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**PERSATUAN GEOLOGI MALAYSIA
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CATITAN GEOLOGI (GEOLOGICAL NOTES)

RECOVERY OF TIN BY GEOMICROBIOLOGICAL TECHNIQUES

G.H. TEH, Dept. of Geology, University of Malaya, Kuala Lumpur.

Abstract

The applicability of geomicrobiological techniques for the recovery of tin from tin-containing minerals was investigated using a pure strain of Thiobacillus ferrooxidans and organic agents which include oxalic acid, EDTA and an oxalic-citric acid mixture. Preliminary results show that the bacteria extracted 54.45%, 72.66% and 97.13% Sn from synthetic stannite, kesterite and stannoidite respectively, after 35 days leaching.

Introduction

A possible aspect of the dissolution oxidation of tin minerals, especially the sulphides, in geologic weathering systems, can be attributed to the biochemical weathering processes by the bacteria, Thiobacillus ferrooxidans, and organic agents, which are normally produced during biochemical weathering of rocks, reacting with polyvalent cations in minerals to form metallo-organic complexes or chelates.

A comparative study of the application of microbiological leaching of these minerals in the presence of the organism, Thiobacillus ferrooxidans and organic agents like oxalic acid, tannic acid, tartaric acid, acetic acid, citric acid, lactic acid and EDTA, was prompted by availability of high-grade synthetic specimens, coupled with research interests in the possible pathways of biochemical oxidation of tin minerals in nature and the applicability of the geomicrobiological leach technique in the recovery of tin from these minerals, low-grade tin deposits or extremely complex intergrown grains inseparable by mechanical or other sophisticated beneficiation techniques.

Initial scientific interest in the microorganism, Thiobacillus ferrooxidans, on its original isolation by COLMER and HINKLE (1947), was followed by extensive studies on microbiological processes applicable to the leaching of metals, especially the sulphides, from ores (DUNCAN & TRUSSELL, 1964; TUOVINEN & KELLY, 1974). At present, the commercial application of the microbiological leach technique is generally limited to the extraction of copper and uranium. However, leaching effects of organic agents and of acid-producing, heterotrophic microorganisms (KIEL, 1977; WAGNER & SCHWARTZ, 1969) are still mainly in the laboratory stage and have previously been directed to studies of soil weathering and decomposition of common rock-forming minerals.

Materials and methods

In the present study, the synthetic tin sulphides, herzenbergite (SnS), ottemannite (Sn_2S_3), berndtite (SnS_2), stannite ($\text{Cu}_2\text{FeSnS}_4$), stannoidite ($\text{Cu}_8\text{Fe}_3\text{Sn}_2\text{S}_{12}$) and kesterite ($\text{Cu}_2\text{ZnSnS}_4$), were derived from synthesis in rigid, evacuated, sealed silica glass tubes as described by KULLERUD (1974) and confirmed by X-ray diffraction analysis. Natural

samples of stannite and cassiterite were collected from Hock Leong Mine, Ampang (Selangor) and Eu Tong Seng Mine, Tekka (Perak), respectively.

A pure strain of Thiobacillus ferrooxidans used in this study was originally isolated from the Kambrischer Alaunschiefer, Ranstad, Sweden. It has been routinely maintained on Medium 3K of SILVERMAN and LUNDGREN (1959). This acidophilic, chemoautotrophic bacterium oxidises inorganic compounds of sulphur for energy, assimilates carbon dioxide as the sole source of carbon and requires only inorganic nutrients; nitrogen (as NH_4^+), phosphate, sulphate, magnesium and potassium (TUOVINEN & KELLY, 1972; SOKOLOVA & KARAVAİKO, 1964). Thiobacillus ferrooxidans is capable of ferrous ion oxidation in dilute sulphuric acid solution; the ferric ion resulting is an efficient chemical oxidising agent at acid pH values on both sulphide and oxide ores. Direct attack on sulphides by the bacteria has also been reported (BECK & BROWN, 1968).

On the ideal conditions and parameters for microbiological leaching of tin by Thiobacillus ferrooxidans, it was found that the minus 0.16 mm size fraction, 0.1% pulp density at a temperature of 32°C and pH 1.5 were optimum, and in addition, ferrous iron was necessary in the nutrient medium especially when leaching minerals or ores low in iron (TEH, 1979). A significant trend is the pronounced decrease in tin extraction by the bacteria with pulp densities above 0.5%, due probably to the high tin concentration having an inhibiting effect on the iron-oxidising activity of the bacteria.

In the experiments with organic agents, 0.1 g of the samples were placed in 7.5 ml of 0.05M solutions of oxalic acid, tannic acid, tartaric acid, acetic acid, lactic acid, EDTA and a mixture of 0.1M oxalic and citric acids. Sulphuric acid and distilled water served as controls. The specimens and leaching solutions were previously sterilised separately by autoclaving. The pH values of the reagents at the start and end of the runs were recorded.

Solubilized tin in both experiments was determined by AAS and confirmed colorimetrically (STANTON & McDONALD, 1961).

Results and Discussion

The study confirmed that it is possible to leach tin from both synthetic and natural tin minerals with the help of the bacteria, Thiobacillus ferrooxidans and organic agents. The results of the two leach techniques differ, however, in some ways.

Using -0.16 mm size fraction, 0.5% pulp density, initial pH 1.5 and at 32°C, preliminary results show that the bacteria extracted 31.30% Sn from the natural stannite sample and 2.77% Sn from natural cassiterite (Figs. 1 & 2).

Synthetic quaternary tin sulphides, stannite, kesterite and stannoidite yielded 54.45%, 72.66% and 97.13% Sn respectively. The exceptionally high yields can be attributed to the influence of Cu and Fe (both elements also easily attacked by the bacteria) in the crystal structure as well as the more "reactive" surfaces and absence of "impurities" in synthetic specimens. The simple tin sulphides, herzenbergite, ottemannite and berndtite yielded 1.97%, 2.30% and 2.47% Sn respectively.

On the other hand, the best yield by the most effective organic agent, the oxalic-citric acid mixture, was 27.08% Sn from synthetic herzenbergite after 35 days of leaching with 1.33% pulp density and a final pH of 1.1 (Fig. 3). In the natural samples, stannite yielded 13.68% Sn while 1.54% Sn was extracted from cassiterite over the same period. Generally, besides the oxalic-citric acid mixture, oxalic acid and EDTA at their respective pH values, proved to be also suitable for the geomicrobiological leaching of tin minerals.

An important finding of this investigation is that the micro-organism, Thiobacillus ferrooxidans, was able to dissolve tin quickly from the quaternary sulphides, stannoidite, stannite and kesterite, which are incidentally more abundant in nature than the binary tin sulphides, and to produce relatively high metal concentrations. However, with organic agents, the binary tin sulphide herzenbergite, gave the most effective release of tin. Thus the study indicates the fact that the different forms of geomicrobiological leach techniques affect the different tin minerals investigated differently, a reflection, probably, of both the chemistry and crystallographic structures of these minerals.

Acknowledgements

The author wishes to thank Professor W. Schwartz (Technische Universität, Braunschweig) and Dr. J. Klinkert (Universität Heidelberg) for their guidance on the microbiological techniques, Professor G.C. Amstutz (Universität Heidelberg) for introduction to this field of research and the Deutsche Akademische Austauschdienst (DAAD) for financial support.

