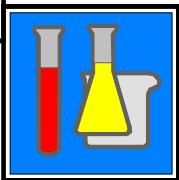




THE SOCIETY FOR ORGANIC PETROLOGY



# NEWSLETTER

Vol. 20, No. 4

December, 2003

ISSN 0743-3816



***Washington, D.C., Annual Meeting***



**TSOP**  
The Society for Organic Petrology



## TWENTY-FIRST ANNUAL MEETING

### *Organic Matter Down Under*

**Sydney, Australia**

**27 September – 1 October, 2004**

The 21st Annual Meeting of TSOP will be held at the Crowne Plaza Hotel, Coogee Beach, a beach-side conference venue conveniently located with respect to Sydney Airport, the city centre and the University of New South Wales.

#### **Some Conference Themes:**

- 7 Non-marine source rocks
- 7 New techniques in organic petrology and geochemistry
- 7 Coal in sustainable development

#### **Provisional Program:**

- 7 Monday, September 27 – Short course, registration, icebreaker reception
- 7 Tuesday, September 28 – Technical sessions, TSOP business lunch
- 7 Wednesday, September 29 – Technical sessions, conference dinner
- 7 Thursday, September 30 – Technical sessions, field trip departure
- 7 Friday, October 1 – Field trip: coal geology of the Hunter Valley

Additional details will be provided as the planning process develops. A formal call for papers will be made during 2003, covering the conference themes together with other advances in coal geology, organic petrology and geochemistry. Sydney, host to the 2000 Olympics, has many attractions for those who can stay a little longer, and a partners' program is being planned to complement the technical activities.

***Mark the dates on your calendar now!***

#### **Organising Committee:**

|               |               |              |
|---------------|---------------|--------------|
| Neil Sherwood | Colin Ward    | Lila Gurba   |
| Claus Diessel | Adrian Hutton | Joan Esterle |
| Herbert Volk  | Harold Read   | Tim Moore    |

#### **For more information contact:**

- 7 Neil Sherwood, CSIRO Petroleum: [Neil.Sherwood@csiro.au](mailto:Neil.Sherwood@csiro.au)
- 7 Colin Ward, University of New South Wales: [C.Ward@unsw.edu.au](mailto:C.Ward@unsw.edu.au)

***See the ENCLOSED COLOR BROCHURE and pages 8 - 9.***

## The Society for Organic Petrology Newsletter

ISSN 0743-3816

published quarterly

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Writers, Photographers and Associate Editors Needed!

The TSOP Newsletter welcomes contributions from members and non-members alike. Submission methods: Text is preferred in WordPerfect, MS Word, RTF or plain text format. Photos as slides or prints (will be returned after use) or as digital files (300 dpi preferred) without strong compression on CD-ROM or as e-mail attachments (if larger than 5 MB, please e-mail me first). Zip disks are discouraged.

Contact the Editor:

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### Address Changes

Please report any changes in address or contact information to:

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### Society Membership

The TSOP Newsletter (ISSN-0743-3816) is published quarterly by The Society for Organic Petrology and is distributed to all Society members as a benefit of membership. Membership in the Society is open to all individuals involved in the fields of organic petrology and organic geochemistry. For more information on membership and Society activities, please see:

<http://www.tsop.org>

For purposes of registration of the TSOP Newsletter, a permanent address is: The Society for Organic Petrology, c/o American Geological Institute, 4220 King St., Alexandria, VA 22302-1520 USA

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| Incoming President Bob Finkelman and Outgoing President Maria Mastalerz (C. Ward photo) |    |
| Newly inducted Honorary Member Alan Davis (D. Glick photo)                              |    |
| Health Effects of Coal course (R. Finkelman photo)                                      |    |
| Smithsonian paleontological collections field trip (C. Ward photo)                      |    |
| Meeting Chairman Peter Warwick (D. Glick photo)   |    |

## President's Column

Bob Finkelman

Before I talk about the future, I must acknowledge the exceptional efforts on behalf of TSOP by Maria Mastalerz, the outgoing Council members, and committee chairs and members. Our society is fortunate to have such dedicated and competent members who are willing to sacrifice time and effort on our behalf. We all owe them a deep debt of gratitude.

But saying thanks is not enough. The best way to show your appreciation is to step up and offer your assistance to TSOP to ensure that it remains a viable organization meeting the needs of its members and the broader organic petrology community. The pool of self-sacrificing members is small and growing smaller as retirements and personal and professional demands take their toll. I have asked many committee chairs to retain their positions during my tenure because of their invaluable experience. Nevertheless, I am dedicated to getting those of you on the sidelines more involved in TSOP. We need your help. You will be the future of this organization. Please contact me (rbf@usgs.gov) and I will help you get involved in one or more of our committees and activities. Elsewhere in this issue we have reproduced the contact information for the new TSOP Council as well as the Chairs of the various committees. Feel free to contact anyone on the list to volunteer your help.

And now to the future. Last year I initiated a new committee, the Committee to Advance TSOP and Coal Science. There were four principal, but not exclusive, objectives set out for the committee:

1. To develop a program to disseminate, *free of charge*, annual subscriptions to the International Journal of Coal Geology to TSOP members who cannot afford the regular subscription rate. (This opportunity is still open for applications)
2. To develop a mechanism for disseminating coal science and geoscience books and journals to universities in developing countries.
3. To help develop a series of short courses in coal science and organic petrography that could be offered in key locations in the U.S. and around the world. These short course offerings would not be in competition with existing university courses but would supplement and augment them. Ideally, the short courses would be developed in conjunction with an accredited university or universities and would convey continuing education credits.

4. To look for financial support to help students attend TSOP functions such as the Annual Meeting.

I hope to push hard on the activities of this committee throughout my tenure. We are also continuing the effort started by my predecessor to seek expanded funding from corporate sponsors. Additional resources will help us expand funding for our research subcommittees, offer additional student research grants, provide travel support for students and young professionals in developing countries, etc.

For the smooth operation of an organization of this size the President and the other council members have to deal with a myriad of details. The learning curve is steep and long. There are no term limits for the Newsletter Editor and the Secretary-Treasurer can serve from 3 to 6 years because they have complex jobs that are best discharged by an experienced incumbent. Why not the President's position as well? I have asked Maria Mastalerz to explore the feasibility of having the President serve a 2-year term. If we choose to go forward with this new structure, it would require a membership-wide vote to change our by-laws. If you have any thoughts on this issue, please send them to Maria (mmastale@indiana.edu).

Although our meetings are well organized with quality presentations and lively discussions, I am concerned about our ability to maintain annual meetings that will not be a drain on our financial resources. I have asked Peter Warwick (pwarwick@usgs.gov) to take a careful look at the attendance trends and costs of the past 10 annual meetings. With this information in hand, we will determine what the best course of action should be and pass our recommendations on to the membership and to the next Council. If you have any thoughts on this issue, please send them to Peter.

Finally, we are looking at ways to strengthen our relationships with the ICCP. We are exploring opportunities to co-sponsor conferences and to share information through our newsletter. We expect that closer cooperation between our organizations will benefit both organizations and our membership.

I hope that this will be an exciting and productive year and I look forward to working with all of you for the betterment of TSOP.

Y

## TSOP OFFICERS 2003-2004

|                      |                |
|----------------------|----------------|
| President:           | Bob Finkelman  |
| Vice-president:      | Leslie Ruppert |
| President-elect:     | Colin Ward     |
| Secretary-Treasurer: | Mike Avery     |
| Councilor:           | Bill Huggett   |
| Councilor:           | Zhongsheng Li  |
| Editor:              | David Glick    |

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## TSOP Graduate Student Research Grants

TSOP invites applications for one or two graduate student research grants of up to \$1000 each. The purpose of the grants is to foster research in organic petrology (which includes coal petrology, kerogen petrology organic geochemistry and related disciplines) by providing support to graduate students who demonstrate the utility and significance of organic petrology in solving the thesis problem.

The Grant Program supports qualified graduate students from around the world who are actively seeking advanced degrees. Preference is given to full-time students in master's (or equivalent) degree programs but applications are also encouraged from Ph.D. candidates and part-time graduate students. The grant is to be applied to expenses directly related to the student's thesis work such as summer fieldwork, laboratory expenses, etc.

