 070-310 54 00, torremans@the-hague.geoquest.slb.com
- October 15-17** EAGE, 9th European Symposium on Improved Oil Recovery, Netherlands Congress Centre, The Hague. Contact: 030-6956997, EAGE@pobox.ruu.nl. Web site: <http://www.accu.nl.eage>
- October 26-29** PESGB/JAPEC/SPE/AAPG etc, 5th Conference & Exhibition on Petroleum Geology of NW Europe, Barbican Centre, London. Please contact: +0171-4990900
- November 4** International Symposium on the occasion of the 105th Anniversary of the Mijnbouwkundige Vereniging entitled "Long Term Management of the Earth's resources". Please contact: De Mijnbouwkundige Vereniging, 015-2786039, MV@mp.tudelft.nl

### **MEMBERS NEWS**

We have received an application for membership from **Mr Frank van den Belt**, **Mr. Serge van Gessel**, **Mrs Esther Veenendaal**, **Mr Stefano Pruno** and **Martin Tuin**, all employed with PanTerra Geoconsultants B.V., **Mr Chiel Stofferis**, employed with Amoco Netherlands B.V., **Mr J.C.P. Pipping**, employed with NAM Schoonebeek B.V., **Mr A. van der Poel**, employed with Elf Petroland B.V. and **Mr Robert-Jan den Tex**, student at the Faculty of Applied Geosciences, TU Delft.

If no objections are received by the end of the next meeting they will automatically be elected member of the society.

### **INCOMING ANNOUNCEMENT**

#### *International Symposium "Long-term management of the earth's resources"*

On the occasion of the 105th anniversary of the 'Mijnbouwkundige Vereniging', the student organisation of the Faculty of Applied Geosciences, an international symposium will be held on Tuesday november 4 1997 at the Aula/Congrescentrum of the TU Delft.

This one-day conference starts with 3 plenary lectures followed by 2 parallel sessions; one involving Oil & Gas and one involving Minerals & Metals.

The morning's sessions lectures are held by Dr. A.H. Lukman (Secretary General of the OPEC), Dr. C.E. Fay (Chairman Shell UK Ltd.) and Dr. H. Speelman (General Director of NITG-TNO).

Themes of afternoon sessions will be: "New global energy developments: reservoir management, optimal recovery technologies and environmental impact" (Oil & Gas) and "Strategies for the european minerals and metals industry" (Metals & Minerals).

Further information can be obtained at the Lustral Committee of the Mijnbouwkundige Vereniging, Mijnbouwstraat 120, 2628 RX, Delft, tel: 015-2783829, fax: 015-2784891, e-mail: [LustrumMV@mp.tudelft.nl](mailto:LustrumMV@mp.tudelft.nl)

### **PGK ON THE WEB**

Members with e-mail and **Eudora** (preferably running on a Macintosh) may also receive the newsletter digitally from the following address [montijn@nitg.tno.nl](mailto:montijn@nitg.tno.nl). EudoraLight can be obtained free from the following site: <http://lorien.qualcomm.com/quest/commercial.html>. The PGK has a new home page on the Web. The address for those interested is:

<http://www.wak.tn.tudelft.nl/~pgk/index.html>. Many thanks go to Frédéric Verhelst and Aart-Jan van Wijngaarden of the Centre for Technical Geoscience, LSA, Fac. of Applied Physics, Delft University of Technology.

### **TIES**

The traditional dark blue and new "Red Stripe" PGK tie will not only smarten you up but makes an excellent business gift for foreign clients and visitors. The ties cost f 25,- each and they can be obtained from the secretary. Both designs are available for sale at every meeting.

### **MAIL LABELS**

The memberships dues on the mail labels were last updated on August 29 1997.

### **SPONSORSHIP**

The PGK is very grateful to its sponsors who have been helping to finance the cost of renting the KIVI lecture room, tickets and accommodation for overseas lecturers, monthly drinks for members and contributing to the cost of the field seminars. The following companies are warmly thanked for contributing to our activities in 1997:

**AMOCO NETHERLANDS PETR. B.V., ARGO GEOLOGICAL CONSULTANTS,  
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**Printing costs of this newsletter are paid by Netherlands Institute of Applied  
Geosciences - TNO *National Geological Survey.***

**Distribution costs of this newsletter are paid by Hays Informatiebeheer B.V.  
(formerly trading as ROCKALL Netherlands BV).**

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