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GEOLOGICL NOTES

Occurrence of Romeite at Tai Lee Mine, Sg. Siput Utara, Perak

P.C. Leong and F.L. Yap, Geological Survey of Malaysia, Ipoh, Malaysia

As far as is known, no previous occurrence of romeite in Malaya has been reported, although stibiconite and romeite have been encountered in Sarawak. Attention was first drawn to the mineral through a dark green, fairly hard pebble being sent to the Geological Survey for identification by the owner of Tai Lee Mine near Sg. Siput. The specimen was found among the gravel on the mine floor.

The Tai Lee Mine is operating as a gravel pump mine now, but in the past, at the beginning of the century, the area has been worked as a lode mine known as Loke Yew's Lode. The Lode occurred as a network of small tin-bearing veins in chert and shale. A brief description has been given by Savage (1937).

The unknown mineral was recovered, together with cobbles and boulders of country rock containing veins of cassiterite. The romeite is in the form of pebbles ranging from 3cm in diameter to lumps of 6cm x 8cm x 7cm and varying in color from yellowish green to chocolate brown, presumeably depending on the Fe^{2+} and Fe^{3+} contents. It is often veined and encrusted with iron oxides. Specific gravity is about 5.1; and hardness about 6. The mineral is isotropic and in microsection is observed to be made up of an aggregate of extremely minute grains.

A Debye-Scherrer powder photograph shows the strongest 14 lines to be very close to those of titanian romeite on the ASTM cards (see Table I).

However, chemical analysis shows the mineral to have the following composition.

Na_2O	4.80%
K_2O	0.30
CaO	16.40
MgO	0.11
PbO	trace
MnO	0.16
FeO	3.05
Fe_2O_3	1.36
Al_2O_3	0.38
TiO_2	trace
Sb_2O_5	71.65
As_2O_5	0.85
F	0.28
H_2O^+	0.30
	99.64
Less F = O	0.11
	99.53

Specific Gravity 5.16

It will be noted that the titanium content is only in trace quantity while the sodium content is 4.80%, indicating that the mineral should be regarded as a sodium romeite. No powder diffraction data on sodium romeite is available at the Geological Survey for comparison, but it appears reasonable to assume that the d spacing values will not be vastly different from those of titanian romeite.

It is not easily explained how the romeite had originated as other antimony minerals have so far not been found at Tai Lee Mine. However jamesonite has been known to occur in the Sungei Siput area. It is intended that further investigations will be conducted in the mine, this note being merely a preliminary report of findings to date.

REFERENCE

SAVAGE, H.E.F., 1937, The Geology of the Neighbourhood of Sungei Siput, Perak, Federated Malay States, with an Account of the Mineral Deposits. Geological Survey, Memoir No. 1.

Table I

X-ray Diffraction Data
14 strongest lines indexed

Relative Intensities I/I' + Unknown Mineral	d Spacing	Relative Intensities I/I' * Titanian Romeite (ASTM)	d Spacing
25	5.84	20	5.84
20	3.08	30	3.08
100	2.94	100	2.94
15	2.55	30	2.55
90	1.813	100	1.813
85	1.548	100	1.548
20	1.337	30	1.337
25	1.179	50	1.179
20	1.150	50	1.150
15	1.050	50	1.050
25	0.989	50	0.989
60	0.870	50	0.870
35	0.858	50	0.858
15	0.814	50	0.814

\+ Cu target, Ni filter 30kV and 26mA. Exposure 3 hours
* Cu target, Ni filter.

The Changing Exploration Scene in Australasia*+

Leslie R. Beddoes, Jr., Cities Service East Asia, Inc, Singapore

Petroleum and mineral exploration in Australia, Papua New Guinea and New Zealand are currently undergoing changes brought about by an interplay of political and economic factors.

Australia is marking time and taking a step or two backward, while a new Labor Government prepares their new set of exploration rules.

Papua New Guinea, approaching independence as a nation, presents a climate of uncertainty as near-term internal struggles mask long-term policies within a country of substantial natural resource potential.

New Zealand's change is far more subtle and toward the progressive. An expanding economy, guided by stable government policies is looking for indigeneous mineral power sufficiency and possible export markets.

