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OVERSEAS VISIT, UNITED KINGDOM AND FRANCH

by

R.F. Thyer

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SUMMARY

The principal reason for this trip was to attend the 9th Commonwealth Mining and Metallurgical Congress held in London from 5-10 May, and the post-sessional excursions to Scotland and North Wales which finished on 24 May.

Various petroleum companies in or near London with interests in oil exploration in Australia were visited during the week prior to the Congress and petroleum companies in Paris and Pau during the week immediately following the Congress tours.

The first week of my overseas visit was spent in or near London visiting various petroleum companies which are engaged in prospecting in Australia, namely Shell Oil Co., Phillips Petroleum Co., Burma Oil Co. Ltd (B.O.C.), British Petroleum Co. Ltd (B.P.) and Esso Petroleum Co. Ltd. These companies are also currently engaged in prospecting in the North Sea with varying degrees of success. Visits were also paid to the research laboratories of B.P. at Sunbury and B.O.C. at Walton-on-Thames. Various aspects of their work in Australia was discussed, in particular the laboratory support which this work receives. It was not possible in the brief time available to see all the research activities of the B.P. and B.O.C. laboratories but in geology and geophysics this support did not seem to extend far beyond investigation in palaeontology and sedimentary petrology and in review studies in geophysics. The setting up of these laboratories in such pleasant surroundings as Sunbury and Walton-on-Thames is no doubt a major factor in retaining professional staff.

Special exploration problems encountered in the North Sea were also discussed briefly. The North Sea area is divided into a large number of relatively small prospecting tenements and as a result there is a large number of operating companies. The regional results of this work are known to the companies through their system of trading information with neighbouring operators but they contrasted these rather complex dealings with the ease with which information is exchanged in Australia through the Petroleum Search Subsidy Act scheme.

The companies were all interested in the recent announcement by the Minister on the continuation of the Petroleum Search Subsidy Act but as this matter has not been before the House there was nothing I could add to the Minister's Statement. Nevertheless I got the impression that continuation of Subsidy under the modified scheme would be welcomed by these companies.

The Ninth Commonwealth Mining & Metallurgical Congress was held in London from May 5th to May 24th at the London Hilton Hotel, Park Lane. The Hotel is very central and very expensive. The Congress is basically a meeting of the principle Institutions and Societies in the British Commonwealth Countries concerned with Mining and Metallurgy, but the constitution also allows for membership of South African Institutes.

In an address given by Sir Ronald Prain, Chairman of the Commonwealth Council of Mining and Metallurgy Institutes in the Plenary Session at the end of the first week in Congress, he traced the history of the Congress and reviewed the discussions at the Plenary Session which considered the future of the Congress.

The first reference to an "Empire" association was in a speech in 1921 by the President of the U.K. Institute of Mining and Metallurgy expressing the hope that "in the near future it will be possible to carry co-operation still further and to link up the various mining institutions of the Empire under one Imperial Federation and by so doing the mining profession will speak as one voice and that the united power will exercise great influence on matters affecting the mining industry".

In October 1922 at a meeting of the Joint Advisory Committee of the Institute of Mining and Metallurgy and Institute of Mining Engineers, a memorandum was considered relating to the "further organisation of British Mining and Metallurgy Engineering professions on Empire lines". It was proposed that a Council of Empire Mining & Metallurgy Institutions be formed and that its principal functions would be -

(a) to create and maintain throughout the Empire a high standard of technical efficiency and professional conduct.

(b) to convene at regular intervals in Empire Mining Congresses.

(c) to establish, if found to be necessary or desirable, a Register of British Mining and Metallurgy Engineers.

(d) to serve as an organ of intercommunication between the co-operating institutions and promote the interests of the professions and industries.

The first Congress was convened in London in 1924 in connection with the British Empire Exhibition and representatives of various Institutions of Mining and Metallurgy from the Dominions were invited. Sir Herbert Gepp represented the Australian Institute of Mining and Metallurgy as its President and Dr. Wallis attended as President of the Canadian Institute of Mining and Metallurgy. At this first Congress the Empire Mining and Metallurgy Council came into being.