Grant application deadline is **May 1, 2004**. The award will be made in September, 2004. Detailed information and an application form are available on the TSOP web site <http://www.tsop.org/grants.htm> or from

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Nigg  
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United Kingdom

fax +44 (0) 1224 88 3689  
e-mail: [suzanne.j.russell@shell.com](mailto:suzanne.j.russell@shell.com)

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## TSOP Dues Form Enclosed

For those who have not yet paid their membership dues for 2004, a personalized dues notice is enclosed with this issue. Please verify your contact information, enter the rate and years being paid (note that a discounted rate of US\$ 100 for 5 years is available) and return the payment to Mike Avery. 2004 publications will not be sent to those delinquent in dues payment.

Members may elect not to receive the printed copy of the Newsletter by marking the box on the dues form. Portable Document Format (PDF) file versions will be available for downloading on the TSOP web site <http://www.tsop.org/news1.htm> at the same time the printed issue is mailed. Each issue is available in two pdf formats, a smaller file suitable for screen viewing and a larger file including graphics at 300 dpi which will provide better appearance when printed.

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## GSA Coal Geology Division Awards

### Medlin Award in Coal Geology

For next year, a \$2000 scholarship and separate \$1500 Field Study Award provide financial support for full-time students involved in research in coal geology. See GSA Today, Dec. 2003, p. 29. Proposal and letter of recommendation must arrive no later than Feb. 15, 2004.

### Cady Award

Nominations for the Cady Award, for outstanding contributions in the field of coal geology, are due by February 28, 2004. See GSA Today, Jan. 2004, p. 24.

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## TSOP Publications Sale until March 10, 2004

In order to reduce our stock and distribute useful publications to organic petrologists, TSOP has a special one-month sale price of US\$ 2.00 each on several items. Publications discounted to \$2.00 are TSOP numbers 1, 2, 5, 6, 7, 9, 13, 14, 16, and 17, as listed on **the insert supplied with this issue**. Orders will be accepted until **March 10, 2004**. Y

## SEGH 2004

### Environmental Geochemistry and Health

Press Release

SEGH 2004, a European research conference on all aspects of Environmental Geochemistry and its impacts on health, will be hosted by the University of Sussex on April 5th-7th 2004. Oral and poster papers will be presented on all aspects of environmental geochemistry, and its impacts on health. Contributions on the characterisation and remediation of contaminated land, and on studies of organic contaminants in any setting, will be especially welcome. Papers are invited from students and post-doctoral fellows, as well as from established researchers. Prizes will be awarded to the best oral and poster presentations by postgraduate research students.

Activities include keynote speakers, field excursion to aquatic environments of the River Arun, welcome buffet, conference dinner on steam train on the picturesque Bluebell Railway.

Further details including registration form, and how to apply for limited number of student bursaries, can be obtained from our web site at

<http://www.sussex.ac.uk/conferences/segh/>

The deadline for abstract submission and cheap/early registration is **February 20th 2004**. Abstracts format should be downloaded from the web site, and abstracts submitted as e-mail attachments to [SEGH2004@sussex.ac.uk](mailto:SEGH2004@sussex.ac.uk)

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## World of Coal Ash 11-15 April 2005

from Jim Hower

The "World of Coal Ash" <<http://www.worldofcoalash.org/>> will be held in Lexington, KY, from 11-15 April 2005. The meeting combines the University of Kentucky CAER's International Ash Utilization Symposium and the American Coal Ash Association's biennial symposium, with contributions from other organizations. Further details will be posted as they become available.

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## Call for papers:

### 21st Annual International Pittsburgh Coal Conference

from Jim Hower

The 21st International Pittsburgh Coal Conference <http://www.engrng.pitt.edu/~pccwww/> will be held 13-17 September 2004 in Osaka, Japan. Abstracts for the meeting are now being solicited and are due **1 March 2004**. The complete call for papers can be found at the conference web site.

Several program topic areas may be of interest, in particular topic areas 12 (Coal Chemistry) and 13 (Coal Geosciences and Resources). Please check the web-based program for other topic areas. Potential topics for papers include:

#### 12. Coal Chemistry

- Coal structure
- Characterization of inorganics and ash
- C-H bond activation for producing hydrogen and aromatic chemicals

Session Co-organizers:

James Hower, 859-257-0261, [hower@caer.uky.edu](mailto:hower@caer.uky.edu)

Toshimasa Takanohashi, +81-298-61-8441, [toshi-takanohashi@aist.go.jp](mailto:toshi-takanohashi@aist.go.jp)

#### 13. Coal Geosciences and Resources

- Coal Resource evaluations
- Coal geology
- Coal bed methane
- Petrology and geochemistry of coal
- Geotechnical characterization of coal-bearing strata

Session Co-organizers:

James Hower, 859-257-0261, [hower@caer.uky.edu](mailto:hower@caer.uky.edu)

Hirofumi Furukawa, [furukawa@jcoal.or.jp](mailto:furukawa@jcoal.or.jp)

Y Y Y Y Y Y Y Y Y

## 32nd International Geological Congress August 20-28, 2004 Florence, Italy

General Symposium G-04.05 "ORGANIC GEO-CHEMISTRY" at IGC is being organized by Luiz Trindade (Petrobras) and Paul Farrimond (University of Newcastle). First and Second Circulars for the Congress are available at the 32nd IGC website at <http://www.32igc.org/home.htm>

Y

## NEWS FROM ELSEVIER

from Jim Hower,  
Editor-in-Chief  
International Journal of Coal Geology

### Color and Multimedia now possible in ScienceDirect

Elsevier and *International Journal of Coal Geology* have introduced some new options in their publications. First, color can now be used in the Internet (ScienceDirect) version of papers at no cost to the author. This means that a black & white version of a figure can be used in the printed text and a color version in the on-line paper. Printed color figures will still be charged at the rate of \$350 for the first page and \$175 for each additional page in a paper (the rates are always subject to change, these are the last numbers quoted).

Second, multimedia files can now be linked to the ScienceDirect version (see "artwork instructions," then "multimedia files" under <http://authors.elsevier.com/> for details concerning file types possible). This now means that such items as oversize charts and maps can be published. In addition, movies or other animations can be linked, opening up a wide range of possibilities.

### Call for Papers: Hazards in Coal Mining Volume

As we all know, coal mining has been and continues to be a dangerous occupation. In the US, federal and state authorities work with the philosophy that one death in a mine is too many. Of course, this goal has not been met in the US or elsewhere where mining of coal takes place.

With this in mind, I am calling for papers for a special issue of *International Journal of Coal Geology* dedicated to "**Geologic hazards in coal mining: Prediction and prevention.**" Many topics, such as, but not limited to roof, rib, and floor control; mine gases; and flooding from old mine works would easily fit in the scope of the call for papers.

Papers should be submitted by **31 May 2004** if at all possible. As always, please follow the guide for

authors at <http://authors.elsevier.com/GuideForAuthors.html?PubID=503337> in preparing a manuscript. Manuscripts should be submitted directly to me. If possible, please let me know if you are interested in contributing a paper so that I can make better plans for the volume.

Thank you,  
Jim

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**Editor-in-Chief,**  
**International Journal of Coal Geology**  
<http://www.elsevier.com/locate/issn/01665162>

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### Organic Matter Topics at Goldschmidt Geochemistry Conference

The Goldschmidt Geochemistry Conference, to be held 5 to 11 June, 2004, in Copenhagen, Denmark, will include sessions on Macromolecular Organic Matter-- Discerning Biological and Non-biological Origins, and Petroleum Geochemistry and Migration. Early registration closes April 2, 2004. Visit the website [www.goldschmidt2004.dk](http://www.goldschmidt2004.dk)

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### Organic matter interfaces and interactions

We invite you to attend the combined Australian Organic Geochemistry Conference (AOGC) and national conference for the International Humic Substances Society (IHSS) in 2004, which will be held at Leura in the Blue Mountains (1.5 hours drive inland from Sydney, New South Wales, Australia) over 4 days, 16-19 February (Monday to Thursday). <http://www.ahort.uq.edu.au/staff/kspark/aogc-ihss/>

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Next TSOP Meeting:

# Organic Matter Down Under

Sydney, Australia  
September 2004

from Colin Ward  
and the Organising Committee

The 21<sup>st</sup> Annual Meeting of TSOP will be held in Sydney, Australia from September 26 to October 1, 2004. This will be the first time that a TSOP annual meeting has been held outside North America, and provides an opportunity to demonstrate the international reach of the Society's activities.