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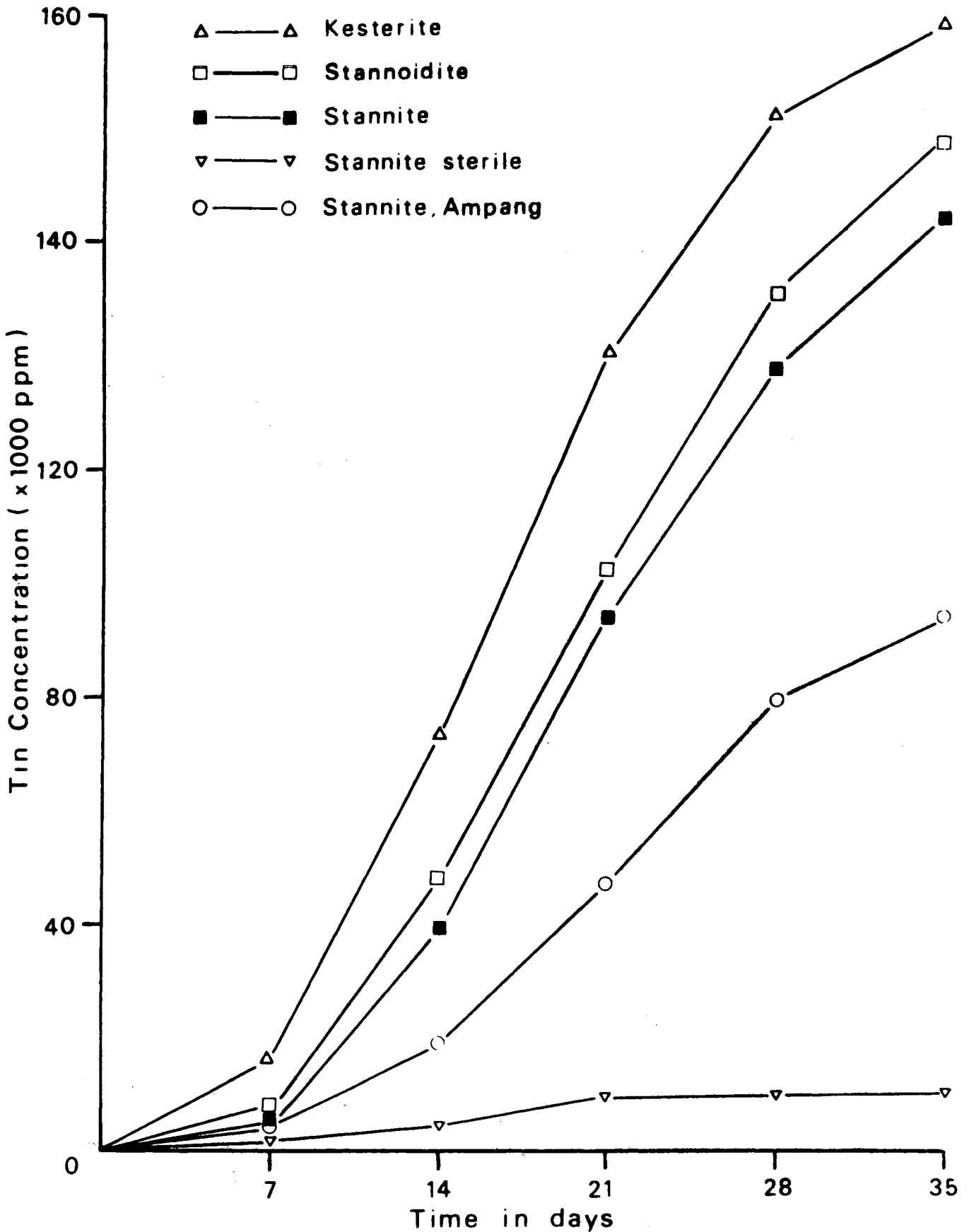


Fig. 1. Leaching of synthetic quaternary tin sulphides, stannite, kesterite, and stannoidite, and natural stannite (Ampang) by *Thiobacillus ferrooxidans* using minus 0.16 mm size fraction, 0.5% pulp density, initial pH 2.5 at 32°C.

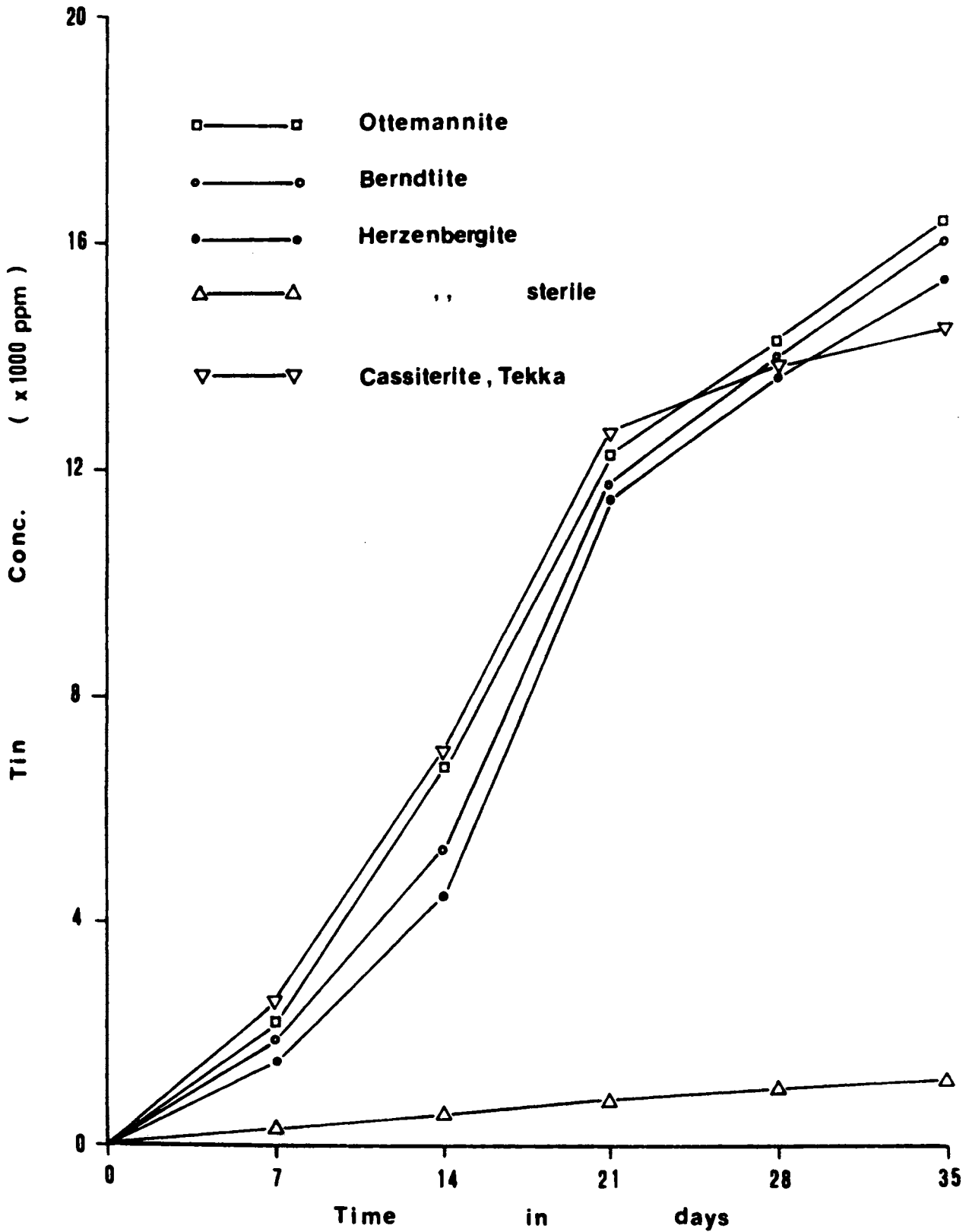


Fig. 2. Leaching of synthetic binary tin sulphides, herzenbergite, ottemannite and berndtite, and natural cassiterite (Tekka) by Thiobacillus ferrooxidans using minus 0.16 mm size fraction, 0.5% pulp density, initial pH 2.5 at 32°C.

