

Petroleum Geology of Northwest Europe:  
Proceedings of the 4th Conference

Volume 1

# Petroleum Geology of Northwest Europe: Proceedings of the 4th Conference

held at the Barbican Centre, London 29 March–1 April 1992

## Volume 1

edited by

J. R. Parker

Shell UK Exploration and Production, London

with

I. D. Bartholomew  
W. G. Cordey  
R. E. Dunay  
O. Eldholm  
A. J. Fleet  
A. J. Fraser  
K. W. Glennie  
J. H. Martin  
M. L. B. Miller  
C. D. Oakman  
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## Foreword

The Fourth Conference on the Petroleum Geology of NW Europe was held in the Barbican Centre, London, on 29 March–1 April 1992.

The conference was sponsored jointly by The Geological Society, The Institute of Petroleum, Petroleum Exploration Society of Great Britain (PESGB) and Joint Association for Petroleum Exploration Courses (JAPEC) in association with UK Department of Energy, British Geological Survey (BGS), UK Offshore Operators' Association (UKOOA) and the American Association of Petroleum Geologists (AAPG). We appreciate the support of these organizations.

We also had generous financial support from the oil industry and our sincere thanks are due to:

Amerada Hess Ltd	Amoco Exploration Company
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We had the great pleasure of inviting Mr Norman Falcon (previously Chief Geologist—BP) as our distinguished guest. Also present as guests of the Conference were Professor Tony Harris (President—The Geological Society), Mr Charles Smith (President-elect—Institute of Petroleum), Mr Alastair Woodrow (Chairman—PESGB), Mr Michael Fisher (Chairman—JAPEC), Dr David Jenkins (BP Exploration) and Mr Gareth Hughes (UK Department of Energy).

However, the conference was principally for the 1230 delegates (including 350 from 15 overseas countries) who appreciated both the scientific and social events. There were some 130 technical papers and poster displays written by 350 authors from oil companies, universities, consultants, service companies and government institutions. A new feature of this conference was the very successful Core Workshop with over 25 displays (600 m core) and corresponding posters which illustrated the Tertiary, Cretaceous, Jurassic, Triassic and Permo-Carboniferous of NW Europe. Over 1700 visits were made by delegates to the Core Workshop during the conference.

The Opening Reception held in the Whitbread Brewery was sponsored by a number of oil companies, and the Conference Gala Dinner (sponsored by BP Exploration) was held in the Guildhall, with Guest Speaker The Right Honourable (now Lord) Denis Healey and a marching display by the Coldstream Guards.

In conclusion, I wish to thank and acknowledge the help and support of the people who contributed scientific papers and posters to the conference, particularly those who responded by releasing so much new information. I also wish to thank the Conference Organizing Committee—especially Dr John Parker and the Technical Session Convenors—for all their hard work in putting the technical sessions together and in the post-conference period in the preparation of these 'Proceedings'. My final words must be a special 'Thank You' to Jane Hill, Lisa Davies and Sharon Pidgeon and their colleagues at Conference Associates and Services Limited (CASL) who so successfully carried out the administration and organization of the conference and to Mr George Meakin who guided the Organizing Committee through the budgets, cash-flows and accounts for the conference.

Thank you to all those who contributed, attended and helped with the conference; it was a great privilege and pleasure to be Chairman of such a successful and enjoyable conference.

*Jim Brooks*  
*Chairman, Organizing Committee*

# Opening address

Jim Brooks

Chairman of the Organizing Committee

During the past decade we have seen many major changes in the oil and gas industry. There have been great fluctuations in crude oil prices, and employment opportunities for geoscientists have taken a dramatic plunge.

If there have been differing uncertainties in the commercial and investment policy regarding North Sea oil and gas, there has certainly been ongoing excellence and *success* in exploration and production.

Speaking at an OPEC Conference in Dallas, USA in October 1987, I presented a view—not fully accepted at the time—that there were significant undeveloped and undiscovered oil and gas reserves on the UKCS. We concluded that the UK's remaining most likely recoverable gas reserves were in the range 68–79 TCF. This is 42 to 49 years consumption at present rates. The most likely remaining recoverable oil reserves were  $16.5\text{--}18 \times 10^9$  (billion) barrels, which is some 28 to 31 years supply at present domestic consumption rates.

There is no reason to fear energy shortages from the UK sector in the next 25–50 years, provided that policies to further motivate and accelerate exploration and development investment are instituted in the North Sea and other UKCS basins.

Recent exploration studies and evaluation of remaining oil and gas reserves on the UKCS show that in excess of  $10 \times 10^9$  (billion) barrels of oil and oil-equivalent may still remain to be discovered.

North Sea is still a *success* story.

I also made comments at the OPEC Conference about the future need to reconstitute the British National Oil Corporation (BNOC)—but this is another story and none of our political parties even mention this subject today. In future there may not even be an active UK Department of Energy. It will be a great pity if oil and gas become solely a commodity of trade and industry, and simply looked at from a purely financial viewpoint. It is essential that we continue to have *success* and control in running the nation's natural assets of oil and gas.

During the last few years we have seen a gradual transition occurring from *major* companies to *independent* operators. In the early days of North Sea exploration, there was a predominance of *majors* working the plays and getting production. This is now changing with an increase in *independents* operating and successfully discovering and producing hydrocarbons.