A pre-meeting field trip to sample the Permian oil shale (torbanite) deposits at Joadja, in the southwestern Sydney Basin will be held on Sunday, September 26. As well as the geology of the area, this trip will allow participants to visit the historic village associated with mining and retorting of the oil shale, enjoy the beautiful scenery of the New South Wales Southern Highlands, and perhaps visit a nearby winery to finish off the day.

The meeting itself will be held at the Crowne Plaza Hotel, Coojee Beach. Directly opposite one of Sydney's famous beaches, this hotel has excellent accommodation and conference facilities, and is conveniently located with respect to both Sydney airport and the city centre. Under-cover car parking is also available for hotel guests and meeting participants.

Please also see the  
**color brochure**  
enclosed with this issue  
and the web site  
<http://www.tsop.org/mtgsyd.htm>

The meeting will start on Monday, September 27, with a short course on mineral matter in coal, to be held at the University of New South Wales, followed by an icebreaker reception at the Crowne Plaza. Mini-bus transport between the hotel and UNSW will be provided for short course participants. Technical sessions will be held at the Crowne Plaza over the next three days, along with the TSOP Business Lunch and the Conference Dinner. These will be followed by a field trip to examine the coal deposits of the Hunter Valley sequence, led by Claus Diessel, in a series of outstanding coastal exposures south of Newcastle.

A feature of the technical program will be a one-day symposium on *Coal in Sustainable Development*, covering aspects such as coal resources, characterisation, utilisation, environmental impact and CO<sub>2</sub> sequestration. This symposium and the meeting in general are co-sponsored by the Co-operative Research Centre for Coal in Sustainable Development, a joint venture between the Australian coal industry, CSIRO and a number of universities for advanced research on coal technology and its applications. Other themes to be featured in the program include non-marine source rocks, new technology for organic petrology (in collaboration with the ICCP), and methane in low and high rank coals.

The program is intended for people from a wide range of areas in organic petrology and organic geochemistry, including researchers and practitioners

in both the coal and petroleum industries as well as those with more academic interests in natural organic matter. Participation by students is especially encouraged.

Sydney was the host city for the 2000 Olympics and the 2003 Rugby World Cup, and has a number of attractions apart from the meeting to make the trip worthwhile. A special Partners' Program is being planned, with visits to the Opera House, the historic area known as The Rocks, Sydney Harbour and the world famous Sydney Zoo, to encourage spouses and family groups.



Outcrop of Great Northern seam, Catherine Hill Bay, on the Sydney Basin coal measures field trip.

Further information on the meeting is available from the TSOP web site. Abstracts of papers for presentation should be submitted to the Conference Secretariat by **April 30**, so start preparing papers and arranging funding make the trip. Subtitled *Organic Matter Down Under*, it should be a meeting not to miss.

Conference Secretariat:

Ms. Rhonda Norton  
Sydney TSOP Meeting 2004 Secretariat  
CRC for Coal in Sustainable Development  
PO Box 883  
Kenmore, Qld, 4069  
Australia

Fax: + 61 7 3871 4444  
E-mail: Rhonda.Norton@ccsd.biz



Some of the TSOP 2004 Organising Committee. From left: Neil Sherwood, Adrian Hutton, Colin Ward, Herbert Volk, Claus Diessel and Harold Read.

Y Y Y

## The Danish-Vietnamese Connection – Petroleum Geology in the East Vietnamese Sea

Henrik I. Petersen

Geological Survey of Denmark and Greenland (GEUS)  
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DK-1350 Copenhagen K, Denmark;  
email: hip@geus.dk

It is generally accepted that there is a direct relationship between energy consumption and economic growth, and for poor developing countries, such as Vietnam, shortage of energy is a serious obstacle for socio-economic development and poverty reduction. Approximately 20% of the annual state income in Vietnam is provided from the hydrocarbon sector, however, in the first nine months of 2002 Vietnam still had to import petroleum worth 1.8 billion US\$. Clearly, a stable and independent supply of energy resources and the revenue obtained from exploitation of oil and gas reserves is vital for improving the standard of living in Vietnam. Hydrocarbon exploitation and exploration, however, is an exercise demanding great skill. Since 1995 the Geological Survey of Denmark and Greenland (GEUS) has had collaboration with Vietnam Petroleum Institute (VPI), Hanoi, which is a subsidiary of the state-owned oil company PetroVietnam, and in 2001 the co-operation was broadened to include Hanoi University of Mining and Geology and Hanoi University of Science. By providing training, know-how transfer, and state-of-the-art analytical techniques, GEUS has helped to strengthen the research capacity of the Vietnamese partners during several research projects.

Palaeogene lacustrine shales and coals constitute together with Miocene coals good to excellent source rocks in Southeast Asia, and in fact the majority of the petroleum in the region is generated from lake-related facies (Todd et al., 1997). On a worldwide scale about 20% of the hydrocarbon production can be related to rocks associated with lakes (Bohacs et al., 2000). In Vietnam oil is primarily produced from fractured basement and sandstone reservoirs in the southern

offshore Nam Con Son and Cuu Long basins (Fig. 1), which have been explored since the 1980s. The principal source rocks of the former basin are paralic carbonaceous mudstones and coals, whereas Palaeogene lacustrine mudstones constitute the dominant source rocks of the latter basin. In the northern Song Hong Basin condensate and gas tests, and shows of early waxy oil, have typical coaly/type III kerogen geochemical signatures, but no commercial discoveries of oil have been encountered (Fig. 1). Onshore in the Hanoi Trough the geochemical composition of an oil show also indicates the presence of lacustrine source rocks (Nielsen et al., 1999; Petersen et al., accepted). A gas field is currently operated in the Hanoi Trough. The northeastern part of the Song Hong Basin has only been drilled by a few wells, and the Phu Khanh Basin offshore central remain unexplored (Fig. 1). The co-operation projects between GEUS and the Vietnamese partners have focused on these two largely unexplored basins.

Due to the scarce well data in the two basins, the evaluation and characterisation of source rocks in the buried Cenozoic syn-rift successions in the lake-rift grabens have relied on analogy studies (Petersen et al.,



Fig. 1. Vietnamese offshore basins and approximate position of localities discussed in the text.

2001; accepted). At Dong Ho, onshore the northeastern Song Hong Basin and on Bach Long Vi Island in the Gulf of Tonkin, Oligocene lacustrine mudstones and coals of the Dong Ho Formation outcrop. The coals are typical Tertiary humic coals with very high amounts of huminite, often exceeding 85 vol.%, and with HI values up to just above 300 mg HC/g TOC. Modelling shows that only the best quality coals may have reached the expulsion threshold in the rift-lake grabens of the northeastern Song Hong Basin (Petersen, 2002; Petersen et al., accepted). The lacustrine mudstones are highly enriched in fluorescing amorphous organic matter (AOM), *Botryococcus*-like alginite, and liptodetrinite (Fig. 2), and they possess a high oil generative potential with HI values of up to more than 700 mg HC/g TOC. The mudstones from Dong Ho contain generally >8 wt.% TOC, whereas the mudstones from Bach Long Vi Island contain from 1–3 wt.%. The Dong Ho locality, where the coals and lacustrine mudstones crop out on a river bed, has up to now been the only known outcrop of the Dong Ho Fm. Recently, however, new outcrops of the formation have been discovered and samples have been collected. These samples are under investigation at GEUS; preliminary organic geochemical and petrographic data support the lacustrine origin of the Dong Ho Fm. mudstones and confirm their highly oil-prone nature. The mudstones have been modelled to be mature in the deeper offshore grabens. The occurrence of such source rocks in the syn-rift successions is suggested by several seismic sections showing distinct, continuous high-amplitude reflectors, a seismic facies pattern often interpreted as lacustrine shale-prone units in the region. Recently an active lacustrine-coal sourced petroleum system in the

northeastern Song Hong Basin has been confirmed by the discovery of a principally lacustrine sourced oil, which very probably was mainly generated from a source rock similar to the mudstones outcropping at Dong Ho (Petersen et al., accepted).