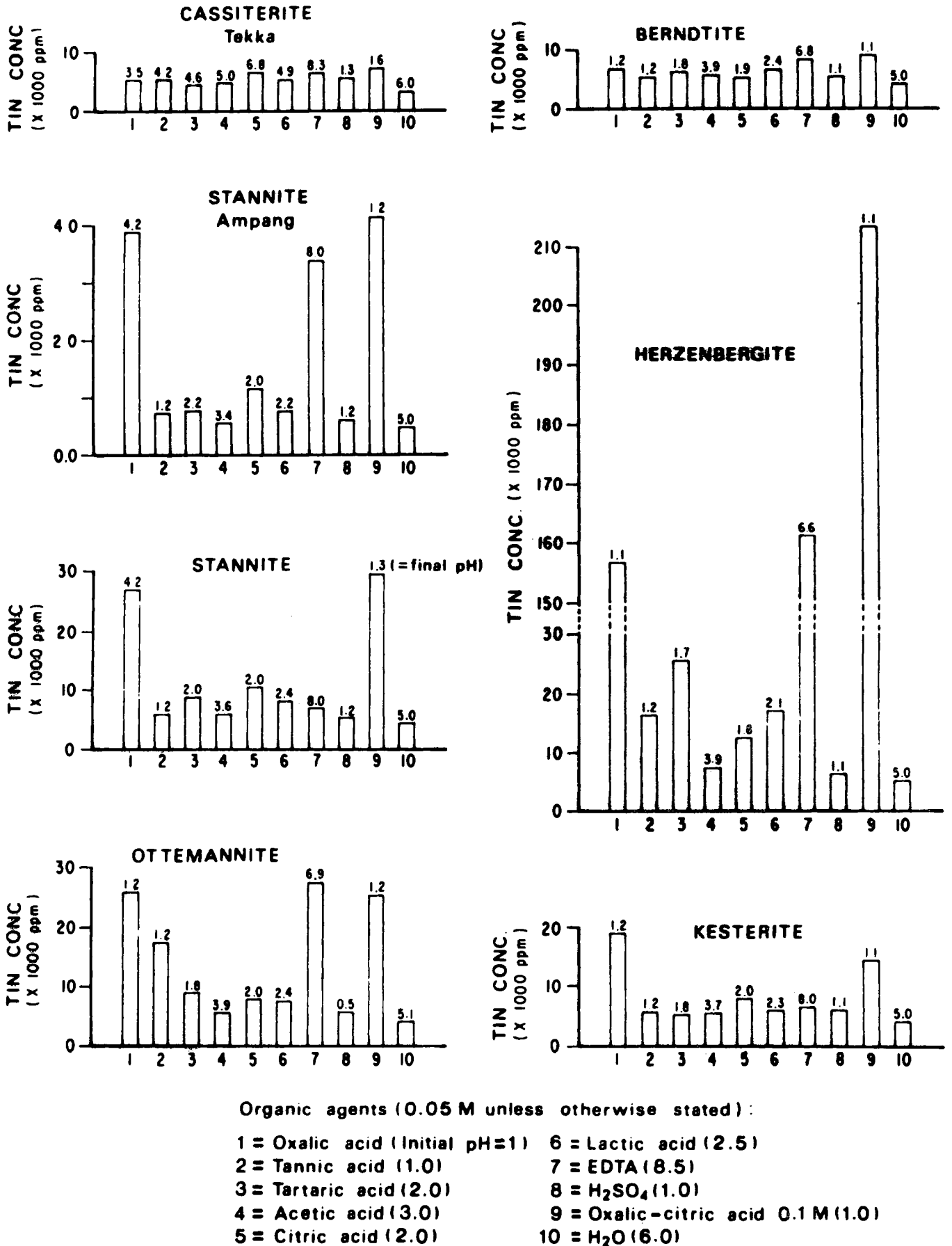


Fig. 3. Leaching of tin from natural and synthetic tin minerals using organic agents. Diagrams derived on 35 days leaching at 32°C using 0.16 mm size fraction with 1.33% initial pulp density solutions.

MESYUARAT PERSATUAN (MEETINGS OF THE SOCIETY)

Third Petroleum Seminar 1979 - Report

In contrast to the 1st and 2nd Petroleum Seminar held in 1977 and 1978, the 3rd Petroleum Seminar held at Merlin Hotel in Kuala Lumpur on 15th December 1979 saw, among the 200 participants, an enthusiastic turnout of a large group of petroleum geologists and geophysicists from the oil industry. Present were explorationists from PETRONAS, PETRONAS Carigali, Shell, Esso, BP, CONOCO, Caltex, Marathon, Aquitaine, Cities Services, Philipps Petroleum and Sun Eastern, together with participants from petroleum exploration service companies like Robertson Research, Schlumberger, Digicon, Exlog, etc.

The 3rd Petroleum Seminar was declared open by Dr. B.K. Tan, President of the Geological Society of Malaysia. In his opening address, Dr. B.K. Tan stressed on the main purposes of the Society in holding the Seminar. These, among other things, included focusing attention on the important role of Geoscientists to the general public in new developments of exploration and exploitation for natural mineral resources, the hope that more Geoscientists will submit papers for publication reporting new geoscience development and research in this region and last but not least, to provide a forum for discussion and exchange of ideas and work towards closer cooperation and links between the various geoscience organisations.

Eight papers covering almost every aspect of petroleum geology were presented at the one-day Seminar. Many of the papers have definitely contributed to the better understanding of the petroleum geology of offshore Malaysia. The theme of the morning session was 'The Decade of Petroleum Exploration and Development in Malaysia'. Two papers, the first by F. Scherer of Sarawak Shell Bhd. and the second by J.H. Armitage of Esso Production Malaysia Inc. summarized the decade of successful exploration, discoveries and development in offshore Sabah and Sarawak and offshore Peninsular Malaysia respectively. In delivering the first paper, Aad Bol of Sarawak Shell Bhd., also gave an insight to the regional geology, tectonic framework, stratigraphy, facies development, hydrocarbon generation and trapping conditions in offshore Sabah and Sarawak which were relevant to the understanding of the exploration play concepts in the region. A geologic account of the Baronia Oilfield in offshore Baram Delta Province - the largest oilfield so far discovered in Sarawak was also presented. In his paper, J.H. Armitage received unbelievable gasps from the audience as the success story of EPMI's exploration record in the Malay Basin - 4 dry wells out of almost 90 drilled - was unfolded. The Malay Basin must surely rank as one of the most prolific hydrocarbon province in the world. An impressive record of commercial discoveries out of 40 structures drilled in the EPMI Contract Area was also presented.

Other papers delivered in the morning session were: one from S. Thompson of Robertson Research on petroleum geochemistry and source rocks studies of samples from 2 wells in Indonesia, and how such studies could aid petroleum exploration; another was by three staff members of Universiti Kebangsaan Malaysia (delivered by Sitaram Garimella) outlining the current research work being carried out on samples supplied by the oil companies and how such work is often met by "frustration and illogical conclusions" as insufficient data were supplied with the samples given. Representatives from Universiti Malaya and Universiti Sains Malaysia also put forward useful suggestions on how to possibly resolve this dilemma.