We, the explorers, are directly effected by any such increase or decrease in exploration requirements, due to economic timing and/or political rules. To a large degree, the interplay of politics and economics creates the exploration cycles with which we are so familiar, and over which we have little control.

Let us now review each country, separately, in regard to: its political climate, economics of exploration and developement, and current exploration activity.

AUSTRALIA

Political Situation:

Australians elected a new government, the Labor Government, into power in early December, 1972, replacing the Liberal Government who had ruled for the past 23 years. Labor's nationalism and socialism policies, well announced prior to the election, have drawn loud cries of concern from private enterprise and State Governments. New Labor policies have had some harsh effects upon exploration and development of petroleum and minerals in their establishment of:-

(a) Federal control over export of all mineral and energy resources; e.g. approval of export projects, product prices, and corporate composition of exporting companies;

* Address delivered to Geological Society of Malaysia - July 6, 1973

+ The opinions expressed in this paper are solely those of the author and not the Society.

(b) Federal control of oil and mineral exploration rights for all offshore areas. These rights are now held by each State.

(c) Federal control over all pipelines carrying oil and natural gas, both onshore and offshore.

(d) A National Minerals and Petroleum Authority to explore for, produce, refine, and transport petroleum and minerals.

(e) A conservation policy for energy fuels and minerals to satisfy projected needs of Australia.

(f) A decrease of foreign investment and participation in all exploration and development ventures involving natural resources. The Minister for Minerals and Energy recently quoted that 62% of Australia's minerals and 70% of her crude oil and natural gas are owned or controlled by foreign companies.

The Government is seriously contemplating a production-sharing type of venture for future exploration. Since many of Labor's policies are in direct conflict with the previous system, a certain amount of time is needed to implement the new concepts and to set-up, staff and run the large, newly created Government agencies. In the meantime, the Labor Government has imposed the following restrictions on exploration:-

(a) The Labor Government has not and will not approve any farmout/farmin proposals on petroleum or mineral exploration leases anywhere in Australia where the company involved in the farmin is foreign owned or controlled.

(b) To restrict foreign capital from entering Australia for exploration or development projects, a 25% deposit of all foreign "loan" capital is required to be placed with the Federal Reserve Bank for a two year period, interest free. Overseas finance for domestic enterprises may be channelled through the Australian Industries Development Corporation (AIDC) and avoid this 25% deposit.

(c) Generation of local risk capital for Australian explorers was discouraged early this year, when the Government announced that it was disallowing tax deductions for private or corporate investors in exploration ventures.

(d) The Government's financial assistance to explorers through the 1957 Petroleum Search Subsidy Act is also to terminate, effective June 30, 1974.

Labor's timing is critical, and directed toward two important events. The first is "offshore acreage relinquishments". One-half of each offshore lease around Australia will be turned-back to a government body for re-distribution from mid-1974 through mid-1976. The Labor Government wants this acreage returned to a Federal body, rather than to each State, as would now be the case.

The second important event is another scheduled Federal election, in late 1975, where Labor must show some results for their new policies.

Economic Factors of Exploration and Development Projects

Within this changing political climate, the economics of exploration ventures within Australia are currently not favorable and do not encourage new exploration interest. However, many of these factors are held-over from the previous Government's policies. A few brief elements of product pricing, costs, taxes and royalties are as follows:-

1. Crude Oil Pricing within Australia is set at a price schedule determined in 1968, by the previous Government to be effective until September 1975. The current price of Bass Strait oil is US$2.94/bbl. (F.O.B. loading terminal). This is about 70 - 80 cents below import parity and the producers have long been requesting a price rise for indigeneous crude.

   Natural Gas Prices have been fixed through tough negotiation between producers and government agencies. Profit margin is small and, consequently, little risk capital is being generated.

   Mineral Prices are somewhat better, and appear to be based upon competitive world market prices. Several iron-ore and coal contracts have been re-negotiated to recover contract prices lost in the recent U.S. Dollar devaluation.

2. Exploration costs are relatively high due to remoteness of many of the operations, and lack of available services and equipment to create a competitive climate.

3. Royalty for oil and gas is basically 10%, but has been increased to 12½% in several Bass Strait fields as an alternative to production lease relinquishment.

