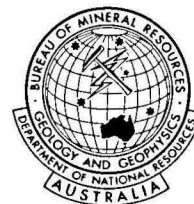


20143
BMR PUBLICATIONS COMPACTUS
(LENDING SECTION)



DEPARTMENT OF NATIONAL RESOURCES

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD 1975/83

056366



RAMBLINGS OF A MICROPALAEONTOLOGIST

by

Irene Crespin

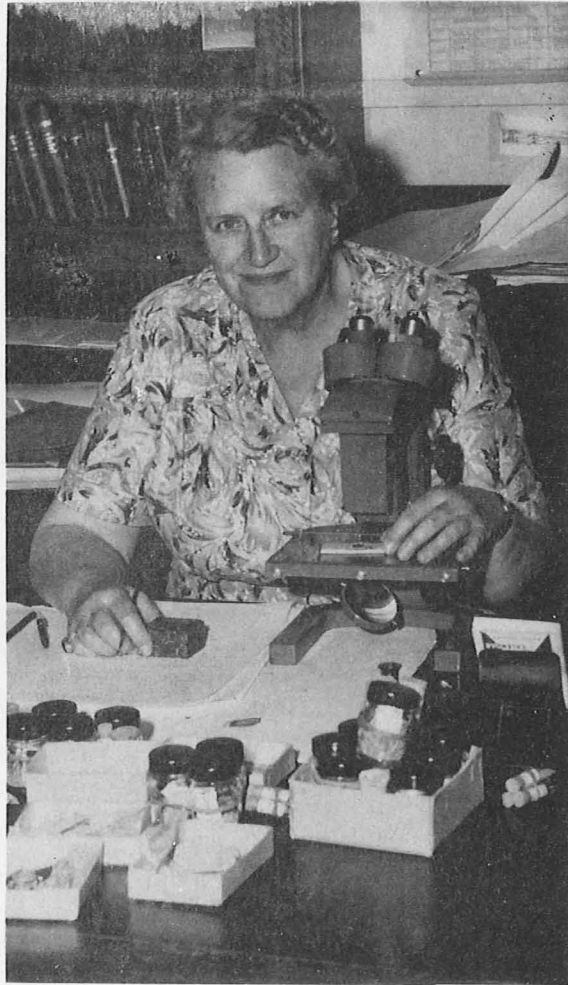
The information contained in this report has been obtained by the Department of National Resources as part of the policy of the Australian Government to assist in the exploration and development of mineral resources. It may not be published in any form or used in a company prospectus or statement without the permission in writing of the Director, Bureau of Mineral Resources, Geology and Geophysics.

RECORD 1975/83

RAMBLINGS OF A MICROPALAEONTOLOGIST

by

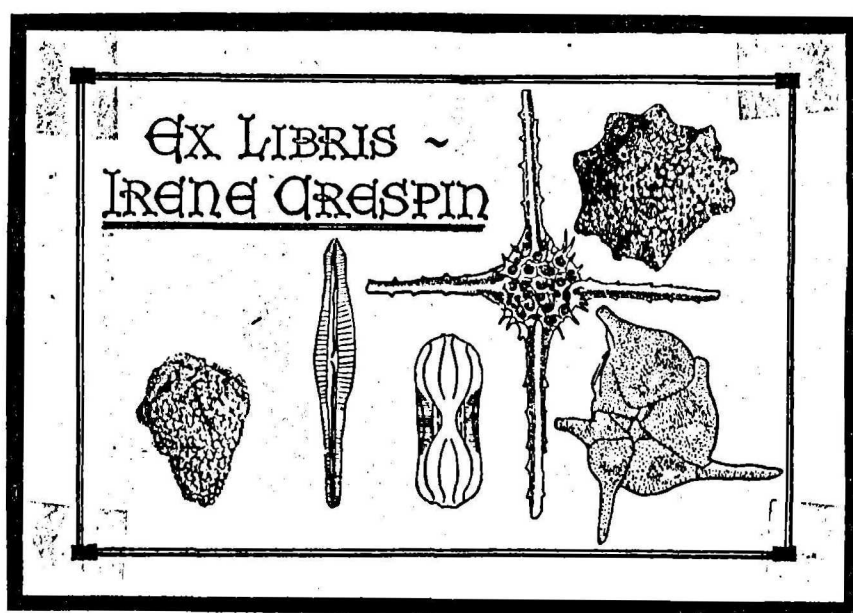
Irene Crespin



Author, prior to retirement, 1927 - 1961.

CONTENTS

	<u>Page</u>
1. INTRODUCTION	
2. MY EVER INCREASING INTEREST IN MICROPALAEONTOLOGY	2.
3. THE NATIONAL MUSEUM ERA 1927-1935	5.
4. CANBERRA ERA 1936-1975	9.
5. FIELD TRIPS	13.
6. JAVA AND SUMATRA, 1939	17.
7. VISIT TO THE UNITED STATES, 1951	24.
8. INTERNATIONAL SCIENTIFIC CONFERENCES	34.
9. DISCOVERING THE PACIFIC ISLANDS	42.
10. SCIENTIFIC PUBLICATIONS OF IRENE CRESPIN	54



A Micropalaeontologist's Book Plate -
Lower left, top right, and lower right - Foraminifera.
Second and third from left - Diatoms. Centre - Radiolaria.

RAMBLINGS OF A MICROPALAEONTOLOGIST

1. INTRODUCTION

After being associated with scientists of different disciplines throughout the world for more than fifty years, immediate colleagues have urged me to place on record some of my personal experiences and observations made during those years. Most of the scientists have been connected with geology, more especially with its branches, palaeontology and micropalaeontology.