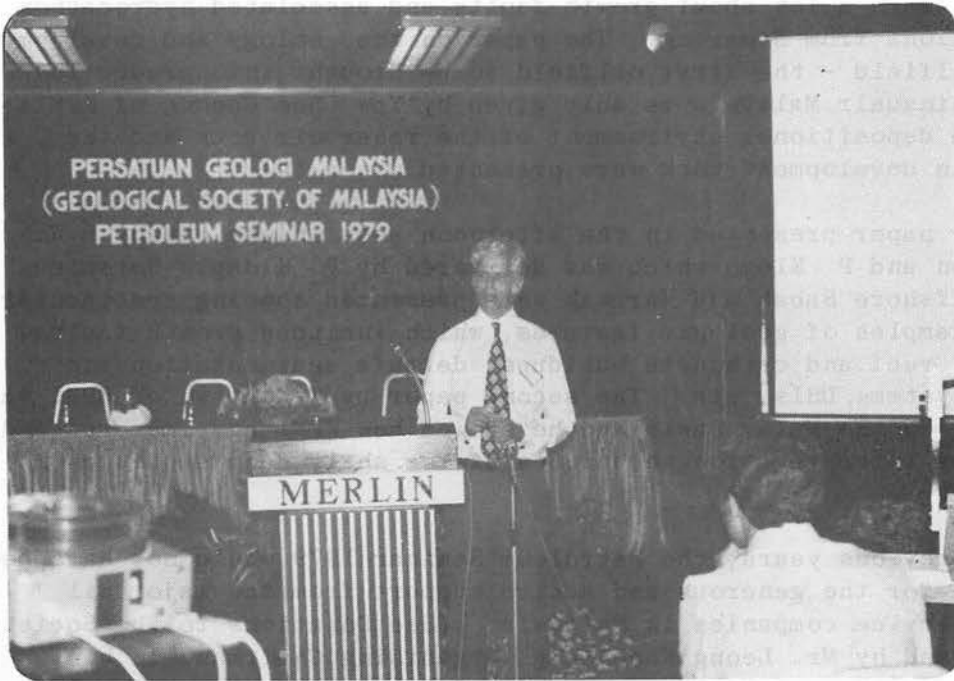


Dr. B.K. Tan, President of GSM delivering the opening address of the 3rd Petroleum Seminar.

Seated L to R: J.H. Armitage, EPMI, Dr. Mohd. Ayob, PETRONAS, A. Bol Shell and Leong Khee Meng, Organising Chairman



Keen participation from the audience during question time.



P. Klomp of Shell describing 'spectacular and textbook' examples of geologic features manifested on seismic section from offshore Sabah and Sarawak.



Yew Chee Cheong of Esso delivering an excellent paper on the geology and development of the Pulau Oilfield.

The theme of the afternoon session was 'The "fruits" of the successful decade of exploration in Malaysia'. L.N. Kaye of Sabah Shell gave an impressive account of the geology and development of the Samarang Oilfield. One can surely learn a lot about growth faults and associated hydrocarbon trapping conditions from Samarang. The paper on the geology and development of the Pulau Oilfield - the first oilfield to be brought into production in offshore Peninsular Malaysia as ably given by Yew Chee Cheong of EPMI. The geology and depositional environment of the reservoir rock and the complications in development work were presented.

Another paper presented in the afternoon session was one by R.W. Allen, P. Hanson and P. Klomp which was delivered by P. Klomp. Seismic sections from offshore Sabah and Sarawak were presented showing spectacular and textbook examples of geologic features, which included growth faults, unconformities, reef and carbonate buildups, deltaic sedimentation and complex fault systems, DHIs, etc. The second paper by K. Kuttan of EPMI was on Log Analysis in the Malay Basin and he showed how EPMI has improved and resolved the log interpretation techniques of the shaly sand sequences in the Malay Basin.

As in previous years, the Petroleum Seminar 1979 would not have been possible if not for the generous and active support from the major oil companies and service companies in Malaysia. (See Donations to the Society). This was expressed by Mr. Leong Khee Meng, Organising Chairman, in his closing remarks at the end of the successful Seminar. He also acknowledged and thanked PETRONAS for giving its approval to the presentation of 6 of the 8 papers, and expressed the hope that all the authors will publish their papers in the GSM Bulletin. Judging from the excellent papers presented and the keen and large attendance of explorationists from the oil industry, it is envisaged that the 4th Petroleum Seminar, in heralding in the 80's, could well be a 2-day Meeting.

KML & GHT

Third Petroleum Seminar 1979 - Abstracts of Papers

Exploration in East Malaysia over the past decade by F.C. Scherer.

In this review of exploration in East Malaysia the following topics are included:

- 1) *A brief account of the main exploration activities undertaken and the discoveries made offshore East Malaysia.*
- 2) *A summary of the regional geology, tectonic framework, stratigraphy and facies development as far as these are considered important for the understanding of the particular geological setting in which exploration took place.*
- 3) *Aspects of the largest oil and gas fields so far discovered are discussed in some detail.*
- 4) *Specific hydrocarbon generation and trapping conditions and how these have affected exploration activities are highlighted.*

Thermal maturity and oil generation from liptinitic and sapropelic sources: Two examples from Indonesia by S. Thompson.

The thermal alteration index, spore colour index, and vitrinite reflectance methods of measuring thermal maturity are discussed. Interpretation of, and correlations between, the parameters of these methods may not be precise, due to variations in physical and chemical properties.

In the CMS-1 well (Northwest Java), heavy waxy oils have been generated from liptinitic kerogen and have accumulated in adjacent reservoirs. The onset of oil generation occurs at a vitrinite reflectance of between 0.35% and 0.4%, and a spore colour index of between 3 and 3.5. Major oil generation occurs at a vitrinite reflectance level of 0.55% and a spore colour index of 5.

In the Susu Selatan - 1 well (North Sumatra), light oils have been generated from sapropelic kerogen and have accumulated in overlying sandstone reservoirs in the area, although not in the well section. The onset of oil generation occurs at a vitrinite reflectance of 0.55% and spore colour index of 5. Optimum oil generation occurs at a vitrinite reflectance level of around 0.8% and a spore colour index of 7.5. No heavy oil accumulations have been discovered in this area.

The well sections are an example of liptinitic kerogen yielding oil at an earlier level of maturity than sapropelic kerogen. The different oil generating characteristics shown by the different kerogen types may primarily be ascribed to differences in the chemical structure of the kerogen; a secondary influence, bulk and concentration of kerogen, may be related to palaeo-environment.

Contributions of the Universities to the oil industry by Kardinal Kusnaeny, Sitaram Garimella, & Sharifah Barlian Aidid.

Currently a great need for cooperation in research exists between the geological departments of the Malaysian universities and the oil industries such as Shell and Esso. Sdn. Bhd. The nature of such works are discussed and suggestions towards better links between universities and oil industries are considered for mutual benefit in future.

Some results concerning analysis of samples (supplied by the oil industries) carried out at the Universiti Kebangsaan Malaysia are presented as examples.

The recognition of geological features on seismic sections of offshore Sarawak and Sabah by R.W. Allen, P. Hanson and P. Klomp.

Sarawak Shell Berhad's and Sabah Shell Petroleum Company's offshore contract areas are characterised by a wide variety of sedimentological and structural settings. The dense coverage of seismic data over the entire area and intensive drilling have significantly enhanced the understanding of the geology of SSB's and SSPC's contract areas.

Characteristic geological features from offshore Sarawak and Sabah discussed manifest themselves on seismic sections. Topics include deltaic sedimentation and growth faulting, facies changes, compressional deformation, erosion, carbonate sedimentation and sealing properties of overlying clastic sequences and direct hydrocarbon indications.