4. Current taxes are 47½% on produced income, after all allowable exploration costs have been deducted.

Current Exploration Scene

The effects of political reorganization of natural resources along with lack of favorable exploration economics, have had a predictable dampening effect upon exploration activity. Most petroleum exploration activity is centered on the Northwest Shelf, where 4 rigs are currently active and 3 more will be working here before the end of 1973.

Since 1968, the Northwest Shelf has increasingly proved to be a major hydrocarbon province. With an approximate success ratio of 1 in 4, compared to the North Sea's reported in 1 in 25 ratio, some 19+ trillion cubic feet of gas and 700+ million barrels of oil and condensate have so far been discovered in 5 fields.

Mineral Exploration and development of new ventures have also been slowed down by the restriction of foreign capital and uncertainties of government policies. The Government's close look at all deals involving foreign participation has "shelfed" many large project proposals.

PAPUA NEW GUINEA

Political Situation

With encouragement from the United Nations and Australia, Papua New Guinea is on the verge of independence. In the current timetable of events, Papua New Guinea should be self-governing by the end of 1973. Independence should follow soon after, from mid-1974 to early 1975.

As with so many emerging nations, Papua New Guinea has serious internal problems. Struggles are currently in progress for land rights, as well as political power, with the concept being that the land held at the time of independence will be honored by the new government. Tension and conflicts are intensifying as time for independence approaches.

The Government party in power appears to be solidly based, and general guidelines have been proposed for mineral and petroleum exploration and development. These are favorable, since Papua New Guinea is eager to encourage projects using local labour and generating substantial income.

Australian and international companies are currently heavily involved in mining and petroleum ventures in Papua New Guinea, and the Australian Bureau of Mineral Resources is completing geological and geophysical investigation of Papua New Guinea's natural resources.

Economic Factors

Papua New Guinea is still tied to Australia's economic and exploration policies. However, their Administrator has recently showed autonomy by further encouraging various exploration projects. Exploration companies are concerned about post-independence policies, but those close to the situation are optimistic. It is speculated that Papua New Guinea may also adopt a production-sharing concession agreement for petroleum exploration, similar to that in operation in many other parts of Southeast Asia. Papua New Guinea does not have any oil or gas production todate, but does have substantial copper production at Bougainville.

Major economic factors in Papua New Guinea, are high costs of exploration projects (due to the geography, complex geology, and operational and logistical support required) - and the magnitude of success necessary to create a viable project. Papua New Guinea has small internal needs for natural resources and would probably export most minerals and petroleum discovered there. Officials have, however, expressed a distinct desire to internally process natural resources to the maximum extent prior to export.

Farmouts have not been frozen in Papua New Guinea, and several companies are actively seeking partners to assist evaluate their acreage while subsidy is still in effect. Also, Papua New Guinea does not have the 25% surcharge on incoming capital, as does Australia.

Current Exploration Scene

Since petroleum subsidies will remain in effect for projects completed before 30 June, 1974, there has been a recent rush of petroleum exploration activity. This follows abundant seismic work completed during the past few years. Mineral evaluation work is also increasing in various parts of Papua New Guinea, mainly by large Australian and international companies.

NEW ZEALAND

Political Situation

A Labor Government came into power in New Zealand in October, 1972. Reforms made by this government were progressive and the country is enjoying a booming economy. Mining and petroleum legislation has been updated and export policies decided for natural resources.

Economic Factors

New Zealand has a relatively small internal market for natural resources and is looking for export situations to improve her trade balance. It is an energy rich country with hydro-electric power, thermal power, abundant coal reserves and natural gas.

New Zealand's old mining and oil legislation contained long lease terms, liberal work obligations, and low royalties (5% on petroleum) but these were made more strigent by recent legislation. Exploration costs are about comparable to those in Australia. New Zealand does not discourage foreign investments; however, strictly controls the percentage of generated profits that can be repatriated.

In a new-type of involvement, the New Zealand Government announced a few months ago that they would buy one half-interest in the offshore Maui gas-condensate field, discovered by Shell-BHP-Todd in 1969, and will then be 50-50 partner for its development.

Current Exploration Activity

Onshore petroleum exploration is relatively inactive, reflecting lack of quality prospects and a long history of exploration effort.

Offshore exploration, however, shall shortly enter a second cycle of exploration drilling when Hunt Oil's new Penrod 74, semi-submersible reaches New Zealand late this year for at least a four well program off the southeast coast of New Zeland. Other offshore operators, with defined prospects, may either use Hunt's rig or bring in another for several additional wells during 1974.