No potential source rock analogues are exposed onshore the Phu Khanh Basin. However, GEUS initiated the drilling of a cored well (Enreca-1 well; Figs. 1, 3) through the entire Cenozoic rift-lake succession in the Song Ba Trough located onshore the central part of the Phu Khanh Basin (Fig. 4). The Enreca-1 well penetrated a thick fluvial-lake succession with coal seams and

reached granitic basement rocks at c. 485 m depth (Fig. 3). Highly oil-prone mudstone sections dominated by fluorescing AOM and *Botryococcus*-like alginite were recorded in the succession. The cored well has provided a unique opportunity to study the organic facies of different stages of rift-lake development, which may be useful in identifying rich source rock intervals in buried rift-lake successions. In addition, vitrinite

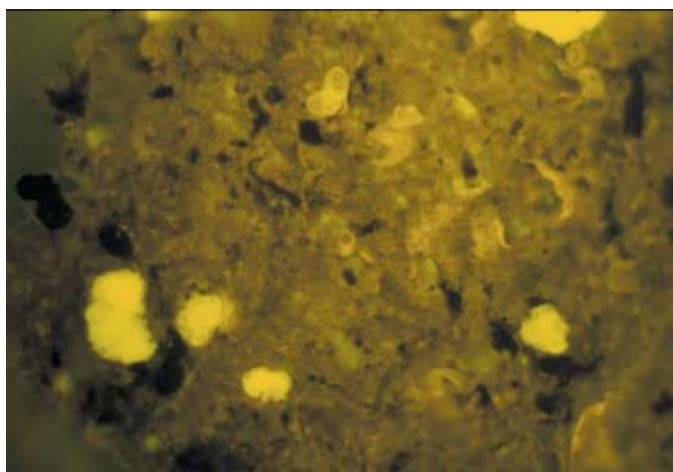


Fig. 2. Photomicrograph of an immature lacustrine mudstone with alginite (*Botryococcus*-like), amorphous organic matter, sporinite, and liptodetrinite. Reflected blue light, oil immersion.



Fig. 3. (A) The drilling rig of Enreca-1



Fig. 3. (B) boxes with cored rift-lake sediments.



Fig. 4. View over part of the quite narrow Song Ba Trough (Krung Pa Graben). The Cenozoic fluvial-lacustrine sediments and coals are today mainly covered by rice fields.

reflectance measurements have indicated a high geothermal palaeogradient, which may have implications for the prospectivity of the Phu Khanh Basin. In contrast to the absence of obvious onshore source rock analogues, seep oils occur at the Dam Thi Nai lagoon close to the city of Quy Nhon immediately onshore the Phu Khanh Basin (Fig. 1). On a fieldtrip, GEUS together with scientists from VPI, PetroVietnam, and the local geological survey in Nha Trang collected a number of seep oils from fractures in granite (Fig. 5), tar mats on the

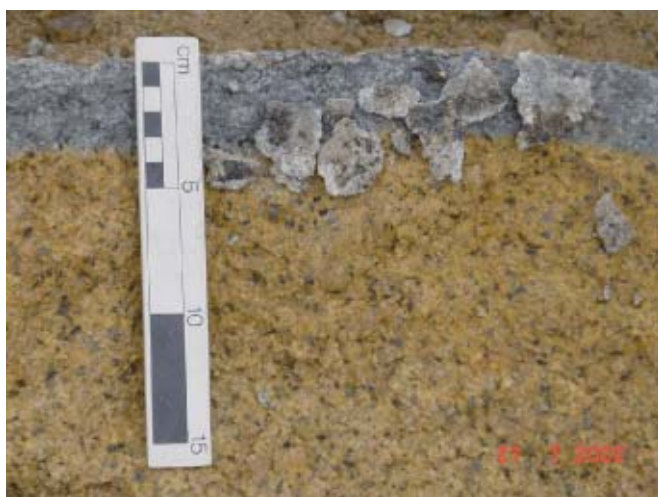


Fig. 5. Seep oil in weathered granite at Dam Thi Nai, central Vietnam.

beach, and oil-scented mud from shrimp farms located in the inner part of the lagoon (Fig. 6). A GC-MS-MS study of the oils points to (Bojesen-Koefoed et al., 2003): (i) seep oils in the granite fissures were sourced from a mixed Cenozoic carbonate/terrestrial source; (ii) oil extracted from shrimp farm muds is severely biodegraded, but similarity in the distribution of tricyclic triterpanes to that of the granite-oils suggests that these oils have a common source rock; (iii) the tar mat shows the presence of an oil with characteristics largely identical to lacustrine sourced oils from elsewhere in Vietnam. These data suggest the presence of at least two active petroleum systems in kitchens offshore in the Phu Khanh Basin. A seismic line perpendicular to the coast close to Dam Thi Nai actually suggest the presence of a deeply buried kitchen in a rift-graben and the existence of a possible migration path.

In addition to the drilling of the Enreca-1 well, field work was carried out on exposed Cenozoic strata along rivers in the Song Ba Trough (Fig. 7). The sediments consisted primarily of fluvial sandstones and lacustrine mudstones with scattered coal beds; these were sampled together with larger coal particles from sandstone layers for vitrinite reflectance measurements.

It is the hope that the research and capacity building collaboration between GEUS and the Vietnamese research institutes and universities helps to increase and disseminate the knowledge of the prospective northern Song Hong Basin and largely virgin Phu Khanh Basin, and eventually stimulate international exploration efforts and investment for the benefit of the Vietnamese society.

*Acknowledgements: The present "Enhanced Research Capacity (ENRECA)" project in Vietnam is sponsored by The Danish International Development Assistance (DANIDA).*

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Fig. 6. (A) View over the shrimp farm basins in the inner part of the Dam Thi Nai lagoon, Quy Nhon, central Vietnam.



Fig. 6. (B) Oil-scented mud is collected from inside of a shrimp basin.

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Fig. 7. Exposed fluvial sediments along Song Ca Lui (Ca Lui River), Song Ba Trough.

# TSOP Annual Meeting Report

## Washington, D.C.

### September 21 - 24, 2003

For its twentieth annual meeting, The Society for Organic Petrology returned to the Washington, D.C., area where its first annual meeting was held. The organizing committee was chaired by Peter Warwick (cover photo) and composed of U.S. Geological Survey personnel. They overcame the effects of a recent hurricane and additional storm, road flooding and electrical outages in the area to present a rewarding and enjoyable meeting. The conference hotel, the Hyatt Arlington on Wilson Boulevard, was not affected and the meeting went smoothly. Major financial support was provided by USGS and Penn State.

Activities began early on Sunday with concurrent workshop and short courses. At the USGS headquarters in Reston, a day-long workshop was held to examine core samples illustrating key attributes of Petroleum Source Rocks and Coal in the National Petroleum Reserve in Alaska (NPRA). At the Hyatt, a morning short course on Health Impacts of Coal: Should We Be Concerned? and an afternoon course on Modes of Occurrence of Trace Elements in Coal (cover photo) were presented.

A Sunday evening welcoming icebreaker party brought all participants together for conversation and good company. Music was provided by the string quartet of



Muki, Wally Dow, Brian Cardott, Marlys Dow enjoying the icebreaker session.  
*R. Finkelman photo*



James Madison High School Orchestra string quartet.  
*D. Glick photo*



Attendees at short course on Health Impacts of Coal.  
*photo courtesy R. Finkelman*



Binbin Wang from Beijing, China, and his host Curtis Palmer, of the USGS, attend the technical sessions.  
*P. Lyons photo*



AGI Executive Director Marcus Milling presents the keynote address on Monday. *D. Glick photo*

James Madison High School Orchestra, which is supported in part by a scholarship fund named in honor of the late Ron Stanton. Their participation, as well as the Monday symposium, honored Ron's leadership and scientific contributions in both TSOP and the meeting's host organization, the U.S. Geological Survey. The Outgoing Council meeting was held later in the evening (see p. 17).

Technical presentations began on Monday morning with a session entitled Petroleum Systems, Source Rocks, and Coalbed Gas. Luncheon was followed by the TSOP Business Meeting; President Maria Mastalerz welcomed the attendees to the annual meeting, and reports from several key officers and committees were presented. As vice-president and chair of the Honorary Membership Committee, Peter Warwick presented TSOP's Honorary Membership Award to Alan Davis (see citation and response on p. 18-19, and cover photo). Colin Ward reported on plans for the 2004 annual meeting in Sydney, Australia, and invited everyone to attend. Incoming President Bob Finkelman and newly elected officers President-elect Colin Ward, Vice-president Leslie Ruppert and Councilor Zhongsheng Li were introduced, and they officially took office as the business meeting closed.

The Ron Stanton Coal Characterization Session took place on Monday afternoon. Poster session presentations were also available for viewing in a nearby room, particularly during happy hour before dinner. Following the conference dinner, the keynote speech was given by Marcus E. Milling, Executive Director of the American Geological Institute. Incoming Council members held their meeting later in the evening (p. 17).