The second Congress was held in Canada in 1927 and the third in South Africa in 1930. The fourth Congress was to have been held in Australia in 1933 and, in fact, an invitation was issued by the Australian Government at the time of the South Africa Congress. However, owing to the rapidly deteriorating economic conditions throughout the world the offer was subsequently withdrawn.

No meeting of the Council was held between this and the outbreak of the 1939-45 War but the idea was revived in 1942 and 1943 by the Council of the U.K. Institute of Mining & Metallurgy. The Empire Council was reconstituted in 1943 and in 1946 a new constitution was drawn up to cater for changed conditions. The fourth Congress was held in the United Kingdom in 1949, the fifth in Australia in 1953 and the sixth in Canada in 1957.

In 1956 the title of the Council was changed from "Empire" to "Commonwealth". The seventh Congress was held in South Africa, Northern Rhodesia and Southern Rhodesia in 1961. Ten days after this Congress, South Africa withdrew from the Commonwealth. The constitution was revised once more in 1963 to provide for a special class of membership to cater for the two constituent bodies in South Africa.

The eighth Congress was held in Australia in 1965. At this Congress for the first time there was open discussion on the future of the congresses and it was agreed that at the 9th Congress Council should re-assess its role. The outcome of this re-assessment was given briefly by Sir Ronald Prain as follows -

1. It was the consensus of opinion that the Commonwealth Council should carry on as at present, with its present constitution, responsibilities and objectives.

2. It was recognised that the congress is no longer an exclusively Commonwealth Meeting but rather a congress called by Commonwealth institutions at which there is no nationality bar, the only qualification to attend being membership of one of the 13 constituent institutions which are:

The Australasian Institute of Mining and Metallurgy
The Canadian Institute of Mining and Metallurgy
The Geological Society of Australia
The Geological Society of South Africa
The Institute of Metals
The Institute of Petroleum
The Institution of Metallurgists
The Institution of Mining Engineers
The Institution of Mining and Metallurgy
The Iron and Steel Institute
The Mining, Geological and Metallurgical Institute of India
The South African Institute of Mining and Metallurgy
The South Wales Institute of Engineers

3. The Council will continue to examine its title and it might be more appropriately called "The Council of Commonwealth Mining and Metallurgy Institutions".

4. It is considered that the constitution should be kept flexible to allow the smaller Commonwealth countries to join as and when they are ready.

5. It was generally felt that Congress agenda should remain as at present. There was general agreement on the high quality of the 9th and past congresses and that the size of the congresses is conducive to intelligent discussion on the one hand and a facility for personal meetings on the other.

6. Council was given a mandate to arrange the next Congress which will possibly be in the Far East (India?)

NINTH COMMONWEALTH MINING & METALLURGICAL CONGRESS

Over 1000 members registered to attend the Congress. More than 200 of these were from South Africa and 100 each from Australia and Canada. The biggest registration was from the United Kingdom with about 450 members. An interesting feature of the attendance was the large representation from non-Commonwealth countries. I have already mentioned South Africa but there were many representatives from United States of America and from nearby European countries, Belgium, Germany, France and Holland.

The Congress was officially opened by the Rt Hon. Micheal Stewart M.P., Secretary of State for Foreign and Commonwealth Affairs, who welcomed delegates on behalf of the Government.

The President of the 9th Commonwealth Congress, Sir Val Duncan then gave his presidential address in which he stressed the need for mining companies and governments alike to develop policies that lead to trust and mutual respect. He emphasized the importance of the mineral industry, particularly to the newly developing countries, some of which appeared to be willing to kill "the goose that lays the golden egg".

The afternoon of the opening day was kept free to allow members to attend the Mining and Metallurgy Exhibition which was held in Alexandra Palace, London. This was mainly heavy mining machinery but one or two English-based geophysical companies had exhibits. Brochures from these companies have been passed on to the Geophysical Branch.