Mineral exploration in New Zealand is increasing in tempo, as the price of minerals increases and a favorable framework for exploration is maintained.

SUMMARY

In Australia, the new Labor Government is effectively nationalizing their natural resources. Their policy is to: "buy-back Australia" from foreign interests, get directly involved in exploration, and conserve natural resources to fulfill Australia's future needs.

Australia's "shut-down" attitude has, and will continue to, shift oil and mineral exploration companies, and experienced personnel into regions where exploration is encouraged. It is interesting to note that

even Australian oil and mineral explorers, as well as the international companies, are increasing their exploration effort outside of Australia.

Areas such as Southeast Asia, where so many participation opportunities are evolving, will benefit from Australia's current attitude. Discovery of major natural resources in Southeast Asia could also fulfill some of the market potential counted on by Australian explorers.

In Papua New Guinea, the transition from territorial rule to self-rule to national independence, presents a challenging set of circumstances. Internal and external pressures are at play on the revolving nebula forming this new nation. It is anticipated, however, that an increasingly unified Government will emerge to continue a reasonable environment for exploration.

New Zealand is changing gears toward a more progressive and pressing attitude for development of its natural resources. This attitude has and will continue to encourage exploration for oil and gas, and for minerals.

Exploration companies and explorationists are predictibly responding to these changes, with flexibility learned early in each of our careers. Exploration, no matter how aesthetic we conceive it to be, is commercially guided by the interplays of international and internal politics, and economics of the time.

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Abstracts of Papers: GSM Seminar on Mineral Exploration and Evaluation, 8th September 1973

The performance of the Bangka drill under offshore conditions and some problems associated with bore-hole evaluation

Choo Mun Keong, Associated Mines (M) Sdn. Bhd., Selangor

Investigations into the performance of the conventional Bangka drill under offshore conditions off the west coast of Thailand revealed that the drilling system has some inherent mechanical limitations. Overall ground sample and cassiterite recoveries were found to be generally poor and erratic.

The low volume recoveries presented problems in the accurate determination of bore-hole grade and three possible methods of grade determination are outlined.

Further investigations into the problem of cassiterite and ground sample recovery using a modified Bangka drill incorporating a flushing unit showed that significant quantities of cassiterite and ground sample were recovered on flushing those bore-holes which were considered to be "adequately bottomed and cleaned" by conventional Bangka drilling. The results of a test programme in which 18 bore-holes drilled by the conventional Bangka system were subsequently flushed for any remaining material indicated that sampling of an individual bore-hole by conventional Bangka drilling was not truly representative as the failure to recover total cassiterite was not balanced by a proportional loss in ground sample. The weighted average grade of the 18 bore results obtained by conventional Bangka drilling was however approximately equal to the weighted average of the grades based on the total cassiterite and ground sample recovered by combined conventional Bangka drilling and flushing; hence, on average, a reasonably reliable average grade estimate was still obtainable by conventional Bangka drilling.

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Evaluation of alluvial deposits by homogeneous blocking

Lee Whye Kwong, Associated Mines (M) Sdn. Bhd., Selangor

Following a study of the evaluation methods practised in the Associated Mines group of companies, a new approach to ore compilation has been evolved placing particular emphasis on the geological and metallurgical aspects of the area being evaluated. The method involves the division of the area under considerations into geological blocks which are homogenous in respect of such parameters as vertical and lateral mineral distribution, bedrock topography, bedrock type, depth, etc. Stress is laid on the determination of recoverable reserves.

Though the evaluation method is particularly designed for dredging operations over pinnacled limestone, it is equally applicable in open-cast mining operations and in different bedrock environments.

A final ore reserve block plan is produced showing detailed information useful for short and long term mine planning, facilitating fairly quick re-evaluation on account of changes in dredge course, dredging

depth, etc. and, in new projects, for economic investigations to ensure the best investment return.

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The Determination of Free Tin Content in Bore-hole Concentrates

C.H. Yeap, Jabatan Geologi, Universiti Malaya, Malaysia

Sediments cored from dill-holes are normally washed and dressed into a cassiterite concentrate and a discard heavy mineral (amang) concentrate. The former is normally assayed direct to give the tin content, while various techniques are used to determine recoverable tin content in the latter.