The geology of the Samarang Oilfield by L.N. Kaye

The Samarang structure, located about 45 km northwest of Labuan Island was formed during late Miocene/early Pliocene time when rapid deposition of coastal/coastal plain sediments and a gentle uplift created the present configuration of a growth-fault bounded anticlinal feature dissected by numerous synthetic and antithetic crestal faults.

Following the discovery well drilled in 1972 and a further exploratory appraisal by 3 additional wells, the development of the field commenced in mid-1975 and so far 60 development wells have been completed. The oil produced is being evacuated via an 18-inch pipeline into the Labuan Terminal.

The information gathered from all wells together with a dense seismic grid surveyed over the structure have resulted in a detailed understanding of important characteristics of the Samarang field such as: fault patterns, reservoir development, hydrocarbon distribution and ultimate recoverable reserves.

Log analysis methods in the Malay Basin by Kumar Kuttan

In the Malay Basin there are two basic aims of any log analysis technique. The first is that log analysis methods must give a rapid evaluation of porosity and water saturation which are required in assessing the hydrocarbon potential of a given reservoir. This requirement is satisfied by EPMI log analysis techniques through the use of a minicomputer and associated peripherals at office level and programmable hand calculators at wellsite levels. The other aim is that the techniques employed must give results in which one has a high level of confidence. To this end EPMI has developed some special log analysis techniques based on extensive core analysis data. These techniques give significantly better results than standard shaly sand techniques.

Geology and development of the Pulai Field, Offshore Peninsular Malaysia by Yew Chee Cheong

The Pulai Field is the first developed commercial oil field in Peninsular Malaysia and is currently producing low-sulphur 45° API oil at a rate of about 35,000 barrels a day. This small, faulted anticlinal feature was explored and delineated by four exploration wells. A 24

conductor platform was installed in 1977 and development drilling was completed in June 1979.

The reservoir rocks in Pulai consist mainly of stacked braided stream, point bar and stream mouth bar deposits which coalesce laterally to form continuous sandstone units. There are three major reservoir sands in the field and in these sands, the oil columns are thin and the oil is reservoired in rim accumulations in the individual sandstone units. Pre-development reservoir engineering studies indicated that oil depletion in the main reservoir sands will be by combination drive and the Pulai drainage model requires that platform wells intersect the objective sand tops fifty to sixty feet above the oil-water contact to maximise ultimate recovery. Due to the shallow depth of the reservoirs, a maximum angle of 60° has been required in some wells to reach the objective sands at the desired structural level. Unexpected stratigraphic variations, limitations in the accuracy of currently available deviation survey tools to more precisely define wellbore trajectories, steep structural dips, structural uncertainty especially in the crestal area along with reservoir engineering requirement to intersect sand stops at specific structural depths have combined to complicate the development of Pulai.

P.E. Gretener: The significance of the rare event in Geology, 7th Dec 1979, Dept. of Geology, University of Malaya.

Dr. Gretener, in addition to his AAPG course, also presented a talk to members of the Society on this rather unusual and fascinating topic. The speaker is the author of the paper with the same title published in 1967 in the AAPG Bulletin no. 51. The main theme of this presentation is the possibility of rare or seemingly improbable events occurring during the long timespan covered in the geological records. The speaker challenged the wellknown Huttonian Theory of Uniformitarianism. Given enough time the improbable was shown to become probable and eventually almost certain. Several paleontological examples were cited to support his arguments that rare events have played an important and significant role in the earth's history. The meeting was attended by about 40 members.

BKT

AAPG Course on Pore Pressure: Fundamentals, General Ramifications and Implications for Structural Geology by Dr. P.E. Gretener.

This AAPG Continuing Education program was held at the Petronas Conference Hall, Kuala Lumpur from Dec 10 to Dec 12 1979. Such courses are now held regularly in many parts of the world but the staging of the course on 'Pore Pressure' marked the first time that such a course was held in the Southeast Asian Region. In order to enable as many interested members to benefit from this course, the Society did not impose any fees on the participants. About 40 participants mainly from the oil industry and the Universities, including students, attended this 3-day course. Petronas offered their full support in arranging the conference facilities as well as refreshments.

A number of reasons have been advanced for the existence of abnormal fluid pressures. In particular, the recent discussion in the AAPG Bulletin with regards to the relative importance of thermal versus load induced pressuring is far from academic. In order for abnormal pressures to exist, fluid movement must be impeded from a certain time onward. Depending on the model adopted, such a restriction may occur early or later in the history of a reservoir. Since this is fundamental with regards to the primary and secondary migration of oil and gas, an evaluation of the various models is basic to any discussion of pore pressure. Pore pressure affects many, if not all, physical rock properties. In particular, higher than normal fluid pressures in sedimentary rocks tend to cause lower than expected density, strength, sonic velocity and electrical resistivity. This in one way permits early recognition of such formations in exploration, but otherwise may adversely affect geological and geophysical exploration as well as drilling. High pore pressures extend the realm of brittle deformation, and fracture porosity and permeability may occur at greater than normal depths. Diapiric, growth fault, and thrust fault structures are in many cases related to high pore pressures. Hydrocarbon trapping mechanisms as well as geophysical and geological exploration in these structural provinces were discussed.

All the participants found this course to be greatly beneficial and several suggested that more of such courses be held in the future. Several people besides members of the Council assisted in entertaining Dr. and Mrs. Gretener during their week stay in Kuala Lumpur. The Society would like to record its appreciation to Dr. Gretener who beside giving the extra talk to the Society, also freely obliged to answer questions and discussed matters raised by the participants. In addition, Dr. Gretener declined to accept the AAPG standard fee for lecturers which would have to be paid by the Society and instead accepted a much smaller sum to cover his wife's expenses.

BKT

BERITA BERITA PERSATUAN (NEWS OF THE SOCIETY)

Seminar: The Geology of northwest Peninsular Malaysia

In conjunction with the Annual General Meeting in March-April next year, the Society will be organising a seminar on 'The Geology of northwest Peninsular Malaysia'. Tentatively the venue will be somewhere in Kuala Lumpur.

Relevant papers are invited from Members. The following have agreed to present papers (tentative titles given):

1. P.H. Stauffer (Univ. Malaya): Glacial deposition interpretation, Singa Formation, Langkawi.
2. Ahmad Jantan (UKM): Upper Palaeozoic sediments.
3. B.K. Lim (Univ. Malaya): Geomagnetism studies, Rest House area, Kedah Peak.
4. T.T. Khoo (Univ. Malaya): Metamorphism, S.W. Kedah.

Members will be further informed in due course.

Election of 1980/81 Council

The Council's list of nominees for the 1980/81 Council is as follows:

| | |
|-----------------------|---|
| President: | Mohd. Ayob (Petronas) |
| Vice President: | T.T. Khoo (Universiti Malaya) |
| Hon. Secretary: | Y.F. Wong (Valdun Consultants) |
| Hon. Asst. Secretary: | Mohd. Ali Hassan (Universiti Malaya) |
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| Editor: | G.H. Teh (Universiti Malaya) |
| Councillors: | Abdul Aziz Hussin (Universiti Teknologi Malaysia) M.K. Choo (Pernas Charter Management) K.K. Khoo (Geological Survey Malaysia) K.M. Leong (Petronas) |

The following 2-year Councillors will continue to serve in the 1980/81 Council:

| |
|--|
| L.S. Chin (Datuk Keramat Holdings) |
| Khalid Ngah (Petronas) |
| S. Subramaniam (Killinghall Tin) |
| Tan Boon Kong (Universiti Kebangsaan Malaysia) |

The Immediate Past - President will be B.K. Tan (Universiti Malaya).