The five days from May 6 to May 10 were occupied by technical sessions concluding with a Plenary Session on May 10 at which Sir Ronald Prain gave the talk which I have already discussed. Generally four meetings were held simultaneously dealing respectively with (1) Mining and Petroleum Technology, (2) Mining and Petroleum Geology, (3) Mineral Processing and Extractive Metallurgy, (4) Physical and Fabrication Metallurgy.

There were four sessions of 90 minutes each and the programme included three general sessions covering subjects of broad and general interest and a number of joint sessions. Three papers were given in each session and the authors were allowed from 5 to 8 minutes each to introduce their topic. This presentation was followed by discussions, some prepared in advance and others "off-the-cuff".

The papers had all been distributed before the Congress but the organisers did not allow for delays in the mail with a result that most of the overseas delegates arrived without their advance copies. My copies were waiting for me at the Bureau when I got back. A complete set of Preprints has been placed in the Bureau Library.

It was disappointing to find, as so often happens, that the projecting facilities were rather poor. The size of the room in which I gave my paper was about twice the size of the Bureau meeting room but the screen was only about six feet square. The public address system was quite good but contributors to the discussions had to come forward to use the microphones on the rostrum.

The papers were well attended and discussions appropriate and at times animated. All told there were about 130 papers presented at the Congress, including several case histories of newly developed mines and a number on exploration techniques. A paper by Woodall and Travis on the Kambalda nickel deposit seemed to arouse particular interest judging by the number of questions asked.

The papers on techniques covered such topics as - Exploration and Sampling; Methods in the Off-shore Diamond Industry; Techniques in Submarine Geology; Recent Application of Geophysical Methods in Coal Mining; and The Portable X-ray Spectrometer for Rapid Ore Analysis (given by Mick Gallagher).

My own paper on "Progress in Petroleum Prospecting on the Australian Continental Shelf" was well received and provoked quite a bit of discussion although most of this was outside the lecture room. I had included reference to the off-shore legislation and Ian Morley, who had recently retired as State Mining Engineer from Brisbane, led the formal discussion by amplifying some of the provisions of this and giving some of the history of its making.

The following notes relate to some of the more interesting papers.

Barringer - Remote Sensing - A paper given by Tony Barringer from Toronto on "Remote Sensing Techniques for Mineral Discovery" proved interesting and entertaining. His paper included such familar techniques as aerial photography, aeromagnetics and aeroelectromagnetics. Some of the more recently developed devices he mentioned included colour infrared photography; very low frequency radio transmissions; optical-mechanical line scanning infrared systems; side looking radar; optical-correlation methods of detecting gas traces; spectral scanning in the thermal infrared region for the remote identification of rock types; and air-sampling for airborne geochemical surveys. He also referred to satellite imagery systems for large scale regional geological interpretation and displayed a most interesting suite of coloured aerial photographs taken from one of the American satellites.

He described radar imagery which as an alternative to aerial photography has the particular advantage that it can be used through cloud cover; it may be the solution to the problem of getting aerial photography cover in parts of New Guinea.

The side-looking radar (SLAR) is a more recent development and one of its advantages is that it can produce an image with density varying with the radar reflectivity of the terrain. It is claimed that this can detect subtle changes in the lithology. It has the disadvantage that the airborne equipment is very expensive and the support equipment very extensive.

The development of "Sniffer" equipment for detecting minute traces of gas is quite interesting. The method of "Spectral Correlation" is used to identify absorption spectrum in reflected sunlight. Equipment has been developed to detect iodine in the air. Iodine has a strong absorption spectrum in the range 5000 to 6000 A^{o}. Reflected sunlight is concentrated by a telescope passed through a slit and dispersed by a grating or prism. The spectral image is focussed on to a multiple slit mask which is essentially a photographic replica of the spectrum of iodine. The image is vibrated across the mask and if there is any absorption spectrum of iodine present, the intensity of the transmitted light will vary as the absorption lines pass to and fro across their corresponding slit. The light is collected by a photo-multipler and amplified to give a reference signal. It is claimed that concentrations as low as one part per billion can be detected.