The practicability of using point-counting to determine tin-content amang concentrates was investigated. Artificial amang samples were made up to simulate actual concentrates from a known prospect. These artificial samples were split into 5 size fractions and point-counted. Weights of cassiterite for each fraction are calculated from the grain-count (volume) percent and specific gravities of the constituent minerals. It is, shown that though the point-count method gives an error of up to 25 percent, this error recalculated to total bore-value is less than one percent, and is a reasonable figure when inaccuracies of the field prospecting method are taken into account. Ease and rapidity of this method calls for its wider practice.

The use of a standard assay figure to report field concentrates is questioned, for this leads to either over-evaluation or under-evaluation as the case may be.

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Biogeochemical Method of Exploration

Tan Teong Hing, Jabatan Kajibumi, Universiti Kebangsaan, Malaysia

The biogeochemical method has rarely been used in this country, as an aid to mineral exploration. The studies, based on the analytical data obtained from the analyses of plant materials collected from certain

parts of the Kledang Range forests (Perak), indicate that there is variation between the metal contents in plants growing close to and within the zones of mineralisation and those removed from the zones of mineralisation. The variation in the metal contents in the plants enables the biogeochemical method to be used in mineral prospecting.

Generally where there is a high metal content in the soils, the plants growing on these soils have a comparatively high concentrations of metals in their tissues. The pattern of the biogeochemical anomalies, therefore has a spatial relationship to that of the geochemical soil anomalies.

Owing to the wide varieties of plant species in the tropical forests, a collective study of the metal content in all the plants in the area provides significant information regarding the pattern of mineralisation in the area.

The biogeochemical studies reveal that plants in the tropical environment behave as normal accumulators particularly towards copper, zinc and lead. The method is, however, not a particularly satisfactory one for the search for concealed tin, tungsten and arsenic deposits.

Leaves of plants are the most suitable biogeochemical samples since they accumulate relatively high concentrations of metals, particularly copper, zinc and lead. Twigs and roots are, nevertheless, suitable since they do give comparable anomalies over areas of mineralisation.

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A Theoretical Study of Gravity Anomalies caused by Limestone Pinnacles

S.H. Chan, Jabatan Geologi, Universiti Malaya, Malaysia

The results of a theoretical study of the gravity anomalies caused by limestone pinnacles are presented. The purpose of this study is to find out what the possibility is in using gravity method of geophysical exploration for mapping limestone pinnacles concealed under a cover of alluvium. A knowledge of the limestone pinnacles with regard to their spatial distribution, sizes, and depths below the ground surface, is of importance to evaluation and mining of alluvial tin deposits in an area in which the limestone pinnacles occur.

In this study gravitational profiles corresponding to two-dimensional models are computed to simulate actual gravity anomalies which might be observed over the limestone pinnacles. Two-dimensional models are used because the computations involved in this case are easier than in the case in which three-dimensional models are employed. It is also found that in this case the analysis of two-dimensional anomalies provides information almost identical to that derivable from the study of anomalies associated with the three-dimensional models.

Study of the densities of limestone and alluvium shows that a density contrast varying from about 0.5 to slightly over 1.0 g/cm^3 exists between the limestone and the alluvium. With such a density contrast, an isolated limestone pinnacle of dimensions, say a height of 60 feet and radii of 10 and 40 feet at the top and bottom respectively, can cause a gravity anomaly detectable by gravity meter with a sensitivity of 0.01 milligal. A number of pinnacles occurring in close proximity to each other produce a much larger gravity anomaly than an isolated pinnacle. Owing to the superposition of gravitational effects of the individual pinnacles, the anomaly associated with such a group of pinnacle has no resolution with regard to the number of pinnacles present and their relative positions. However, when the pinnacles are separated at sufficient distances apart, the presence of each individual pinnacle can definitely be identified from the gravity anomaly.

Computed anomalies associated with pinnacles buried in a deep trough show that such pinnacles are difficult to detect because their gravitational effects are almost completely masked by those caused by the walls of the trough. This is especially true when the density contrast between trough and alluvium is larger than the density contrast between pinnacle and alluvium.