At the close of nominations, except for the post of Editor and Councillors, all the nominees were returned unopposed.

For the posts of Editor and Councillor, nominations were also received for Mohd. Ismail Noor (Universiti Kebangsaan Malaysia) and H.D. Tjia (Universiti Kebangsaan Malaysia) respectively. An election is in progress for these two posts.

Some particulars of members of the 1980/81 Council returned unopposed and candidates for the various contested posts are tabulated below:

| <u>Name</u> | <u>Education</u> | <u>Nationality</u> | <u>Previous posts held in the Society</u> |
|-------------------|------------------|--------------------|---|
| M. Ayob | Ph.D. | Malaysian | Councillor, Vice-President |
| T.T. Khoo | Ph.D. | " | Councillor, Editor, Vice-President |
| Y.F. Wong | B.Sc. | " | Councillor, Hon. Secretary |
| M. Ali Hassan | M. Phil. | " | Councillor |
| A.S. Gan | B.Sc. | " | Councillor, Asst. Secretary, Treasurer |
| L.S. Chin | B.Sc. | " | Councillor |
| Khalid Ngah | M.Sc. | " | Councillor |
| S. Subramaniam | P. Eng. | " | Councillor |
| Tan Boon Kong | M.Sc. | " | Councillor |
| M. Noor Ismail | Ph.D. | " | - |
| G.H. Teh | Dr. rer.nat. | " | Treasurer |
| Abdul Aziz Hussin | B.Sc. | " | Councillor |
| M.K. Choo | B.Sc. | " | Councillor |
| K.K. Khoo | B.Sc. | " | Councillor, Asst. Secretary |
| K.M. Leong | M.Sc. | " | Councillor |
| H.D. Tjia | Ph.D. | Indonesian | Councillor |

Donations to the Society

The Society would like to acknowledge the following donations given in support of the Petroleum Seminar and other activities of the Society:

| | |
|----------------------------------|------------|
| 1) Shell Group of Companies | \$5,000.00 |
| 2) Petronas | \$2,000.00 |
| 3) Esso Production Malaysia Inc. | \$1,500.00 |
| 4) Schlumberger Overseas S.A. | \$1,000.00 |
| 5) ANTAH Holdings | \$ 500.00 |

BKT

New Library Additions

The following publications were added to the Library of the Society:

1. Commonwealth Geological Liaison Office, no. 10, & 11, 1979.
2. AAPG Explorer, Sept. 1979.
3. Geological correlation, no. 7, 1979.
4. Bulletin of the American Museum of Natural History, vol. 163, article 1, and vol. 164, article 1, 1979.
5. American Museum Novitates, no. 2681 & 2675, 1979.
6. Scripta Geologica, no. 50, & 51, 1979.
7. IMM Transactions/Sect. A, vol. 88, 1979.
8. National Library Singapore, adult reference collections, accessions list, Sept & Oct., 1979.
9. IMM Bulletin no. 876, 1979.
10. Bulletin of the National Science Museum, series C, v. 5, no. 3, 1979.
11. IMM/Transactions B, v. 88, Aug 1979.
12. Mineralogica Polonica, vol. 9, no. 1, 1978.
13. Report of petrological study team, no. 1, parts I & II, 1979.
14. University of Kansas, Paleontological contributions, paper 95, 1979.
15. Suara Remaja, vol. 1, no. 1, 1979.

Membership

The following persons have joined the Society:

Full Members

1. Dr. Mustapha Kamal bin Shahrom, Ayer Hitam Tin Dredging Bhd., Jln Puchong, Selangor.
2. Zelina Zaiton Ibrahim, 8, 16/1, P.J.
3. Xavier Payre, 38-D, Lg. Universiti, P.J.
4. Tuan Kob bin Tuan Dir, Petronas.
5. Nordin Ramli, Petronas.

Change of Address

The following members have informed the Society of new addresses as indicated:

Chan See Chin, Earth Search Processing Inc., unit 501, 5th Floor, Union Textile Bldg., 37 Jalan Pemimpin, Singapore 20.

C.K. Burton, 25 Cherry Tree Close, Off Linden Farm Drive, Countesthorpe, Leicester, England.

J.G. Wilson, P.O. Box 363, Fyshwick, ACT 2609, Australia.

Lim Keng Hoo, no. 4, Tingkat Taman Ipoh Sembilan, Ipoh Garden South, Ipoh.

Yong Fook Shin, Rahman Hydraulic, 798 Main Road, Prai, Penang.

K. Burlinson, 12 Mooringe Ave., Plympton 5037, South Australia.

Michiya Kouno, 46-15 Sakuragaoka-5, Setagaya-ku, Tokyo 156, Japan.

Zakaria Hussain, P.O. Box 1015, Ipoh, Perak.

D.R. Workman, Dept. of Geography and Geology, University of Hong Kong, Pokfulam Road, Hong Kong.

Mohd. Khair H. Abd. Kadir, P.O. Box 2444, Kuala Lumpur.

BERITA BERITA LAIN (OTHER NEWS)

Congress on Science and Technology in Resource Development

This Congress is organised as part of the Silver Jubilee Celebrations of the MSA in collaboration with the Agricultural Institute Malaysia, Malaysian Institute of Chemistry, the Geological Society of Malaysia, the Malayan Nature Society, and the Malaysian Society of Soil Science.

The Congress aims to bring scientists and technologists of different disciplines together; to review and discuss the use of science and technology for resource development with particular reference to Malaysia; this will include achievements and problems.

In addition to voluntary contributions, there will be several invited specialist papers.

The Conference welcomes original papers related to the following sciences:- Agriculture, Biology, Chemistry, Education, Engineering, Environment, Forestry, Geology, Medicine, Physics, Social Science and Technology.

In addition, the final plenary session would be a panel discussion on "Priorities in Science and technology for Fourth Malaysia Plan".

Intending authors are requested to submit the full titles of their papers and abstracts (not more than 300 words) before end of April 1980 to the Secretary of GSM. Instructions to authors of papers would be forwarded together with notification of acceptance of papers.

The proceedings of the Conference would be published by the MSA, (Malaysian Scientific Association).

The registration fee is

| | |
|------------------------------------|-----------|
| Members of sponsoring Associations | M\$75.00 |
| Non-members | M\$150.00 |

All payments are to be made out in the name of the "Malaysian Scientific Association".

The Conference will be held at a leading hotel in Kuala Lumpur from Thursday 4th to Saturday 6th September 1980.

All correspondence should be addressed to

Secretary
Jubilee Science Congress
c/o Malaysian Scientific Association
P.O. Box 911
Kuala Lumpur.

Conference on Application of rock mechanics to cut and fill mining

The Conference is organised by the Departments of Rock Mechanics and Soil Mechanics Research Foundation, Stockholm, Sweden and will be held at the University of Lulea, Lulea, Sweden, June 2-4, 1980.

The purpose of the Conference is to present the state of the art in application of rock mechanics to cut and fill mining in general as well as to present the results of the Nasliden project involving about 20 scientists from mining companies, universities and research organisations in the Scandinavian countries and to present state of the art in the application of rock mechanics to cut and fill mining in other countries.

The conference will have a programme for three days. In the morning of the first day a technical session will be held at which papers from invited speakers will be presented. During the afternoon of the first day and the second day technical sessions will be held at which papers under broad headings will be discussed. Such papers will be related to themes like pre-investigations of mines, structural mapping and analysis, rock stress measurements, instrumentation, properties of rock mass and fill, mathematical modelling, control, statistics, etc. Papers related to the Nasliden project will be presented during the second day. A visit to the Nasliden mine, 250 km from Lulea, is planned for the third day. The visit is organised by the Boliden Metal Company, Boliden, Sweden.

