Front cover:

APEA annually invites drafting personnel in member companies to submit a design for the APEA Journal cover. This year’s cover design represents the sharpening of focus now taking place in all areas of the oil exploration and production industry. The designer, Henryk Wojcik of Esso, says: ‘The cover concept uses a graphic medium to illustrate the oil industry’s increasingly sharpening focus. The icons represent vital elements of the business: maximising earnings, improving technology and the industry’s concern for the environment.’ As the designer of this year’s design competition, Henryk receives a free trip to the APEA Conference. He is a member of the Graphics Section, Esso Australia Limited. Henryk has had 10 years design experience. After his training at Swinburne University he was involved in traditional publishing and illustration for the commercial sector and the health industry. He joined Esso’s Computer Graphics Group two years ago and works on publishing design and illustration for various departments within the company.
APEA Councillors

Chairman: Peter Power
Ampolex Ltd

Vice Chairman: Bernard Wheelahan
Shell Australia Ltd

Dennis D. Benbow
Magellan Petroleum Australia Limited
S. Bevan Devine
SAGASCO Resources Ltd
Joe M. Evon
BHP Petroleum Pty Ltd
David N. Hayes
Hudson Energy Ltd
Nick M. Heath
Esso Australia Ltd
John A Hinkins
GFE Resources Ltd
Ray Hutchinson
Western Mining Corporation
B. Jeremy Lawrance
Santos Ltd
James G. Pullar
Woodside Petroleum Ltd
Eric C. Streitberg
Discovery Petroleum NL
Gregory H. Roder
Parker & Parsley (Aust.) Pty Ltd
Ray I. Wilcox
Chevron Asiatic Limited
Robert J. Young
West Australian Petroleum Pty Ltd

The 1995 APEA Conference

Chairman: Bevan Devine

Journal Papers Committee

Chairman: Rob Willink

Members: Jenny Bauer
Gerry Carne
David Cole
Bob Frears
David Gravestock
Rhodri Johns
Steven Kelemen
Nick Lemon
Andy McGee
David McKirdy
Rob Neumann
Robert Seggie
Albert Thompson
Rod Wortley
Tony Wright

THE AUSTRALIAN PETROLEUM EXPLORATION ASSOCIATION LIMITED

An Association Not for Gain—Limited by Guarantee.
(Incorporated under the Companies [New South Wales] code)

THE APEA JOURNAL
1995

APEA Executive Staff

Executive Director:
Deputy Director:
Assistant Director (Technical):
Assistant Director (Commercial):
Assistant Director (Communications):
APEA 1995 Conference Manager:

Dick Wells
Peter Cochrane
Tony Noon
Noel Mullen
Jim Devine
Danelle Baxter

AUSTRALIAN PETROLEUM EXPLORATION ASSOCIATION LIMITED

© This collection APEA Limited 1995. Authors retain © in respect of their own contribution.

This book is copyright. Apart from any fair dealing for purposes of research, criticism or review, as permitted under the Copyright Act, no part may be reproduced by any process without written permission. Inquiries should be made to the publisher. Copying for educational purposes. Where copies of part or the whole of the book are made under section 53B or section 53D of the Act, the law requires that records of such copying be kept. In such cases the copyright owner is entitled to claim payment.

ISSN 0084–7534

Published by the:
Australian Petroleum Exploration Association Limited.

Technical co-ordinating editor: Murray H. Johnstone

Publication production editing:
Christopher Beck Books
64 Massey Street, Ascot, Queensland, 4007.
Phone: (07) 862 2466. Facsimile: (07) 862 2568.
Production editing team: Christopher Beck, Kate Fagan, Sarah Finegan, Barbara Fensom and Candace Wright.

APEA SECRETARIAT AND OFFICE:
Australian Petroleum Exploration Association Limited.
PO Box 2201, Canberra City, ACT, 2601.
Level 6, 39 London Circuit, Canberra City, ACT, 2600.
Telephone: (06) 247 0960. Fax: (06) 247 0548.
CONTENTS

SECTION 1
New discoveries, field reviews and reservoir studies
D.G. Bennett, R.S. Heath and S. Taylor
The Stokes gas field, southwest Queensland
10

B.J. Evans, B.F. Oke, M. Urosevic and K. Chakraborty
A comparison of physical model with field data over Oliver Field, Vulcan Graben
26

I.F. Young, T.M. Schmedje and W.F. Muir
The Elang oil discovery establishes new oil province in the eastern Timor Sea (Timor Gap Zone of Cooperation)
44

S.I. Mackie and C.M. Gumley
The Dirkala South oil discovery: focussing on cost-efficient reservoir delineation
65

M.G. Cousins
Geophysical optimisation of the Mackerel Field re-development—Gippsland Basin, Australia
79