Tuesday morning's session addressed Energy and Government, and the afternoon general session concluded the technical presentations. Poster session viewing



Mike Avery presents the Secretary-Treasurer's report at the Business Meeting. *D. Glick photo*

continued, and the group photograph was taken. The photograph will be part of a CD-ROM of meeting abstracts and other materials to be distributed to all TSOP members early in 2004. Technical papers from the meeting are to be published in an issue of the *International Journal of Coal Geology*.

Two field trips were conducted on Wednesday. One group took the Metro subway system to the Smithsonian Natural History Museum in downtown Washington and were provided with a behind-the-scenes tour of paleontological collections (cover photo). The other group traveled to a series of stops to examine the



TSOP President Bob Finkelman and Farthest Traveled Award winner Guy Holdgate of Australia.

*D. Glick photo*



Jeff Quick, Alan Davis and Harold Gluskoter at the poster session. *C. Ward photo*

Geology and Energy Resources of the Triassic Basins of Northern Virginia (photos on back cover).

### Lisa Buckley Wins Student Paper Award

TSOP's Best Student Paper award for this annual meeting was presented to Lisa Buckley, who had completed her studies at the University of Newcastle upon Tyne. Her presentation, "Cretaceous Crud from Canada - Organic Facies Analysis of the Colorado Group, Western Canada Sedimentary Basin," which opened the Monday morning session, was co-authored with Dr. R.V. Tyson. H



TSOP President Bob Finkelman and Best Student Paper award winner Lisa Buckley. *D. Glick photo*

## Outgoing Council Meeting Items

ICCP and TSOP will continue to investigate avenues of cooperation. Each Society plans to provide one page of material to each issue of the other's Newsletter.

An effort is to be made to expand the list of contacts for possible corporate support.

Ray Pheifer reported on possibilities for a non-profit Foundation. Setting up such a foundation would require significant effort.

## Incoming Council Meeting Items

A service award will be investigated.

A publications sale will be held to reduce stock of some publications (see p. 5 and insert in this issue).

A revised edition of the CD-ROM Atlas of Coal Geology is being planned.

Plans for the dispersed organic matter atlas on CD-ROM were presented by Vern Stasiuk. Digital photomicrographs have been taken at Calgary.

H H H

## Daniel Ross wins Graduate Student Research Grant

By Suzanne J. Russell, TSOP Research Committee

Thirteen submissions were made for the 2003 TSOP Student Research Grant. This ties a previous year for the highest number of applications received. The international make-up of this year's applicants was especially gratifying. The nationalities of the applicants were: Australian, Brazilian, Chinese, Cuban, Indonesian, Irish, Korean, Nigerian, Scottish, Turkish and USA.

The applications were submitted by seven Master's candidates and six PhD candidates. This year's awardee is Daniel Ross of the University of British Columbia, a Master's student of Dr. Marc Bustin. The title of Mr. Ross's thesis topic is "Gas Potential of Canadian Black Shales and the Role of Organic Matter." Mr. Ross is a graduate of the University of Aberdeen (Scotland) with a BSc Honors in Geology and Petroleum Geology. He is a British citizen. Mr. Ross was unable to attend the Washington D.C. meeting; hence the award will be mailed to him.

Mr. Ross has written the following summary of his research topic. H

## Gas Potential of Canadian Black Shales and the Role of Organic Matter

by Daniel Ross

### Statement of the Problem and Scientific Significance

Black shales in the United States have been producing gas for over 100 years and contribute a significant proportion of US energy resources. Organic rich mud rocks range in age from Ordovician-Cretaceous in Canada but there is no production from these unconventional reserves. I will be concentrating my research on the Nordegg and Poker Chip Shales in northeastern British Columbia and west-central Alberta. Both these units are considered important petroleum source rocks and their high total organic carbon and fracture properties make them excellent gas shale candidates. Research in the past for these units has concentrated on the oil-source potential and gas potential has been overlooked. There is also a lack of correlation of these rock units across British Columbia and Alberta which will need to be addressed to determine the total gas in place. The gas is derived from the organic matter in the shale and subsequently adsorbed, so the shale is both source and reservoir.

For gas in place calculations, fractured shales must be evaluated and quantified in terms of reservoir characteristics. Gas storage mechanisms and the significance of kerogen type and organic maturation are poorly understood. The gas is stored by sorption mainly onto organic matter, as free gas in pores and as solution gas in solid bitumen. The relationship between kerogen type and the sorbed capacity of the shale will be important in my research.

Interest in these unconventional resources has increased recently as improvements in exploration technology have continued. This has been needed due to the fine-grained, low permeability nature of these black shales making gas extraction complicated and high-risk.

### Major Hypothesis

The major hypothesis of my research is to better understand the relationship between kerogen types, degree of organic matter maturation and mineral composition of the shales and relate this to gas sorption. Analogies can be used from the United States such as the Antrim, New Albany, Lewis Shale and Barnett Shales to aid development of Canadian shales such as the Nordegg and Poker Chip.

### Research Plan

I have already spent two months at the core facility at Charlie Lake, NE British Columbia. There I examined,

described and sampled all cores in British Columbia which contain Nordegg and Poker Chip units.

Determination of abundance, type and maturity of the organic matter will be done using Rock Eval Pyrolysis. Reflected light and UV fluorescence microscopy will be used to characterize the maceral composition. High pressure methane (between 4 and 8 per major stratigraphic interval), carbon dioxide (1) and ethane (1) adsorption isotherms will be measured on representative samples to determine the gas adsorption capacity. Desorption isotherms may also be utilized. Measurements of adsorption isotherms on samples with varying maturity, kerogen composition and TOC will be performed. There is good correlation between amount of gas adsorbed and total organic carbon content (TOC), therefore measuring TOC is key for establishing reservoir capacity. Using this data, the organic richness of the unit can be regionally mapped. My research will also focus on the porosity systems of organic matter. The porosity is classified as micro-, meso- or macropores. Microporosity is thought to be the controlling factor for gas sorption and storage capacity, mesoporosity controlling transmissibility from micro to macropores. The pore volumes will be calculated using He density (skeletal density) and Hg porosimetry (particle density).

An effective fracture system is required for the extraction of gas from black shales to allow for economic production. My analysis of the fracture systems will include establishing relationships between fracture porosity, geometry, aperture width and flow geometry. These will be evaluated using wire-line logs and extensive field work in northeastern British Columbia and west central Alberta. Samples will also be analysed for mineralogical variations and the effect clay minerals have on organic matter preservation and gas sorption.

### Application and significance of organic petrology in solving the problem

SEM along with UV Fluorescence microscopy and reflected light microscopy will be used to determine the types of organic matter and the relative abundances in the Nordegg and Poker Chip Shales. This analysis will help establish key characteristics of the organic matter such as type, distribution and maturation levels.

To this date, little research has gone into determining the relationship between source rock adsorption capacities and kerogen types, organic maturation or mineral matter. Petrological data is essential for understanding the palaeoenvironment and paleoecology of these shales and the relationship between gas sorption and kerogen type, maturation and abundance.

H

Citation for Honorary Membership in  
The Society for Organic Petrology to  
**Dr. Alan Davis**  
September, 2003

by Peter Warwick  
Honorary Member Committee Chair

Dr. Alan Davis, Emeritus Professor of Geology, The Pennsylvania State University, is the 2003 recipient of The Society for Organic Petrology Honorary Member Award. Dr. Davis has had a most profound, and predictably, will have an ever-lasting impact on the science of coal and organic petrology. Dr Davis's national and international career and reputation has been most highly distinguished: as a research scientist, as a science educator and research supervisor, as a science and university administrator, and also as one who has been wholly dedicated and committed to scientific societies, such as TSOP.

Dr. Davis received a B.Sc. in Geology in 1956 from the Imperial College of Science and Technology, London University, a M.S. in Geology from The Pennsylvania State University in 1961, and a Ph.D. in Geology from the University of Durham in 1965. Early in his career from 1956 to 1958, he was a geologist and scientist for John Taylor and Sons, New Consolidated Goldfields, and the National Coal Board. After completion of his M.S. and Ph.D., Dr. Davis was a senior Geologist with the Geological Survey of Queensland. In 1973, he returned to The Pennsylvania State University as an Associate Professor of Geology and became Professor of Geology in 1980. While at The Pennsylvania State University he served as Assistant Director and Director of the Coal Research Section, and Director of the Energy and Fuels Research Center and the Coal and Organic Petrology Laboratories. Dr. Davis became Emeritus Professor of Geology in 1997.