It is believed that iodine will be a useful indicator of those types of mineral deposits which are associated with halogens and for the location of oil source rocks and seepages of oil-field brines. It is claimed that it will have wide application in problems of air pollution and in detecting primary fish food areas (which are rich in iodine). The spectral absorption of SO_2 and NO_2 can also be used in this spectral correlation method and there is a possibility that it may be useful for detecting oxidizing ore bodies. I got the impression that it is a "solution looking for a problem"!

One of the interesting case histories concerned the discovery of the Fitula Copper ore-body in Zambia by geochemical means.

The Fitula Copper Deposit, with estimated reserves of 4,510,000 tons grading 5.28 percent copper, came into production in May 1968. The deposit is completely concealed by deep-residual soils and was found by detailed exploration following up a prominent geochemical anomaly.

A geochemical survey was carried out over 36 square miles with samples taken along the lines 500 feet apart at 250 to 100 foot intervals. Soil samples were taken at a uniform depth of 15 inches. Intermediate lines were placed where needed. Background values ranged from 20 to 50 ppm and high order anomalies of 500 and 100 ppm were found. In spite of high copper values, no visible copper mineralisation was seen; the copper is held in copper bearing micas and absorbed by clay. The 300 ppm contour is closely associated with all the established ore bodies in the district.

The authors claimed that the optimum method for follow-up exploration was a combination of detailed geological mapping and bedrock sampling from bedrock exposed in pits and crosscuts and that diamond drilling should await adequate definition of the source of the soil anomalies.

Prospecting in Cornwall by Consolidated Gold Fields. Mr J. D. Willson of Consolidated Gold Fields Ltd gave an interesting paper on his Company's prospecting in Cornwall since 1964. The Company recently announced that they had developed sufficient ore to warrant mining.

Mr. Willson's paper discussed the aims of this work and the difficulties encountered in carrying it out. Quite apart from the usual difficulties associated with mineral prospecting, special legal difficulties were encountered over ownership rights.

Mineral rights in Great Britain are held by the property owners and in past years it has been possible for properties to be sold while the mineral rights were retained by the original owners. In an area like Cornwall, properties are small and to obtain a reasonable area a large number of separate agreements have to be negotiated regarding the mineral rights. Some of the special difficulties noted by Mr Willson were -

- Owners were difficult to find
- Owners were unwilling to give options
- Owners saw difficulties arising out of the Land Commission Act of 1967 because they foresaw the possibility of the assessed value of their land (and their tax) being increased without any commensurate royalty payments.
- Some owners were willing but their legal advisors opposed granting of options.
- Some owners negotiated with Consolidated Gold Fields without advising them that they were granting an option to another party.

Negotiations of many small properties to make up a satisfactory prospecting area became so involved and expensive that the Company looked around for large estates willing to give options; they found it necessary to engage an experienced land agent. Payments for options were variable and royalties on the sale of minerals was almost invariably agreed at a rate of 1/35 of the value at the mine.

Another speaker mentioned that even when satisfactory options were negotiated, prospecting companies had to deal with a substantial number of Government authorities like the National Trust, the local city authorities, and Forestry Departments, and each had to agree to the proposal. Another disadvantage of mining in Great Britain is that it does not attract any special tax benefits such as in Ireland where new mines have a tax holiday for 20 years.

One interesting paper in the General Sessions was "Economics of Mineral Exploration" by D.A.O. Morgan. The author of this paper had studied a number of case histories and from these, together with the findings of other workers, concluded that "providing mineral exploration is carried out on an adequate scale in a geological favoured terrain with the exercise of a high standard of scientific and technology expertise, it can yield acceptable levels of profitability. The greater the number of prospects investigated the better is the chance of making a successful discovery. In general the minimum desirable annual rate of expenditure on exploration appears to be between $US1.5 million and $US3 million. Expenditure at this scale should provide a better than 50% likelihood of finding a medium or large ore deposit in six to ten years with an outside chance of making a very large ore discovery."