The resolution of a gravity anomaly may be improved by computing the second vertical derivative of the gravity field. The profile of the second vertical derivative computed from the anomaly associated with a pair of pinnacles separated by a small distance apart reveals clearly the position of each pinnacle along the traverse. Other possible techniques for increasing the resolution of gravity data are downward continuation and digital filtering.

Based on the results of this theoretical study one may conclude that gravity method can be utilized for mapping limestone pinnacles provided that the anomalies associated with these pinnacles are of sufficient order of magnitude. However, a word of warning is in order. Great care must be exercised in carrying out the actual field measurements because the anomalies to be expected, as indicated by this study,

are going to be small and can easily masked by 'noises' associated with the observations. Geologic data and data from other sources are necessary for proper interpretation of the gravity measurements.

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A computer programme for the evaluation of placer drilling data

Toh Swee Cheng, Conzinc Riotinto Malaysia Sdn. Bhd., Selangor

The programme is designed to yield the basic data formats necessary for the interpretation and description of placer deposits. Borelog information is processed into master files, for use in an integrated series of computer subprogrammes. This raw information can be modified by subsequent control cords, which may incorporate assay corrections, ground recovery revisions, and changing cutoff decisions by management. Programme reports consist of bore lists, ore reserve summaries, plans and cross-sections, frequency tables, and rolling mean distributions.

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REPORT OF MEETINGS

Annual Convention of the Indonesian Petroleum Association, Jakarta, June 4 and 5, 1973

The second annual convention of the Indonesian Petroleum Association (IPA) was held in Jakarta on June 4 and 5, 1973 and was followed by three field excursions to Java and the south arm of Sulawesi (Celebes). Between 300 and 400 participants heard twenty technical papers, which may be classified as follows:

Six field studies or field area reports:

Arun, N. Sumatra (Mobil)
Jatibarang, Java (Pertamina)
NE Java Fields (Pertamina-Lemigas)
Tarakan, Kalimantan (Tesoro)
Attaka, Kalimantan (Union)
Kasim-Jaya, West Irian (Trend)

Nine regional studies:

Lower-Middle Miocene, N. Sumatra (Pertamina)
S. Sumatra Paleotopography and Sedimentation (Stanvac)
South China Sea Plate Tectonics (AGIP)
Banyumas Area, Java (Pertamina)
SW Java (BEICIP - Lemigas)
Reefs, SW Java (Lemigas)
Java Sea Structure (Pertamina)
Offshore Mahakam, Kalimantan (Total - BEICIP-Lemigas)
Sahul Shelf, Australia (BMR, Canberra)

Five other papers:

Oil Industry in Indonesia (Dept. Mines)
Helicopter Drilling Operations, Central Sumatra (Caltex)
Pipelines, Central Sumatra (Stanvac)
Wax Plant Operation (Pertamina)
Offshore Storage (Chicago Bridge)

Even though fourteen of the speakers were talking in a language not their own, the quality of presentation was high. The quality of the written papers was extraordinarily good, and a large amount of well-organized data was presented.

Oil Field Studies:

Three papers of timely interest to petroleum geologists were the oil field studies of the Arun, Attaka, and Kasim-Jaya fields. Mobil's Arun field is a giant gas-condensate accumulation stratigraphically trapped in a Middle Miocene reef sitting on a north-trending basement high and sealed by marine shales. Although reserve estimates are not available, productive thickness approaches 500 feet and ultimate field size may be in excess of 30,000 acres.

The Attaka field, discovered in 1970 by Union in the East Kalimantan Mahakam delta offshore area, is a major oilfield in an Upper Miocene to Pleistocene deltaic complex. The major accumulations are in delta front sands above and below a delta plain lobe. Trapping is structural. Production of about 100,000 b/d of low sulfur 35°- 43° oil will be attained by the end of 1973.

Petromer-Trend's Kasim and Jaya discoveries in West Irian were described by Richard Vincelette in an outstanding conference paper from the standpoint of both content and delivery. The area offers an elegant demonstration of how a small company was able to make signifi-

cant discoveries by coupling a bold exploration idea with solid geology, acute airphoto interpretation, and a very limited seismic budget. Vincelette was convinced that buried reefs must exist in West Irian much as the Devonian reef play of Alberta. He isolated small fault block areas on airphotos and reasoned that these faults were probably reef flank faults on pinnacle reefs with great vertical extent. A limited but careful CDP seismic program then was used to define drilling locations. The two discoveries to date - Kasim and Jaya - have oil columns of 250-400 feet, calculated porosities of up to 42%, and in-place reserves of up to 2000 bbl/ac. ft.