During Dr. Davis's career, he has been active in many geological professional organizations and has held many leadership positions. Such organizations include the Geological Society of Australia, the Geological Society of America (where he was Chair of the Coal Geology Division in 1994), American Chemical Society, American Society for Testing and Materials, International Committee for Coal and Organic Petrology (he served as President from 1991-1995, and received the Reinhardt Thiessen Medal in 1994), and The Society for Organic Petrology (he served as chair



of various committees). Dr. Davis also served on the Advisory Board and editorial board for several institutions and professional scientific journals, including the International Journal of Coal Geology.

As a research scientist and student supervisor Dr. Davis has conducted and collaborated on outstanding and pioneering research into the nature and distribution of organic matter in sediments and the petrographic characterization of coal in particular. His research contributions have been in the areas of: the origin of coal; thermal, burial and tectonic history of coals, coal molecular structure, petrology, minerals, classification, systematics, optical properties, oxidation, utilization; oil-shale petrology; automated microscopy; fluorescence microscopy.

Dr. Davis' national and international reputation as a leader in the field of organic petrology led to active industrial and government consultancies in a wide range of organizations as well as visiting professorships. He has been very successful in receiving funding for his research including the work associated with The Penn State Coal Sample Bank and Data Base. He has been teacher and mentor for many of our colleagues in the field of organic petrology.

“In recognition and appreciation for being distinguished in a scientific discipline significant to The Society for Organic Petrology” it is with greatest pleasure that I bestow upon Dr. Alan Davis, the award of Honorary Lifetime Membership. H

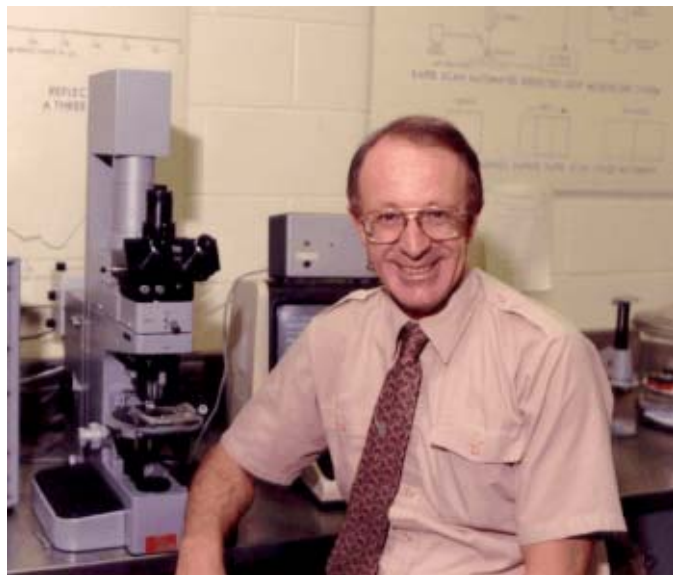
## Response in Acceptance of Honorary Membership Award

by Alan Davis

My deepest appreciation goes to the Award committee and all TSOP members for elevating me to Honorary Member. One look at the list of past honorees is enough to understand why I am humbled and gratified by this recognition. The preparation of this response has given me cause to reflect on the significant contributions of TSOP and its members, and of the truly amazing advances in organic petrology achieved during my professional years.

My first introduction to coal petrology was through Van Krevelen's and Francis' books, both entitled "Coal." Consider how much has been added to the sum of knowledge since I first read those treatises in 1958, jam-packed with information as they were. What I read was enough to stimulate me to apply to graduate school at Penn State and I arrived there that same year. At about the time I left I was shown how to do the recently-developed petrographic calculations of coke strength. An entirely new phase of organic petrology was being spawned, resulting in the opening of many labs around the country and then the world. I also remember one of the microscope companies demonstrating a scope with fluorescence capability in Dr Spackman's lab. A summary of what was known about coal fluorescence at that time would be "How pretty!"

From Penn State I went to Newcastle upon Tyne to work on the optical properties of carbonized vitrinites. The equipment I began working on was a modification of the Berek microphotometer of the type used by Seyler when he thought he had proved a step-wise increase in reflectance with rank. The consensus in 1961, however, was that the change was progressive and smooth. Now we know that some of the irregularity that Seyler encountered was due to the different coalification tracks that result from differing thermal histories, and there are multiple causes of the phenomenon referred to by some as "vitrinite suppression" and they could also have influenced his results. The possible influence of anisotropy on Seyler's results was suspected in the 1950s, and the anisotropic character of coal had been known since the 1940s, but the only model accepted was the uniaxial negative. We know now that this property is much more complex.



From Newcastle I went to Brisbane, Australia. At about the end of my time there, the application of petrographic methods to petroleum exploration was taking off. People were measuring (shudder) random rather than maximum reflectance on minute bits of organic matter extracted from sedimentary rocks by death-defying treatments. Another new phase of organic petrology was being spawned.

And later the thermal histories of basins were being determined. And then, using oriented samples or ingenious models to calculate principal reflectances, the stress histories of basins were interpreted. And others discovered how cokes can be formed through the mesophase mechanism, and were creating astounding new forms of carbon. And more.

All of this happened within the space of one all-too-short professional career. I have been so fortunate in having my mentors, students and colleagues lead me into several of these areas. It is because of their imaginations and efforts that I am receiving this honor today.

Where will organic petrology go next? The challenges are there. Global warming, the origin of life, resource depletion, and the development and support of emerging and yet to emerge technologies are just some. Will organic petrology play a significant role in addressing these challenges? I have no doubt that the need to look at organic matter at its most elemental levels, optically and chemically, will keep the science alive, even if moving in different directions.

Once again, thank you TSOP for this singular honor.

H

*The Geochemical Society's Treibs Medal was presented to Dr. Archie Douglas at the 2002 joint meeting of CSCOP-TSOP in Banff. TSOP is grateful to Elsevier for permission to reprint this article.*

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## Citation for presentation of the 2002 Alfred E. Treibs Medal to Archie Douglas

JAMES R. MAXWELL

Organic Geochemistry Unit, School of Chemistry, University of Bristol, Cantock's Close, Bristol BS8 1TS, United Kingdom

I am grateful for the opportunity to provide a few words about an ex-colleague and great friend who also happens to be a fellow Scot. Archibald Gibson Douglas (aka Archie, Arch, AGD, or even "Archee"! ) was born in Glasgow, Scotland, in 1927. Why do I refer to "ex-colleague" when Archie's career is inevitably associated with the University of Newcastle and I have spent virtually all of my post-PhD career at the University of Bristol? Well, I suspect that it isn't too widely known that he spent two years, from 1964-1966, at the University of Glasgow, helping Geoff Eglinton set up the UK's first organic geochemistry group. During this time, he was essentially my joint PhD supervisor with Geoff, giving me access to his incredible knowledge of, and expertise in, analytical chemistry, particularly chromatography and especially gas chromatography (GC). Indeed, Archie's 20-foot-x-1/16-inch stainless steel preparative GC columns, used at Glasgow in the 1960s to isolate pure biomarkers, were at least as efficient as the glass analytical columns we initially used in our first GC-mass spectrometry (MS) system!

Archie is one of the oldest recipients at the time of the award. This reflects in part the fact that he is a somewhat modest man, who certainly isn't into the game of self-promotion. In addition, he was something of a late starter. Having left school at age 14 (1941), he did not take up research until 1953 when he was 26.

His research career began when he was appointed an assistant in the Carcinogenic Substances Research Unit at the University of Exeter in southwest England, funded by the Medical Research Council. His first publication (Carruthers and Douglas, 1955) comes from this period and was, in a sense, prophetic in that it was the forerunner of about half a dozen others in the late 1950s and early 1960s, covering the identification and synthesis of a variety of aromatic hydrocarbons and sulfur compounds in petroleum, before the field of organic geochemistry really exploded. So, here we have Archie carrying out top-class organic geochemistry research but getting the medics to pay for it!

In recent years, there has been a great deal of interest, particularly in the Netherlands Institute for Sea Research (NIOZ) and Strasbourg groups, in unravelling the role of sulfur in bringing about relatively low temperature diagenetic reactions and in the formation of organic sulfur compounds (OSCs). It is no surprise that Archie in a sense predicted this interest nearly 40 years ago (Douglas and Mair, 1965) by showing that elemental sulfur could react with cholesterol at low temperature to give a variety of aromatic hydrocarbons and OSCs.