CONGRESS TOURS

The Technical Sessions were followed by Congress Tours during the next two weeks. I took part in geological tours of Scotland and North Wales. The geological tour in Scotland was mostly in the Grampians Highlands and in the south-eastern part of the Northern Highlands. Some of the route was along the major fault zones that separate the Grampian Highlands from the Northern Highlands in the north and from the Midland Valley in the south. The portable x-ray fluorescence analyser developed jointly by the Institute of Geological Science and the U.K.A.E.C. was demonstrated by Dr. Callagher on a minor galena-fluorite mineralisation in the Grudie Granite at Invershin. The tour included visits to many of the major fault zones including the Highland Border Fault to the south-east of the Grampian Highlands and the Great Glen Fault on the north-western side, the Moine Thrust near Inchnadamph and the Glen Coe Cauldron Subsidence.

A visit was paid to the ancient lead-zinc mines near Strontian and to the Cruachan hydro-electric scheme at Lochawe. At Strontian in Argyllshire lead and zinc mineralisation occurs in association with calcite, barytes and some strontianite from which the element strontian was first isolated and named in 1791. The mineralisation was probably known in Roman times but was worked mainly between 1732 and 1872. Attempts in recent years to revive mining in this area have not met with any success and the deposits are more of historic interest than of interest as potential producers.

The Cruachan hydro-electric scheme at Lochawe is a pump-storage system designed to utilize off-peak loads from atomic power stations in Northern Scotland. The storage dam is of quite small size and the power station has been built underground at a depth of about 1200 feet below the dam. The station is equipped with 4 x 100 M.W. generators driven by reversible turbines which are used to pump water to the storage dam at night and at weekends when surplus power is available cheaply. The system is said to be 75 percent efficient and as power is purchased at about half the price of the power sold from the plant, the overall system appears to be economic. Incidentally the power house design is based on one of the Tumut power stations in the Snowy Mountains Scheme. Notes on the scheme have been filed in the library.

The geological tour of northern Wales was mainly an introduction to the Lower Palaeozoic rocks of North Wales with specific reference to their economic value. Areas visited contain some of the classic type localities from which the manes Cambrian, Ordovician, and Silurian were derived.

Visits were paid to the Robinson Research Company laboratories at Llanddulas adjacent to the Company's limestone quarries, and to the Smit (Diamond Tools Ltd) at Mochdre. The Robinson Research Company conducts mineral investigations rather similar to those carried out by AMDL; the Bureau is interested in the possibility of this laboratory carrying out some rock age determinations for it during the next financial year. The Company undertakes rubidium/strontian and potassium/argon determinations on a contract basis. Laboratories have quite a good reputation for the quality of their work. The Company has tentative plans to set up business in Australia either in Sydney or Melbourne and is in fact already carrying out some work for Australian clients. Smit (Diamond Tools Ltd) was originally a Dutch firm which transferred from Holland during the German occupation. One of the principals returned to Holland during the war under somewhat romantic circumstances to bring back the Company's stock of industrial diamonds. The Company was set up in business on the northern coast of Wales and has since flourished; it has branches in most parts of the World including Australia. Although they make diamond drilling bits, the greater part of their production is for special diamond tools for the precision milling of grinding wheels. The motor vehicle trade is their biggest customer.

A visit was made to the historic copper mines of Parys Mountain near Amlwch. These mines are pre-Roman in age but their main activity dates from 1768 when the principal copper ore bodies were discovered. The mines ceased production in 1883; the total recorded production was about 130,000 tons of metallic copper. Although this is certainly not large by present day standards, nevertheless in its day the Parys Mountain was the World's leading copper mine.

An overseas company, Canadian Industrial Gas and Oil Ltd is currently diamond drilling beneath the original ore body, the deepest hole to date being 1500 feet. Although the local Company representatives were very guarded in their comments, one gained the impression from the extent of the drilling that has been done and planned to date, and from inspection of some of the drilling core, that there is a reasonable possibility that an economic ore deposit will be developed. The Company's problems regarding mineral rights have been greatly simplified in Anglesea where all these rights are held by a single person. Metallic sulphides are associated with strong silicification of the country rocks which comprises mainly Silurian and Ordovician shales and slightly altered sediments adjacent to felsite. Mineralisation includes "bluestone" ore (lead, zinc, copper, and pyrite), chalcopyrite concentrations and pyrite veins.