For a truly fact-packed article on a mature producing region, the Pertamina article on the fields of NE Java is a classic. 150,000,000 bbl. have been produced from Middle Miocene to Pliocene quartz sandstones and calcarenites in some 27 elongate narrow, asymmetric E-W trending anticlines. The fields are classified as to structural subtype and illustrated by maps and cross-sections. Production histories are summarized, basin evolution depicted, and timing of trap formation and oil migration sketched. Tabular data includes year of discovery, cummulative production, peak production, number and depth of wells, areal and vertical closure, number of reservoirs, geometrical information on the anticlines, and remarks on the producing intervals.

Regional Papers:

Regional presentations included two on Sumatra, four on Java and the Java Sea, one on East Kalimantan, and one on the South China Sea. A cardinal feature of the newer work is the resolution of previous stratigraphic problems by the application of the worldwide Tertiary planktonic foraminiferal zonations.

An excellent Pertamina paper on the Lower and Middle Miocene of North Sumatra included new stratigraphic information on 25 wildcat wells, setting into a regional framework the subsurface formations which have been the targets of recent successful drilling: the Arun Limestone and the Alur Siwah Limestone.

Stanvac's discussion of the relationship between paleotopography and Tertiary sedimentation in South Sumatra not only demonstrated the paleogeographic patterns but also included an updated basement map of the area.

A first plate tectonic interpretation of the South China Sea appeare in Dr M. Pupilli's AGIP - sponsored paper. The argument is carefully thought out and documented - including some new data from the South China Sea wells.

In a facies study of the offshore Mahakam delta area, including Attaka and several other major discoveries, the TOTAL-BEICIP-Lemigas group documented in exemplary fashion a prograding Upper Tertiary tropical delta and the locus of oil accumulations within the deltaic setting.

Field Trips:

Three short field excursions followed the presentations of formal papers: SW Java (one day), Central Java (two days) and the South Arm of Sulawesi: (three days).

The field trips were well organized and only led. The quality of the field mapping is quite high and it was a great pleasure to view at first hand areas which had previously been known only through literature.

R.W. Murphy

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Meeting of 7th September: R.W. Murphy and D.E. Karig

A meeting of the Society was held at 8.00 p.m. on the evening of 7th September 1973 in the Department of Geology, University of Malaya. The speakers for the evening was Mr R.W. Murphy and D.E. Karig who both spoke on some aspects of Island Arcs. The meeting was attended by approximately 40 members and ended at 9.45 p.m.

Mr R.W. Murphy of Esso Exploration Inc., Singapore spoke on "Diversity of Island Arcs" with Japan, Philippine and Northern Mollucas as examples of island arcs systems.

Although these three island arcs complexes show many common characteristics, detail studies of their surface geology suggests great diversity in their geological development. Mr Murphy presented geologic and geochronological data which he has interpreted as evidence for long continued but not necessarily continous, subduction at the site of the present day Japanese Islands. Implicit in his discussion is the assumption that the pre-Neogene core of Japan was formerly attached to the Asian mainland and that the Japanese Sea is a marginal sea which has

been created by horizontal separation and insertion of young basaltic crust between Japan and the mainland. The two other arcs, the Philippines and the Northern Mollucas, both relatively young but both composite in nature appear to be in the stage of continental construction out of elements which were originally oceanic in origin.

Most of the materials presented in his talk have already appeared in his paper in The APEA Journal, 1973, pp. 19-25 and members interested in this aspect of the Island Arcs System may request for reprints of this article from the author.

Following Mr Murphy's presentation there was a brief informal talk by Dr D.E. (Dan) Karig of the University of California at Santa Barbara, whose papers on the origin of "marginal basins" are well known to students of plate tectonics. Dr Karig had recently been a participant in Leg 31 of the JOIDES deep sea drilling project in the western Pacific, and was visiting Kuala Lumpur on his way back from the island of Nias, off Sumatra, where he examined a part of the outer, non-volcanic arc of an active island arc system. Dr Karig spoke about the detailed structure of island arcs.