Although the commercial view of exploration and production—and the economy in general—has been *low* in recent years, the scientific activities, advances and *successes* in petroleum geology continue to be *high*.

In facing the challenge of our energy needs for NW Europe, petroleum geologists clearly still have a major role to play. The extent of this important role is clearly reflected in the wide variety of scientific papers to be presented at this conference.

The science and technology of finding and producing oil and gas in the North Sea is still a *success* story.

For many of us at the conference it will be a 'look back' over the last few years to discover and evaluate some of the rapid advances made in *finding*, *evaluating* and *producing* hydrocarbons. I am sure we will all be stimulated and encouraged by learning of the *successes* of our fellow explorers. These exchanges over the next few days, of new data, interpretations and applications will no doubt encourage us all to persevere in our day-to-day work with the hope . . . the next big one. Our *success* story.

This conference is an important event in bringing together the most concentrated review of new geological information and exploration and production data of NW Europe obtained during the last few years. Following on in the tradition of previous conferences, we have assembled some 130 papers in three parallel technical sessions on all aspects of petroleum geology, exploration and production. Our successful poster session will again be on display.

New topics included in this conference are a session on 'Field Management' and a three-day 'Core Workshop and Discussion Forum' on Tertiary, Cretaceous, Jurassic, Triassic and Permo-Carboniferous cores. These cores will illustrate some of the papers presented in the technical sessions.

In addition to technical sessions and core workshop, there will be a display of various geoscience projects and research currently being undertaken at universities and colleges. We are again pleased to include with the conference a major Trade and Technical Exhibition and I encourage you to visit and support the exhibition during the conference.

The conference has had excellent scientific and financial support from many companies. In addition we have had ongoing support from our sponsors: The Geological Society, PESGB, JAPEC, Institute of Petroleum and support also from Department of Energy, BGS, UKOOA and AAPG.

The Organizing Committee have worked very hard in setting up the conference and I would like to thank them all, but especially John Brooks (Secretary) and John Parker (Technical Committee) for their support in bringing together the conference programme.

Before officially opening the conference on behalf of the Organizing Committee, I would like to thank all of you and

your companies for coming along to the conference. It would have been a big disappointment and somewhat embarrassing if you hadn't! We will do all we can to make your attendance rewarding, both scientifically and in other ways.

Welcome, I trust together we will have a *successful* conference.

It now gives me great pleasure to officially open the 4th Conference on the Petroleum Geology of Northwest Europe.

# General introduction

J. R. Parker

Shell UK Exploration and Production, Shell-Mex House, Strand, London WC2R 0DX, UK

The papers in these conference proceedings are grouped thematically, as in the sessions at the conference, and include both oral and poster presentations: first, the stratigraphically related papers (Tertiary; Cretaceous; Jurassic; Triassic; Permo-Carboniferous and older), then the regional papers (Irish Sea basins; Atlantic margin) and finally the subject papers (Structural styles; Fluids; Field management). A few of the presentations were not submitted as papers for publication but their abstracts are included with each group to provide a complete record of the conference. For each group of papers, the session convenors have contributed an introduction and review, highlighting the main themes and conclusions from each session.

After more than 25 years of a very rapid pace of exploration, development and production, the North Sea can, to a considerable extent, be regarded as a hydrocarbon province reaching maturity; but, even in the short time since the last conference in 1986, significant new insights—and discoveries—have been, and continue to be made.

Reviewing the conference as a whole, three aspects in particular stand out.

- The application of the sequence stratigraphic approach to sub-surface evaluation, both at the regional and the field scale. The emphasis on sequence stratigraphy marks the welcome return of stratigraphy to what I believe is its rightful place as the central discipline of geology. Stratigraphy provides a framework for the understanding of the spatial and temporal relationships between rocks and hence the intricate relationships between deposition and erosion, source rock and migration path, and reservoir and seal. The North Sea provides many examples of the application of sequence stratigraphy to syn-rift settings where local tectonic effects are considerably more important than the traditionally considered eustatic effect. It is also evident that a knowledge of the underlying biostratigraphic framework is crucial for the understanding, testing and application of such schemes, and the publication of such schemes is to be welcomed and encouraged.
- The use of 3D seismic datasets and seismic attribute analysis in enhancing structural understanding, especially in areas of complex structural geometries. However, it is important to view structural problems in both their local and basin-wide context and integrate what is seen on a prospect (or work station screen) scale into a consistent regional framework.
- The contribution of both geology and geophysics to the further understanding of producing fields and accumulations still to be developed, highlighting the need for a close interaction between geoscientist, petroleum engineer and management to ensure that development is optimum and that maximum recovery is achieved.

All of these interact with each other and this provides the fascination and the challenge of our discipline.

An outstanding feature of the conference was the Core Workshop and a special word of thanks must be made to Colin Oakman and John Martin for all their enthusiasm and hard work; a report on the Core Workshop is included in these proceedings and a separate publication is being planned.

Stratigraphic terminology follows Harland *et al.* (1990: *A Geological Time Scale 1989*, Cambridge University Press) and structural terminology follows the Petroleum Exploration Society of Great Britain map of the *Structural Framework of the North Sea area* (new edition, 1992); a list of commonly used abbreviations is given at the end of each volume.

I would like to express my thanks to all those who made the conference such a success: authors, presenters, organizers and delegates; but in particular to the members of the Technical Committee who were responsible for convening, chairing and finally refereeing and editing the contributions to each session.