S.I. Mackie, C.A. Grasso and S.R. McGuire
Reservoir characterisation of the Toolachee Unit ‘C’ in the Moomba/Big Lake area: focussing on minimising risk
92

M.R. Kamali, N.M. Lemon and S.N. Apak
Porosity generation and reservoir potential of Ouldburra Formation carbonates, Officer Basin, South Australia
106

T.N. Magner
Economic benefits of the Kutubu reservoir management strategy
121

P.J. Boult, P.N. Theologou, G.A. Johnson and M. Carbone
Probe permeability studies for better reservoir unit evaluation with examples from the Tirrawarra Sandstone, Cooper Basin and the Murta and McKinlay Members, Eromanga Basin
132

S.R.J. Clinch, P.J. Boult and R.A. Hayes
The importance of wettability and wettability testing methods used in the oil industry
143

SECTION 2
Exploration geology and geophysics
J.D. Gorter and A.S. Kirk
The Kimmeridgian marl in the Timor Sea: relevance to regional and geological evolution and possible hydrocarbon plays
152

J. K. Davidson
Globally synchronous compressional pulses in extensional basins: implications for hydrocarbon exploration
169

S.N. Apak, W. J. Stuart and N.M. Lemon
Compressional control on sediment and facies distribution, SW Nappamerri Syncline and adjacent Murteree High, Cooper Basin
190
<table>
<thead>
<tr>
<th>Authors</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>M. A. Smith and I.F. Donaldson</td>
<td>The hydrocarbon potential of the Duntroon Basin</td>
<td>203</td>
</tr>
<tr>
<td>G.W. O'Brien and E.P. Woods</td>
<td>Hydrocarbon-related diagenetic zones (HRDZs) in the Vulcan Sub-basin, Timor Sea: recognition and exploration implications</td>
<td>220</td>
</tr>
<tr>
<td>M.I. Ross</td>
<td>Influence of plate tectonic re-organisations and tectonic subsidence on the Mesozoic stratigraphy of northwestern and southeastern Australia: implications for sequence stratigraphic analysis</td>
<td>253</td>
</tr>
<tr>
<td>S. Ryan-Grigor and J.P. Schulz-Rojahn</td>
<td>Seismic delineation of structure-controlled carbonate cement and potential economic implications, Angel Field, North West Shelf.</td>
<td>280</td>
</tr>
<tr>
<td>J.S. Rasidi</td>
<td>Depositional sequence of the Withnell Formation, Dampier Sub-basin</td>
<td>296</td>
</tr>
<tr>
<td>R. Moussavi-Harami and D.I. Gravestock</td>
<td>Burial history of the eastern Officer Basin, South Australia</td>
<td>307</td>
</tr>
<tr>
<td>P.W. Baillie and E. Jacobson</td>
<td>Structural evolution of the Carnarvon Terrace, Western Australia</td>
<td>321</td>
</tr>
<tr>
<td>G.R. Beardsmore and P.B. O'Sullivan</td>
<td>Uplift and erosion on the Ashmore Platform, North West Shelf: conflicting evidence from maturation indicators</td>
<td>333</td>
</tr>
<tr>
<td>J. W. Beeston, O. Dixon and P.M. Green</td>
<td>Depositional history of the southern Taroom Trough, Queensland</td>
<td>344</td>
</tr>
<tr>
<td>R. Lovibond, R.J. Sutill, J.E. Skinner and A.N. Aburas</td>
<td>The hydrocarbon potential of the Penola Trough, Otway Basin</td>
<td>358</td>
</tr>
<tr>
<td>P.A. Arditto</td>
<td>The eastern Otway Basin Wangerrrip Group revisited using an integrated sequence stratigraphic methodology</td>
<td>372</td>
</tr>
<tr>
<td>C.D. Cockshell, G.W. O'Brien, A. McGee, R. Lovibond, D. Perincek and R.Higgins</td>
<td>Western Otway Crayfish Group troughs</td>
<td>385</td>
</tr>
<tr>
<td>J.D. Foster and A.J. Hodgson</td>
<td>Port Campbell reviewed: methane and champagne</td>
<td>418</td>
</tr>
<tr>
<td>G.T. Cooper</td>
<td>Seismic structure and extensional development of the eastern Otway Basin—Torquay Embayment</td>
<td>436</td>
</tr>
<tr>
<td>D. Perincek and C.D. Cockshell</td>
<td>The Otway Basin: Early Cretaceous rifting to Neogene inversion</td>
<td>451</td>
</tr>
</tbody>
</table>
Mesozoic tectonics of the Otway Basin region: the legacy of Gondwana and the active Pacific Margin—a review and on-going research
467

R.R. Hillis, S.A. Monte, C.P. Tan and D.R. Willoughby
The contemporary stress field of the Otway Basin, South Australia: implications for hydrocarbon exploration and production
494