If there is one single thread running through his research, it is that it relies on the utilisation and application of first-rate analytical methodology. For example, he provided the analytical brains behind a number of the significant biomarker contributions of the 1960s, such as the discovery of isoprenoid carboxylic acids in geological samples (Eglinton et al., 1966)

and of botryococcene hydrocarbons (Maxwell et al., 1968), the latter leading to a whole subarea of *Botryococcus*-based biogeochemistry, still one of considerable interest and significance today. Continuing in the biomarker vein, the first authenticated account of the occurrence of sesquiterpenoids in fossil deposits should not be forgotten (Douglas and Grantham, 1973).

One of Archie's hobbies has always been tinkering with (!), tweaking, and developing analytical methods and instrumentation. Of several original contributions, one which typifies this as much as any is the following: the standard method for isolating carboxylic acids of sedimentary origin was, and still is to a large extent, to use a so-called McCarthy and Duthie chromatography column. This involves the use of formic acid, which is difficult to remove. So, Archie invented a much more convenient thin layer chromatography (TLC)-based approach that doesn't use formic acid (Douglas and Powell, 1969). Sadly, this improved approach is hardly used; Archie maintains that this is because present-day students don't read the old literature!

Despite all of these achievements, if you were to ask most organic geochemists what Archie Douglas is best known for, the answer would inevitably be for his pyrolysis work. This started in the 1970s with the first report of the occurrence of triterpenoids in coal (Allan and Douglas, 1974) and the famous *Nature* paper (Larter et al., 1979) that identified the most abundant biomarker hydrocarbon in kerogen pyrolysates as prist-1-ene and showed its systematic variation with sediment maturity and the likely bonding environments of isoprenoid groups in kerogens. Around this time, there were also a number of major contributions that together provided the foundation of present-day protocols for kerogen molecular typing by GC and GC-MS (e.g., Larter and Douglas, 1980). With respect to kerogen, one of the major debates over the years has been the question of its mode (algaenan vs condensation). Needless to say, Archie has been at the centre of the debate by way of a major contribution to the condensation hypothesis for protokerogen formation, whereby pyrolysis of model protokerogens, made from reaction of lipids with amino acids and sugars, afforded products similar to those formed from pyrolysis of natural materials.

Accordingly, from his research contributions alone, award of the Treibs medal is fully justified. It should not be forgotten, however, that he founded with Duncan Murchison the Organic Geochemistry Unit at Newcastle in 1966, which has grown over the years as Newcastle Research Group (NRG) to become the largest research grouping in the field in the West. Indeed, the list of Newcastle PhD students who have benefited from Archie's supervision reads like a *Who's Who* of organic geochemistry. As if all of this weren't enough, he has served with great distinction as co-editor in chief of *Organic Geochemistry* for the last 13 years.

*Continued on p. 23*

*The Geochemical Society's Treibs Medal was presented to Dr. Archie Douglas at the 2002 joint meeting of CSCOP-TSOP in Banff. TSOP is grateful to Elsevier for permission to reprint this article.*

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## Acceptance of the 2002 Alfred E. Treibs Award

ARCHIE DOUGLAS

School of Civil Engineering and Geosciences, University of Newcastle upon Tyne, Newcastle upon Tyne NE1 7RU, UK

Mr. Chairman, Ladies and Gentlemen, I was astonished but flattered to be told that I had been chosen by the Geochemical Society to be this year's recipient of the Treibs medal. It never entered my head that my name would go forward for this award, and I am most grateful to the society.

The award is, of course, to the Newcastle Group that I had the pleasure, and honour, to work with over the past 30 years or so. They did the work and should be standing here instead of me. Some are in the audience, and it has been a great, great pleasure to be reacquainted with them in this beautiful setting. Without their hard work and enthusiasm, there would not have been a Newcastle Organic Geochemistry Unit. I realise that it is customary in giving an acceptance speech to detail briefly the highlights of one's career, but since James Maxwell has, in his introduction, given you an outline of our interests, I thought that I might, before briefly describing the work at Newcastle and elsewhere, tell you how I got into organic geochemistry.

I was introduced to simple chemistry when I left school at 14 to work as an assistant chemist in a factory manufacturing fertilisers. After conscription for 3 years into the Fleet Air Arm, followed by 4 years at Glasgow University, I was employed as a research assistant on a multidisciplinary Medical Research Council [MRC] project aimed at investigating the carcinogenic action of mineral oil. One may ask, "Why was the MRC interested, in 1950, in the carcinogenic properties of mineral oil nearly 200 years after the first publication of evidence of environmental carcinogenesis due to fossil fuels?"

Early during the Industrial Revolution, the English surgeon Sir Percival Pott [1775] suggested that the cancers he was encountering in chimney sweeps were due to skin contact with soot. In those days, it was customary to use small boys [known as climbing boys] to climb inside narrow chimneys to scrape and brush them free from soot. Some children began at the age of 5 or 6, and many went on to develop cancer of the scrotum. Pott argued that the rugose surface of the scrotum was the ideal place for soot to lodge, to be difficult to dislodge, and to initiate the cancer-inducing process. About 75 years later, it was reported that skin cancers were appearing in workers in the Scottish oil shale industry. Shale oil was being manufactured in Scotland (some 9 years before Colonel Drake's well was drilled in Pennsylvania) by an industrial chemist known as "Paraffin" Young. His factory produced, inter alia, shale oil and paraffin wax, by retorting Boghead or Cannel coal from deposits near Torbanehill, west of Edinburgh. Workers in the paraffin wax department were relatively free of skin conditions, but workers with the shale oil developed precancerous papillomas on the arms, hands, and scrotum, which in many progressed to invasive cancers. About this time, there were also reports that workers in the German tar and paraffin industries were subject to skin cancers.

Subsequently, it was found that others suffering from cancer



of the scrotum were the mule spinners in the Lancashire cotton industry. Here, cotton was spun on large machines called mules, which had to be kept lubricated with spindle oil [mineral oil] and, in consequence, the male operators' trousers became soaked in the oil, giving rise in some to cancer of the scrotum.

There was some evidence that the active materials in the higher boiling oil fractions that showed intense fluorescence were PAHs, as did extract fractions from coal tar. The first experimental evidence that supported the thesis that coal tar was carcinogenic was obtained by some Japanese workers who, in 1915, obtained skin cancers by painting rabbits' skin with coal tar; in the U.K., fractions of shale oil also produced epitheliomas on the skin of mice.

In the early 1930s, Sir James Cook decided to try and isolate pure carcinogenic compounds from coal tar. Starting with 2 tons of coal tar, he eventually isolated about 200 mg of the strongly carcinogenic hydrocarbon 1:2 benzopyrene (benz[a]-pyrene) in pure crystalline form. So here was final proof that at least one potent carcinogen occurred in coal tar.

Later, evidence was accumulating that the cutting oils used by machine operators in the engineering industries in the English midlands were carcinogenic. Arms and clothing exposed to the oil resulted in skin cancers, and in the years 1950 to 1955, there were 219 fatal cases of skin epitheliomas. The government asked the MRC to look into this problem, and I joined the project in 1953 under the titular leadership of Sir James Cook and my boss Bill Carruthers. Our remit was to concentrate, isolate, and identify the carcinogenic constituents

of distillation cuts of fractions that had previously been prepared and tested on animals elsewhere. Aromatic extracts of Kuwait oil had been distilled under vacuum into 2.5°C cuts, with true boiling points between 350°C and 410°C [liquid in still pot was kept below 250°C to avoid cracking]. The distribution of carcinogenic activity at each stage was followed by painting the skin of rabbits and mice. Most of the fractions had a low activity on mouse skin, but some showed a moderate degree of activity on rabbit skin. Using these methods, a number of pure PAHs and sulphur compounds, then unknown in petroleum, were isolated and synthesised. Adduction with maleic anhydride afforded methyl-substituted anthracenes and benzantracenes. Other PAHs isolated included, inter alia, a number of methyl-substituted phenanthrenes, fluorenes, benz-fluorenes, chrysenes, pyrene, and triphenylene. Kuwait oil is rich in sulphur, and assuming one atom per molecule in the boiling range used implies that 35 to 40% of the molecules contain sulphur. Hence, a number of polymethyldibenzothiophenes [most subsequently synthesised], thiabenzofluorenes, a naphthothiophene, and some methylcarbazoles were isolated. Now, 40 years on, the problem of isolating and identifying compounds would be greatly simplified using today's separation and spectroscopic methods. We had no sophisticated techniques in those days, and all of the work depended on column chromatography and the tedious and time-consuming repeated recrystallisation of the charge-transfer complexes made by treating the aromatic rich fractions with picric acid, styphnic acid, and trinitrobenzene that gave beautiful coloured crystals of which artists, known as the Scottish colourists [the Scottish Fauves], would have been proud. By the end of the project, about 45 pure compounds had been isolated and identified; almost all had never been reported as constituents of crude mineral oil. Although animal tests had shown that some fractions produced cancers in mice and rabbits, no pure potent carcinogen was isolated during the project. However, in the complex mixtures of benzantracenes that were isolated, better methods would surely have enabled a search for the potent carcinogen 9,10 dimethyl-1:2-benzanthracene.