The Organising Committee intends to invite internationally known scientists in rock mechanics and mining to present papers at the morning session of the first day. In addition summaries of contributions to be presented at the technical sessions, are requested.

Abstracts (250-300 words) should be sent to Prof. Ove Stephansson, Department of Rock Mechanics, University of Lulea, S-951 87 Lulea, Sweden, before December 1979. Selected authors will be required to submit the completed manuscript before March 1, 1980 to enable copies to be prepared and distributed to all conference registrants in May 1980. The volume proceedings of the conference will be published by the Institution of Mining and Metallurgy, London, in late 1980 - early 1981 and will contain the papers, discussion, authors' replies and name and subject indexes.

News items on Malaysian petroleum and mining industries

The following news items are condensed from reports and news items in other publications.

MINERAL EXPORTS REGISTER IMPRESSIVE GROWTH RATES:- The 1979/80 report released recently by the government shows that tin and crude petroleum exports have increased by 5.4 percent and 22.3 percent respectively. The estimated export for tin for the coming year is 74,000 tonnes which would maintain Malaysia's share of world's tin export at about 38 percent. This would account for 9.5 percent of Malaysia's export making it the fourth largest primary commodity export after petroleum, rubber and palm oil. Export of petroleum crude is estimated to increase by about 17 percent to about 269,000 barrels per day. (New Straits Times).

TIN INDUSTRY-MIXED FORTUNE FOR THE MINERS:- The Malaysian tin industry is expected to be badly affected by the recent increased tariff rates for electricity brought about mainly by the world's increase in oil prices mines most seriously affected would be the gravel pump mines where the cost of electricity account for between 30 and 35 percent of the cost of production. The new tariff rates for electricity would bring up this expenditure by about 27 percent.

The U.S. Senate's approval to authorise the disposal of 35,000 long tons of government stockpile tin poses a treat to the tin industry. Malaysia and other tin producing countries including Bolivia have consistently opposed the Bill.

Malaysia's 1979/80 Budget, announced recently, provides tax relief to boost tin production. The tin export duty has been reduced. The initial response from the mining sector is favourable as both the gravel pump and the dredging sector are expected to benefit. The tin industry has for a long time claimed that it is one of the most highly taxed industry in the country. (New Straits Times).

MALAYSIA'S ONLY COPPER MINE TO STAY OPEN:- The Mamut Copper Mine which has been producing copper since 1975, without showing a profit, for the Overseas Mineral Resources Development Company (OMRD), a Japanese joint venture corporation, is to stay open. The losses has been attributed mainly to the depreciation of the US currency, the instability of the world's copper prices and high local costs including the compensation of villages and farmers for environmental pollution. It has been reported that this mine has become the centre of controversy over whether the ores should be smelted locally rather than be exported to Japan. The Mamut mine has a life span of 15 years and ore reserves containing 0.476% copper amounting to 178,754,800 tonnes. Yearly production is 5,670,000 tonnes containing 0.59% of copper. From the 'traces' of gold and silver, OMRD exports an average of 2.4 tonnes of gold valued at around one third of the total annual export value of copper. Other finds of 'geochemical anomalies' which could be potential copper mines occur in nearby areas. (New Straits Times).

PAHANG SEARCH:- Conzinc Riotinto Malaysia, a subsidiary of Conzinc Riotinto of Australia, has started drilling in the Pahang Tenggara area in Pahang State to test for lead, copper, gold and other minerals. The tests are preliminary surveys and it is expected that six holes of 1,000 feet deep will be drilled over five square miles in the Chini district of

Pahang Tenggara. The tests will cost M\$500,000 (£105,000) and should be completed before the monsoon begins in November. If the results prove encouraging further tests will be conducted next year. A spokesman of Conzinc Riotinto Malaysia said that although the company had earlier discovered mineralisation, possibly of lead, copper and molybdenum, in the Chini area, it was still uncertain of what it would find. (Financial Times, 17 July 1979).

MALAYSIAN AIRBORNE SURVEY PLANNED:- An airborne magnetic and radiometric base metals survey of the central belt area is planned to supplement a previous geochemical survey. The study area, about 58,000 line km and covering 32,375 sq km in the states of Kelantan, Pahang and Trengganu, is thought to contain copper, zinc, lead, and possibly tin. Mineralisation has been discovered in the Chini area of Pahang by Conzinc Riotinto Malaysia and the state development authority. (E & MJ, July 1979).

AAPG John C. Sproule Memorial Award

The award is for a young author for publication of an article dealing with petroleum geology, and to qualify he must meet the following criteria:

1. He must be 35 years of age or younger at the time of submittal of the paper.
2. He must be a member of AAPG.
3. His article must appear in a publication of the AAPG or an affiliated society of the AAPG (of which the GSM is one) during the calendar year of 1979.

Nominations prior to 1st April 1980 will be considered for the 1981 award. Send information to

AAPG Headquarters
 Attention: Honors & Awards Committee
 Box 979
 Tulsa, Oklahoma 74101, USA.

Calendar

Under this column the Society will note coming events on meetings, courses and symposia of interest to members. Date in parenthesis gives the issue of Newsletter containing more information pertaining to the events:

1979

- Nov 17 - 21 : X World Mining Congress, Istanbul. The Turkish National Committee of the World Mining Congress, Ziya Gokalp Caddesi, No. 17, Kat 8, Ankara, Turkey.
- Nov 20 - 21 : National Symposium on the availability of strategic minerals, London, U.K. The Secretary, Institute of Mining and Metallurgy, 44, Portland Place, London, W1N 4BR. (May-Jun 1979).