A.J. Buffin, A.J. Sutherland and J.A. Gorski
Gas detection in the onshore Otway Basin using array sonic waveform data
507

D. Padley, D.M. McKirdy, J.E. Skinner, R.E. Summons and R.P. Morgan
Crayfish Group hydrocarbons—implications for palaeoenvironment of Early Cretaceous rift fill in the western Otway Basin.
517

B.M. Little and S.E. Phillips
Detrital and authigenic mineralogy of the Pretty Hill Formation in the Penola Trough, Otway Basin: implications for future exploration and production.
538

N.J. Moriarty, R.J. Taylor and G.J. Daneel
The Sawpit structure—evaluation of a fractured basement reservoir play in the Otway Basin
558

SECTION 4
Petroleum geochemistry

C.J. Boreham
Origin of petroleum in the Bowen and Surat Basins: geochemistry revisited
579

R.E. Summons, C.J. Boreham, C.B. Foster, A.P. Murray and J.D. Gorter
Chemostatigraphy and the composition of oils in the Perth Basin, Western Australia
613

P.F. Greenwood and N. Sherwood
A review: organic geochemical studies by laser pyrolysis mass-spectrometry and how they compare with flash pyrolysis mass-spectrometry studies
633

SECTION 5
Drilling, testing and production technology

H. Crocker, J.H. Hann, P.B. Hall
Some recent advances in wireline testing
646

D. C. Lowry
Fighting fractured Flamingo—lessons from Rambler-I, Timor Sea
655

K.C. Hunter
The Griffin Field development
666

C.P. Tan, E.M. Zeynaly-Andabily and S.S. Rahman
The effects of drilling fluid-shale interactions on well-bore stability
678

D.G. Crosby, D. Tamhane, Z. Yang, A.K. Khurana and V.A. Kuuskraa
A review of the US tight gas industry from the perspective of selected Australian and New Zealand basins
692
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acidizing kinetics and its application to planning and optimisation of reservoir stimulation and formation damage removal</td>
<td>707</td>
</tr>
<tr>
<td><strong>SECTION 6</strong></td>
<td></td>
</tr>
<tr>
<td>Commercial and legal</td>
<td></td>
</tr>
<tr>
<td>A. Capito</td>
<td>716</td>
</tr>
<tr>
<td>Adding value from a taxation perspective</td>
<td></td>
</tr>
<tr>
<td>N.G. Johnson</td>
<td>719</td>
</tr>
<tr>
<td>Comparative funding consequences of large v. small gas-fired power generation units</td>
<td></td>
</tr>
<tr>
<td>M. L. Standen</td>
<td>725</td>
</tr>
<tr>
<td>When venturers disagree: strategies for resolving conflict</td>
<td></td>
</tr>
<tr>
<td>M.S. Sandman</td>
<td>732</td>
</tr>
<tr>
<td>Due diligence—a legal compliance program</td>
<td></td>
</tr>
<tr>
<td>A. Ikin</td>
<td>737</td>
</tr>
<tr>
<td>Getting value out of non-operator audits</td>
<td></td>
</tr>
<tr>
<td>D.C. Shimko</td>
<td>740</td>
</tr>
<tr>
<td>Can risk management add value?</td>
<td></td>
</tr>
<tr>
<td>P.A. Kasian</td>
<td>751</td>
</tr>
<tr>
<td>Measuring the economic performance and value of companies</td>
<td></td>
</tr>
<tr>
<td>T. Bednall</td>
<td>757</td>
</tr>
<tr>
<td>Competition laws in the Cooper Basin</td>
<td></td>
</tr>
<tr>
<td>D. Crawford</td>
<td>766</td>
</tr>
<tr>
<td>The New Zealand petroleum industry's experience under the Resource Management Act</td>
<td></td>
</tr>
<tr>
<td>E. Vickery</td>
<td>774</td>
</tr>
<tr>
<td>Native Title: its effects on petroleum exploration</td>
<td></td>
</tr>
<tr>
<td>P.D. Slattery and G. Radford</td>
<td>783</td>
</tr>
<tr>
<td>The enforceability of typical JOA default provisions</td>
<td></td>
</tr>
<tr>
<td><strong>SECTION 7</strong></td>
<td></td>
</tr>
<tr>
<td>Education, health, safety and environment</td>
<td></td>
</tr>
<tr>
<td>B.W. Mattes and C. Walters</td>
<td>792</td>
</tr>
<tr>
<td>Design and implementation of a safety, health and environment management system in BHP Petroleum</td>
<td></td>
</tr>
<tr>
<td>M.R. White</td>
<td>805</td>
</tr>
<tr>
<td>Integrated approach leads to successful 3D seismic acquisition on Barrow Island</td>
<td></td>
</tr>
<tr>
<td>D.A. Cole</td>
<td>813</td>
</tr>
<tr>
<td>Environmental law regimes—petroleum operations in Australia's offshore areas</td>
<td></td>
</tr>
<tr>
<td>I. Stejskal</td>
<td>822</td>
</tr>
<tr>
<td>Exploration in sensitive areas: convincing the community</td>
<td></td>
</tr>
<tr>
<td>Author</td>
<td>Title</td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>D.J. Blackmore</td>
<td>Oil spill preparedness: the oil industry and the national arrangements</td>
</tr>
<tr>
<td>J.A. Mazzone</td>
<td>School–industry links: a value adding process</td>
</tr>
<tr>
<td></td>
<td><strong>SECTION 8</strong></td>
</tr>
<tr>
<td></td>
<td>Corporate exploration and production strategies</td>
</tr>
<tr>
<td>S.T. Baker</td>
<td>Foreign investors and corporations sharpen focus on Australia</td>
</tr>
<tr>
<td>R.J.P. Doran</td>
<td>Command Petroleum—home and away</td>
</tr>
<tr>
<td>A.C. Clifford</td>
<td>Replacing Bass Strait—BHP Petroleum's global quest, 1970 to 1994</td>
</tr>
</tbody>
</table>
The 1995 APEA Conference Sponsors