A year in Pittsburgh, with the American Petroleum Institute's Project 6 with Bev Mair, intended to investigate the higher boiling fractions of Ponca City crude, was thwarted. Instead, we debated whether biomarkers [i.e., cholesterol and farnesol] might be aromatised during burial in sulphur-rich sediments, at temperatures well below those used for dehydrogenation in classical chemistry. When cholesterol was heated at 150°C over a number of weeks with sulphur, in addition to complex unresolvable sulphur-containing mixtures, an aromatic-rich fraction showed the presence of benzene-, naphthalene-, and phenanthrene-containing structures. At 135°C, farnesol gave pure cadalene [1,6, dimethyl, 4 isopropyl naphthalene] and again complex sulphur-containing mixtures.

Back in Glasgow [1964-1966], an old acquaintance, Geoff Eglinton, the first U.K. recipient of this award, had returned from Calvin's lab to set up the first organic geochemistry unit

in a British university. Geoff's enthusiasm and ability to squeeze money from various sources allowed us to get the lab up and running. He was instrumental in getting the first GC-MS instrument into a British university. We were lucky to be joined by James Maxwell (the second U.K. recipient of this award) and also by Pierre Albrecht and Sister Mary Murphy, long-term visitors. Research in this infant geochemistry unit produced results on fatty and isoprenoid acids in shales, torbanite, B. Braunii, coorongite, etc.

In Newcastle, the Geology Department had a long tradition in coal petrology. Duncan Murchison was instrumental in cleverly obtaining permission to have a bonded warehouse, belonging to Scottish and Newcastle breweries, converted to our new Organic Geochemistry Unit! There, from 1966 on, I was privileged to have many fine Ph.D. students, starting with Trevor Powell in 1966 and finishing with Tim Eglinton in 1987. Between these times, our interests ranged widely and were ably researched by, inter alia, Jim Allan, Peter Grantham, Steve Larter, Brian Horsfield, Peter Barry Hall, Martin Fowler, Martin Jones, and others who left geochemistry to pursue duller, but no doubt more lucrative, careers. With them we saw, inter alia, progress in our knowledge of microbial degradation of oil in pollution studies, of hydrocarbons and fatty acids in many fossil deposits, including bituminous and algal coals, shales, recent sediments, pollen, spores, coorongite, asphalts, and fresh material. Early investigations into the structure of kerogen by chemical and pyrolysis methods allowed us some insight into the nature of this material. The debate as to whether kerogen formation is due to the condensation of small molecules [Tissot and Welte et al.] or is due to selectively preserved plant structures [NIOZ group et al.] is likely to continue, not so much as an either-or question but more the global mass due to one or the other. Our work on the release of biomarkers from kerogen by pyrolysis and the synthesis of "kerogen-like" material by incorporating biomarkers into synthetic melanoidins favours the former.

In the 12 years since James Maxwell said in his acceptance speech that "geochemists should not be blinded into becoming too specialised," the field has blossomed. For example, the aims and scope of the journal *Organic Geochemistry* were extended to include "archaeological chemistry, biogeochemical ecology, biomolecular paleontology, molecular stratigraphy, petroleum reservoir inhomogeneities, etc."

However, there have been changes in British universities, not all good. In the past, we had lots of fun, and soundness of purpose in research: today, administrators frustrate the endeavours of researchers so much so that leaving it all behind is a good option. A good time to bow out. This I do with thoughts of T.S. Eliot's Mr. Prufrock:

I grow old, I grow old  
I shall wear the bottom of my trousers rolled

but not before again thanking the Geochemical Society for the honour they have bestowed on my coworkers and myself.

**Citation, continued from p. 20**

Finally, perhaps the clearest indication of his track record in our field appears in a recent historical note (Kvenvolden, 2000) where AGD has proper pride of place in the figure as one of the "Pioneers of Organic Geochemistry"!

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**Calendar of Events****2004**

Feb. 16 - 19, 2004: Australian Organic Geochemistry Conf. and Internat. Humic Substances Soc., Organic matter interfaces and interactions, Leura, NSW. <http://www.aghort.uq.edu.au/staff/kspar/aogc-ihss/>

April 5 - 7, 2004: SEGH, Sussex, UK, Environmental Geochemistry and its impacts on health. <http://www.sussex.ac.uk/conferences/segh/>.

April 18 - 21, 2004: AAPG, Dallas, Texas, including Poster Session: Oceanic Anoxic events and Source Rock Formation.

June 5 - 11, 2004: Goldschmidt Conference, Copenhagen, Denmark, including: Macromolecular Organic Matter; Discerning Biological and Non-biological Origins; Petroleum Geochemistry and Migration. [www.goldschmidt2004.dk](http://www.goldschmidt2004.dk)

August 20 - 28, 2004: 32<sup>nd</sup> International Geological Congress, Florence, Italy, including G-04.05 Organic Geochemistry. <http://www.32igc.org/home.htm>.

Sept. 5 - 11, 2004: 56<sup>th</sup> Annual Meeting of ICCP, Budapest, Hungary. <http://www.iccop.org/56AnnualMeeting.htm>

Sept. 13 - 17, 2004: 21<sup>st</sup> International Coal Conference, Osaka, Japan. <http://www.engrng.pitt.edu/~pccwww/>

**Sept. 27 - Oct. 1, 2004:** 21st Annual TSOP Meeting, TSOP: **Organic Matter Down Under**, Sydney, Australia. See page 2, 10 and 11 and <http://www.tsop.org/mtgsyd.htm>

Oct. 12 - 14, 2004: AAAPG-2004, 6th Internat. Conf. on Petroleum Geochemistry and Exploration in the Afro-Asian Region, Beijing, China.

**2005**

April 11 - 15, 2005: World of Coal Ash, Lexington, KY, USA.

**Sept. 11 - 14, 2005:** 22nd Annual TSOP Meeting, Louisville, Kentucky, USA.

Sept. 18 - 23: 57<sup>th</sup> Annual Meeting of ICCP, Patras, Greece. Followed by a three-day excursion. <http://www.iccop.org/57AnnualMeeting.htm>

## Photo Gallery

### 2003 Annual Meeting Field Trip

Geology and Energy Resources of the Triassic Basins of Northern Virginia  
September 24, 2003



The field trip group at a granite quarry, the second stop.

Mine ventilation shaft, well defended by hornets.

Photos by Ray Pheifer.

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| 2.            | <i>Fluorescence - microscopical changes of liptinites and vitrinites during coalification and their relationship to bitumen generation and coking behavior</i> , TSOP Special Publication No. I (English translation by Neely Bostick, without photomicrographs) M. Teichmüller, 1984 | \$ 2                                      |
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| 11.           | <i>Organic Geochemistry</i> , 8th TSOP Meeting, Lexington, KY, 1991; Vol. 20, No. 2, 1993   | \$10                                      |
| 12.           | 8th TSOP Meeting Field Trip Guidebook, Lexington, KY, 1991  | \$ 5                                      |
| 13.           | <i>Organic Geochemistry</i> , 10th TSOP Meeting, Norman, OK, 1993; Vol. 22, No. 1, 1994   | \$ 2                                      |
| 14.           | <i>Energy &amp; Fuels</i> , ACS symposium on kerogen/macerals; Vol. 8, No. 6, 1994  | \$ 2                                      |
| 15.           | 12th TSOP Meeting Field Trip Guidebook, The Woodlands, TX, 1995   | \$ 5                                      |
| 16.           | <i>Organic Geochemistry</i> , 11th TSOP Meeting, Jackson, WY, 1994; Vol. 24, No. 2, 1996  | \$ 2                                      |
| 17.           | <i>International Journal of Coal Geology (IJCG)</i> , 12th TSOP Meeting, The Woodlands, TX, 1995; Vol. 34, Nos. 3-4, 1997   | \$ 2                                      |
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