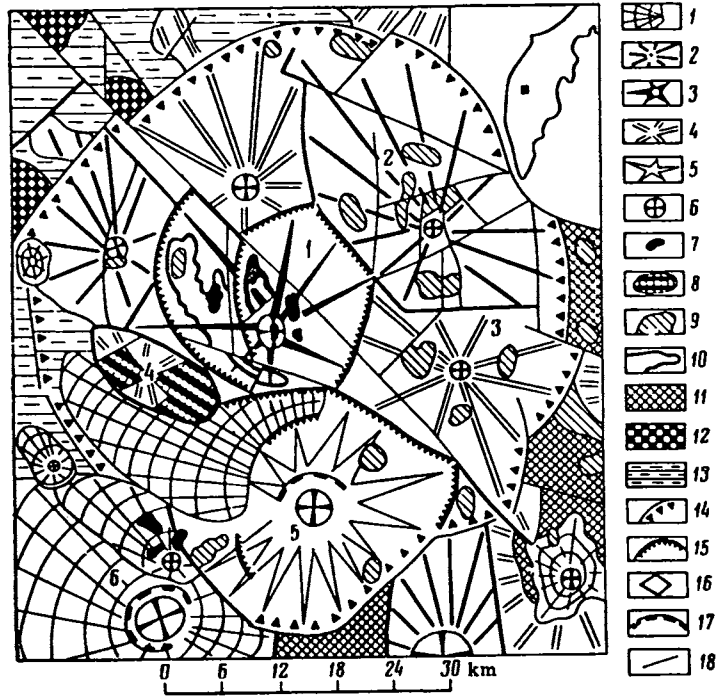
- Dec 13 - 16 : Problems of mineralisation associated with acid magmatism, Exeter, U.M. (M. Stone, Dept. of Geology, University of Exeter, North Park Road, Exeter, England).
- Dec 17 - 19 : Evolution of India-Pacific plate boundaries, (workshop and symposium), Sydney, Australia. (Convenors, Dept. of Geology and Geophysics, University of Sydney, Sydney, NSW 2006, Australia).
- 1980
- Jan 7 - 10 : International Conference on Engineering for Protection from Natural Disasters, Bangkok, Thailand. Conference Secretary, ICEPND, Div. of Geotechnical and Transportation Engineering, AIT, P.O. Box 2754, Bangkok, Thailand.
- Feb 11 - 16 : Fifth Gondwana Symposium, Wellington, New Zealand. Symposium and field trips. C.J. Burgess, Fifth Gondwana Symposium, Victoria University of Wellington, Private Bag, Wellington, New Zealand. (May-Jun 1978).
- Feb 14 - 17 : Interdisciplinary Conference on Earthquake Prediction Research in the North Anatolian Fault Zone, Istanbul, Turkey. A. Vogel, Inst. für Geophysikalische Wissenschaften, Freie Universität Berlin, Rheinbabenalle 49, 1000 Berlin 33, F.R.G.
- Feb 25 - 26 : Time Scale Symposium, London, U.K. Secretary, Geological Society, Burlington House, Piccadilly, London, WI, U.K.
- Mar 4 - 6 : Petroleum Geology of the Continental Shelf of North-West Europe, London, U.K. Miss I. McCann, Conference Officer, London, W1M 8AR, U.K.
- Mar 24 - 28 : AAPG Petroleum Reservoir Fundamentals School. AAPG Education Dept., P.O. Box 979, Tulsa, Okla. 74101, USA.
- Apr 7 - 11 : International symposium on landslides 'ISL 1980', New Delhi. Dr. R.K. Bhandari, Organising Secretary, ISL 1980, P.O. Central Road Research Inst., New Delhi, 110002, India.
- Apr 10 - 15 : 8th International Geochemical Exploration Symposium, Hannover, Fed. Rep. Germany. Dr. H. Gundlach, Organising Committee, 8th International Geochemical Exploration Symposium, P.O. Box 51 01 53, D-3000 Hannover 51, F.R.G. (Jul-Aug 1978).
- May 12 - 14 : Conference on Soil Science and Agricultural Development in Malaysia. Secretary, Executive Committee, Conference on Soil Science and Agricultural Development, P.O. Box 2644, Kuala Lumpur, Malaysia. (Jul-Aug 1979).
- May 12 - 16 : International Archaeological Symposium, Perth, Australia. Sponsored by IGCP Archaeological Geochemistry project and Geological Society of Australia. (J.A. Hallberg, Archaeological Symposium, CSIRO, Division of Mineralogy, Private Bag, Wembley, Australia 6014).

- May 27 - 28 : Ninth Annual Convention of the Indonesia Petroleum Association. Indonesia Petroleum Association, Lecture Committee, Jalan Menteng Raya 3, Jakarta, Indonesia.
- May 27 - 30 : National and International Management of Mineral Resources. The Secretary, Institute of Mining and Metallurgy, 44 Portland Place, London W1N 4BR, U.K. (Mar-Apr 1979).
- May 28 - 30 : 4th Industrial Minerals International Congress, Atlanta, U.S. Details from Metal Bulletin Congresses Ltd., Park House, Park Terrace, Worcester Park, Surrey KT4 7HY, U.K.
- Jun 3 - 5 : IVth International Precious Metals Conference, Toronto. Details from International Precious Metals Institute, Polytechnic Institute of New York, 333 Jay Street, Brooklyn, NY 11201, US.
- Jun 25 - 27 : Fore-Arc Sedimentation and Tectonics in Modern and Ancient Subduction Zones, London, U.K. J.K. Leggett, Department of Geology, Imperial College, Prince Consort Road, London, SW7 2AZ, U.K.
- Jun 29 - Jul 6 : Fifth International Palynological Conference, Cambridge, England, U.K. Conference with field excursions. (Mrs. G.E. Drewry, Dept. of Geology, Sedgwick Museum, Downing Street, Cambridge, CB2 3EQ, England).
- Jul 4 - 7 : General meeting of the International Mineralogical Association (IMA), Orleans, France. Scientific & poster sessions, field excursions. (Secretariat de la 12eme Assemblee Generale de l'IMA, B.R.G.M., BP 6009, 45018, Orleans, Cedex, France).
- Jul 7 - 17 : 26th International Geological Congress, Paris, France. Paul Sangnier, Secretaire General du 26eme C.G.I., Maison de la Geologie, 77-79 rue Claude-Bernard, 75005, France. (Nov-Dec 1977).
- Jul 14 - 24 : International Symposium on water-rock interaction, Edmonton, Alberta, Canada. Sponsored by IAGC and the Alberta Research Council. (B. Hitchon, Alberta Research Council, 11315, 87th Avenue, Edmonton, Alberta, Canada T6G 2C2).
- Jul 29 - Aug 10 : Second European Conodont Symposium (ECOS II), Austria and Czechoslovakia. Symposium with pre- and post symposium field trips co-sponsored by the Geological Survey of Austria and Geological Survey of Czechoslovakia. (ECOS II, Geological Survey of Austria, P.O. Box 154, Rasumofskygasse 23, A-1031, Vienna, Austria).
- Sep 8 - 13 : World Conference on Earthquake Engineering, Istanbul, Turkey. A. Gurbinar, Secretary, 7 WCEE, Yuksel Caddesi 7/B, Ankara, Turkey.
- Sep 17 - 19 : Eurotunnel '80, Basle, Switzerland. Conference on Tunnelling in Europe. (Secretary, Institute of Mining and Metallurgy, 44 Portland Place, London, W1N 4BR, U.K.).

- Oct 5 - 8 : Complex sulphide ores, Rome, Italy. Organised by IMM in association with Consiglio Nazionale delle Ricerche (Laboratorio per il Trattamento del Minerals). The Secretary, IMM, 44 Portland Place, London W1N 1BR, U.K.
- Sometime in 1980 : Workshop on Fission Track Dating by the Geoscience Network. Prof. B.K. Kim, Executive Secretary, Geoscience Network, Seoul National University, Seoul, South Korea.

1981

- Mar 29 - Apr 4 : International Conference on Arid Soils - Properties, Genesis and Management, Jerusalem, Israel. International Conference on Arid Soils - Properties, Genesis and Management, P.O. Box 3054, 122 Hayarkon St., Tel Aviv, Israel. (May-Jun 1979).



What's this? See below for answer.

TTK

Caption Fig. 1 reads: Structural geologic sketch map of the Payalpan volcano-tectonic structure. Palvolcanoes and their fragments: 1) lower Pliocene, mostly basalt; 2) upper Miocene-Pliocene, mostly andesite; 3) upper Miocene-middle Pliocene, mostly basalt; 4) upper Miocene-Pliocene, mostly andesite; 5) middle Pliocene-Holocene, Icha volcano; 6) centers of paleovolcanoes, necks. Extrusive bodies: 7) alkaline rhyolite and alkaline quartz trachyte; 8) quartz latite; 9) rhyolite and dacite; 10) sheet of alkaline quartz trachyte. Old volcanic complexes: 11) early and middle Miocene; 12) Late Cretaceous; 13) Paleogene-Neogene marine sediments. Tectonic boundaries: 14) Payalpan volcano- tectonic structure; 15) volcanotectonic ring basins; 16) individual paleovolcanoes; 17) caldera scarp; 18) other faults.

From Fig. 1 of Patoka, M.G. & Uspensky, V.S. (1977) "Siltic subalkalic - alkalic rocks of central Kamchatka", Doklady Akad. Nauk SSR, vol. 233, 114-116.