Principal Sponsor
JB Were & Son

Satchel Sponsors
SAGASCO Resources Limited

The APEA Journal Sponsor
Santos Limited

Supporting Sponsors
Conference Pens and Pads
Business Centre
Conference Lunch
Coffee Breaks
Continuous Coffee
Wine
Ice Breaker Marquee

Parker & Parsley Australasia Ltd
Konica Business Machines Australia Pty Ltd
Ampolex Limited
Esso Australia Limited
Apache Energy Limited
Southcorp Wines Pty Ltd
Santos Limited

Technical and Commercial Session Sponsors
Command Petroleum Holdings NL
Discovery Petroleum NL
Enterprise Oil Exploration Ltd
Energy Research & Development Corporation
Geotechnical Services Pty Ltd
Kufpec Australia Pty Ltd
Labrador Petro-Management Ltd

Ice Breaker Sponsors
Chevron Asiatic Ltd
Crusader Limited
LETService Pty Ltd
Magellan Petroleum Australia Limited

Bookmark advertiser
AGL Limited

Journal advertiser
Attwood Oceanics Australia Limited (Page 189)

APEA also extends its thanks the following companies and institutions for their financial contribution to the publication of the journal:

ABBREVIATIONS

American Association of Petroleum Geologists  
American Geological Institute  
American Petroleum Institute  
Association of Australasian Palaeontologists  
Australasian Institute of Mining and Metallurgy  
Australian Bureau of Agricultural and Resource Economics  
Australian Geological Survey Organisation  
Australian Government Publishing Service  
Australian Institute of Marine Science  
Australian Institute of Petroleum  
Australian Mining and Petroleum Law Association Limited  
Australian Society of Exploration Geophysicists  
Australian Petroleum Exploration Association  
Blackwell Scientific Publications  
Bureau of Mineral Resources  
Bureau of Resource Sciences  
Environment Institute of Australia  
Canadian Society of Petroleum Geologists  
Commonwealth Scientific and Industrial Research Organisation  
Geological Survey of Papua New Guinea  
Geological Society of America  
Geological Society of Australia  
Geological Society of London  
Geological Survey of South Australia  
Geological Survey of Victoria  
Institute of Engineers Australia  
Department of Mines and Energy South Australia  
National Environmental Law Association  
National Centre for Petroleum Geology and Geophysics  
Northern Territory Geological Survey  
Petroleum Exploration Association of New Zealand  
Petroleum Exploration Society of Australia  
Queensland Department of Resource Industries  
Queensland Geological Survey  
Royal Australian Chemical Institute  
Society of Core Analysts  
Society of Petroleum Engineers  
Society of Petroleum Well Log Analysts  
Victorian Institute of Marine Science  
WA Mining and Petroleum Research Institute  
Western Australian Geological Survey  

APA  
AGI  
API  
AAP  
AusIMM  
ABARE  
AGSO  
AGPS  
AIMS  
AIP  
AMPLA  
ASEG  
APEA  
BSP  
BMR  
BRS  
EIA  
CSPG  
CSIRO  
GSPNG  
GSA  
GSAm  
GSa  
GSL  
GSSA  
GSV  
IEA  
MESA  
NELA  
NCPGG  
NTGS  
PEANZ  
PESA  
QDRI  
QGS  
RACI  
SCE  
SPE  
SPWLA  
VIMS  
WAMPRI  
WAGS