Northern Wales is known for its slate quarries which in earlier days provided nearly all the roofing slates for London. Many of the old slate quarries are still being worked by methods which have been used for the last 200 years, even down to hand splitting of individual slates. It appears to be a dying industry although belated attempts are being made to develop machines for splitting the tiles with a view to reducing costs. Some time was spent at a slate quarry at Blaenau Ffestiniog which once employed several hundred men. Now only about ten men are working at the quarry face and a similar number on the slate splitting works.

Mount Snowdon was visited one day partly by foot and partly by the Snowdon Mountain Railway. The area contains some outstanding examples of Pleistocene glacial topography and one or two minor copper and lead occurrences. Not far away are the Trawsfyndd nuclear power station and a pump storage hydro-electric scheme similar to the Cruachan Station on Lockawe in the Northern Highlands.

Officers of the Institute of Geological Science from Leeds had prepared an itinerary guide giving a succinct account of the geology and matters of historical interest in the places visited; it finishes with the following warning.

> "The climate of North Wales is such that the itinerary is subject to the contingencies of the weather and may have to be altered drastically".

Fortunately the tour was favoured with exceptionally fine weather for most of the time and none of the itinerary had to be omitted. The weather in Scotland was also quite reasonable apart from a few hours of Scotch mist and rain.

VISIT TO PARIS AND PAU, FRANCE

The Congress finished in London on May 24 and during the following week visits were made to Institut Francais du Petrole (I.F.P.) and Compagnie Generale de Geophysique (C.G.G.) in Paris and Societe Nationale Des Petroles D'Aquitaine (S.N.P.A.) in Pau. The I.F.P. continues to grow in size and importance. It was founded by government decision in 1944 with three objectives, namely, scientific and technical research, training of technical personnel, and documentation and information. It is a non-profit organisation with a budget provided from a small government tax on petrol, plus whatever revenue it can earn from royalties and fees. In 1968 its income from government tax was 120 million francs and from royalties and fees about 45 million francs (roughly $A30 million total income). Its staff in 1968 was 1662 of whom 542 are executive or professional positions.

Its Information and Documentation Centre has functions almost parallel to those proposed for the Bureau's re-organised Publication and Information Sections. Quoting from the Brochure put out by the Institute describing its activities, "the Documentation and Information Department exercises its activity by providing industry with an extensive Library, by sending out descriptive index cards of books and periodicals and articles, by undertaking bibliographical research and by answering all requests for information. It draws up, promotes and carries out the I.F.P. publication programme and sees to the distribution of the documents such as technical reviews books, ENSPN course texts etc. At the same time it remains at the disposal of all the I.F.P. laboratory services". The I.F.P. technical divisions contribute to the above by participating in the task of analysing technical documents, by writing articles, lectures, courses and books".

The second of its functions, namely that of technical training, is carried out in the Ecole Nationale Superieure Du Petrole Et Des Moteurs (E.N.S.P.M.) which forms a direct part of I.F.P. It has five graduate centres: the Schools for Advanced Study in Geological and Geophysical Prospecting; Drilling and Production; Refining and Chemical Engineering; Internal Combustion Engines Products Applications; and Petroleum Economics.

The teaching staff is provided in part by the I.F.P. and partly by universities. In 1968 ENSPM teaching staff included no less than 32 university professors.

The I.F.P. has started a new organisation, the Bureau d'Etudes Industrielles et de Cooperation de l'Institut Francais du Petrole (B.E.I.C.I.P.), to be a consulting centre for the processing and interpretation of seismic data. Through this new organisation the skills and experience of the I.F.P.'s geologists and geophysicists can be made available to exploration companies to study well-defined problems of a precise nature.

During the visits to their laboratory some of the current research projects being undertaken by the Institute were examined. Recent developments in geophysics include a side-looking sonar which is now manufactured under licence for the I.F.P. by Geo Mechanique in Paris and seismic streamer cables using miniature hydrophones.