Identifiable structural and topographic subdivisions of an island arc include, starting from the outside, that is the side of the down-going slab: (1) the trench, whose bottom is the site of the actual dislocation plane between the two lithosphere slabs, (2) the inner trench wall, a steep slope formed mainly of deformed sediments, (3) the trench-slope break, which may be expressed as an outer, non-volcanic string of islands, but more commonly as a submarine shoal or even just a break in slope, (4) the shallow basin of the arc-trench gap, which receives sediment mainly from the inner side, (5) the upper slope discontinuity, a major fault or flexure, with the outer side displaced downward, (6) the frontal arc, a mechanically rigid and stable region which may be composed of any sorts of rocks, (7) the volcanic arc itself, and (8) the marginal basin separating the arc system from, in most cases, a continent some distance behind.

Although the basin in the arc-trench gap is shallow, its sedimentary fill may be quite thick (as much as 5 km or more) and commonly is tilted toward the frontal arc, indicating the sense of displacement on the upper slope discontinuity.

The depth of a trench seems to depend on, among other things, the depth of the ocean over the down-going plate (the deeper this is, the deeper the trench); the amount of sediment being supplied to the trench (the more sediment, the shallower the trench); and whether the trench is in a marginal basin or an ocean (oceanic trenches are deeper).

The make-up of the inner trench wall and of trench-slope break are of considerable interest, and at least three varieties can be recognized (1) the "Mariana-Tonga" type, in which little oceanic sediment is supplied, and the inner trench wall consists of slivers of oceanic crust as well as oceanic sediments, forming a 'platform' on which arc-derived sediments can accumulate, (2) the "Sumatra" type, in which much oceanic sediment is supplied, but only limited amounts from the arc, and the thick sediment pile may be pushed up into an actual island chain, with an unfilled basin between it and the frontal arc, and (3) the "Aleutian" type, in which much sediment is supplied from both sides, and the whole region between the frontal arc and the trench-slope break becomes a sedimented platform, the basin being filled.

Some drill holes into the lower part of the inner trench wall made during JOIDES Leg 31 seem to verify the hypothesis that sediments caught in the 'jaws' of the trench bottom are deformed into packets of isoclinally folded (and surprisingly dewatered and compacted) material, which are slid into position in the base of the inner trench wall, pushing up the previous packets, which gradually rotate from a near-horizontal position to steeper and steeper dips, and indicate that the deformation and dewatering take place in a relatively short time.

Preliminary results of JOIDES Leg 31 will appear soon in Nature.

PHS

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GSM Seminar on Mineral Exploration and Evaluation, Kuala Lumpur, September 8th 1973

This seminar was originally scheduled to be held on 4th August but was postponed due to the untimely death of the honourable Deputy Prime Minister of Malaysia, Tun (Dr) Ismail Al Haj. The abstracts of the papers presented at this seminar appear earlier in this Newsletter for the benefit of those members who were not able to attend.

Besides the valuable contributions made by the speakers and other members participating in the discussions which followed each presentation, this meeting is notable on two other counts. For the first time

in the Society's history, a seminar or discussion meeting was held with a theme which is priminarily of interest to the mining community in this country. The presence at this meeting of representative from most of the leading Mining Companies operating in this region, augers well for future undertakings along similar lines. Dr S.H. Chan, the Seminar organizer expressed the hope that other organizations in this country serving the mining community would in future join with the Geological Society in sponsoring more seminars and discussion meetings of this nature.

This meeting is also the first Society function to be held in the Geology Department of the University Kebangsaan. The Society would like to record its appreciation for the use of the excellent facilities and the cooperation of the staff of the University.

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NEWS OF THE SOCIETY

Bulletin 6

Most members and participants at the Conference should have received their free copy of the Proceedings, Regional Conference on the Geology of Southeast Asia. This Bulletin was published at the end of July but due mainly to a shortage of packing material there was some delay in posting them to the various individuals. The Council has decided that all members of the Society (except for Student members category two) would receive a free copy of this Bulletin. This decision was taken mainly in view of the Society's sound financial standing arising largely to the generous donations made to the Society for the Conference and the publication arising from it.

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Membership

2 new Full members and 7 new student members were elected to the Society:

Full members

Graham Moorcroft Miller
c/o Getty Oil Development Co.
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North Sydney, AUSTRALIA

David Leslie Mathias
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Petaling Jaya

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