A number of reprints and brochures dealing with the activities of the Institute and its affiliates have been filed in the B.M.R. Library.

A day was spent in visiting the Compagnie Generale de Geophysique at its new offices and laboratories at Massy on the outskirts of Paris near the Orly Airport. This Company has recently completed an aeromagnetic contract for B.M.R. in Papua and New Guinea and is the successful tenderer for the 1969 aeromagnetic survey in the New Guinea area. C.G.G. is one of the oldest geophysical companies in the World, being able to trace its beginning back to 1912. The present Company was founded in 1931 by the merger of two small exploration Companies with the original Company founded by the Schlumberger brothers in 1926. These brothers, Conrad and Marcel, are true pioneers of exploration geophysics. They first used electrical methods in 1912 and were the originators of electric well-logging techniques in 1927. In 1931, the Schlumberger brothers decided to concentrate on the well-logging techniques, which now form the basis of the World-wide Schlumberger organisation, and to hand over their surface geophysical techniques to C.G.G.

The Company's new laboratories at Massy are most impressive, being in size and appearance rather similar to the B.M.R.'s offices and laboratories in Canberra. An outstanding feature is the extent to which digital processing has been undertaken, in particular in aeromagnetic and seismic surveys.

The Company's computer centre houses four EMR computers and I.B.M. 360-40 and two 90 digital plotters manufactured by their subsidiary Company SERCEL. At the time I visited Massy, work was proceeding on the installation of an additional computer which would double the Company's capacity for handling seismic data. All the seismic data, whether from their own crews or company data under review, are first converted to digital form (if this has not already been done during recording) and then processed by a variety of programmes adapted to each geological problem. Other computing programmes have been perfected by C.G.G. for aeromagnetic reduction including various forms of filtering to remove unwanted anomalies, for radio and satellite navigation with automatic mapping, and for various electrical methods.

None of these developments is new, and in fact many of them are in use to some extent in the B.M.R., but we still have some distance to go to reach the state of sophistication of the C.G.G. laboratories.

A two day visit was paid to the Societe Nationale des Petroles D'Aquitaine at Pau in the south of France. Main contacts were Monsieur Claude Menetrier, Divisional Manager for the South Pacific Zone, and Monsieur Denis Berte, Chief Geologist for the Pacific Zone.

S.N.P.A. was formed in 1941 with 51 percent of the capital held by Bureau de Recherches de Petrole, a French Government organisation. It operates in two complementary fields, oil exploration and exploitation in France and overseas and industrial chemistry petrochemistry and thichemistry - plastics. Its overseas operations are conducted through wholly owned subsidiaries such as Australian Aquitaine Petroleum. It has an oil production of approximately 16 million barrels per year from a small field at Lacq near Pau and from the El Gassi and El Agreb structures in the Sahara, and gas production (approximately 300 billion cubic feet in 1967) from two sulphurous gas reservoirs near Lacq.

The Company's research laboratory and exploration centre at Pau services the needs of the parent Company as well as of most of the subsidiaries. Its equipment, staff, and general air of efficiency are quite outstanding. It is equipped to carry out a full range of chemical analyses in x-ray fluorescence and diffraction, optical and atomic absorption spectroscopy as well as by wet chemical analysis. It is also equipped for both potassium/argon and rubidium/strontiam radio-isotope age determinations having four modern mass spectrographs (two for each process) for the purpose. It has recently installed a Cambridge Scanning Electron Microscope and also electron-microprobe equipment.

Its computing facilities are both modern and extensive and, like the C.G.G., all its seismic processing is now done by computers. It makes extensive use of Laser scan equipment for the preliminary assessment of filtering and other factors to be incorporated in the digital processing of seismic records.

Visits were made to the gas field at Lacq and to the extensive gas treatment plant from which elemental sulphur as well as other valuable by-products are extracted from raw gas. A brief visit was also made to drilling rigs currently in use to develop a new gas field recently discovered immediately south of Pau.