I look back on those occasions with a feeling of pride that I should have been privileged to meet and to have the friendship of so many outstanding men and women.

I have come to realise more and more that, as a woman, I was a pioneer in the study and application of Micropalaeontology to the search for oil in Australia, Papua, New Guinea, and in other parts of the Pacific region.

I have visited many countries overseas, partly in an official capacity, partly in response to invitations from scientific organizations, and partly from my desire to see localities, especially those in the Indo-Pacific region from which I had examined fossiliferous rocks submitted by different Geological Surveys and companies searching for oil.

In relating these events, some reference is made to the early history of the Commonwealth Bureau of Mineral Resources, Geology and Geophysics created in 1946.

For myself, I joined the Commonwealth Government as Assistant Palaeontologist to the late Frederick Chapman in December 1927, after the Government, in 1926, passed the Petroleum Prospecting Act and took definite steps to further the search for oil and other minerals in Australia, Papua and New Guinea (see Crespín, 1972).

In January 1936, I succeeded Mr. Chapman as Commonwealth Palaeontologist, which involved the transfer of the Palaeontological Section of the Geological Branch from the National Museum, Melbourne, to Canberra, Australian Capital Territory. I retired on November 12th 1961, when, at that time, I was a Supervising Geologist and Senior Micropalaeontologist. The appreciation of my work has been shown by the honours that have been bestowed on me, including the Order of the British Empire in the New Years Honours of 1969.

2. MY EVER INCREASING INTEREST IN MICROPALAEONTOLOGY

My interest in Palaeontology began early in my life, when I was one of the first students to attend the Mansfield High School in northeastern Victoria. The head master for a short period, was the eminent Australian geographer and geologist, the late Dr Charles Fenner, father of the distinguished micro-biologist, Professor Frank Fenner, presently at the Australian National University, Canberra. Dr. Fenner's enthusiasm in searching for fossil plants and fish remains in the purplish Carboniferous mudstone at different localities in that beautiful countryside, soon aroused my interest in Palaeontology, which, after many decades, is still an integral part of my existence. It was revealed in later years that fossils of different ages were to be found in some abundance in many localities in the Mansfield district.

On entering the University of Melbourne as a student in the Faculty of Arts, it seemed natural for me to take Geology Part 1 as the science subject, which, in those days, had to be included in the Arts course. Prior to the decision to take an Arts course and probably become a teacher, I was tempted to make music my career. Although I had been successful in the higher examinations in music, it was decided for me that it would not be my career. So I planned to be a teacher.

Fellow students at the University were men and women who later became prominent citizens. They include Dame Mary Herring (nee Mary Lyle), Sir Robert Menzies, Professor Sir Keith Hancock, Sir Philip D. Phillips and Professor Sir Kenneth Bailey.

I was the first woman to be President of the Students Representative Council. That was in 1918. I held this pride of place for 54 years until 1972, when Miss Mary-Ann O'Connell was elected to that position. Shortly after her appointment she was in Canberra and called to see me. I did appreciate this kind thought.

In taking Geology as my science subject, I came under the influence of the noted Palaeontologist, Frederick Chapman, A.L.S., who, at that time was Palaeontologist at the National Museum, Melbourne, and lecturer in Palaeontology in the Geology Department of the University. The subject fascinated me and instead of becoming a teacher, I became a geologist, with special interest in Palaeontology. I completed the course in Geology.

In the Geology Department, I found fellow students who have remained my friends through the passing of the years. Such friends are Mrs. H.M. Sherrard M.Sc. (formerly Kathleen McInerny) and her husband, Howard M. Sherrard, C.B.E., who studied Civil Engineering and later becoming Commissioner for Main Roads in New South Wales. Their home in Sydney is always open for me. Mrs. Sherrard and I are both Life Members of the Royal Society of Victoria, after being members for fifty years.



**Frederick Chapman - First Commonwealth Palaeontologist,
1927 - 1935.**

Chapman was a world authority on the microscopic, single-celled marine organisms, known as the Foraminifera. These organisms have become of considerable importance in oil field investigations. Chapman, in 1900, was the first specialist to examine subsurface sediments from an oil well in Santa Clara County, California, and to discover microfossils in them.

I found myself becoming increasingly attracted to the study of microfossils. It was under Chapman's guidance that, in 1926, I made my first contribution to Victorian geology, palaeontology and micropalaeontology on the Tertiary deposits at Green Gully, Keilor, near Melbourne (Crespin, 1926).

Chapman was a man small in stature but with great tenacity of purpose. He was Palaeontologist at the National Museum, Melbourne, for 25 years, from 1902 when he arrived from London, to 1927, when, in June of that year he was seconded to the Commonwealth Government to become the first Commonwealth Palaeontologist to the newly formed Geological Branch of the Department of Home and Territories (later, Department of Home Affairs and then the Department of the Interior). He retired from that position in 1935 and died in 1943, in his 80th year. The late P. Crosby Morrison wrote ("Melbourne Herald", 16/12/43) "that with his death ends an age of Australian Geology, an age to which Sir Edgeworth David and the younger Etheridge belonged". He received many honours from scientific institutions both in Australia and overseas.

Following Chapman's retirement in December 1935, on January 1st 1936, I was appointed his successor as Commonwealth Palaeontologist, and on February 10th was transferred from the National Museum, Melbourne to join the Commonwealth Geological Adviser, Dr. W.G. Woolnough, in Canberra. The ever increasing numbers of micro- and macro fossils, fossiliferous rocks and bore cores together with the small library we had acquired, came with me.

With my appointment as Assistant Palaeontologist to F. Chapman in December 1927 and succeeding him as Commonwealth Palaeontologist in January 1936 together with my transfer to Canberra, opened up a new horizon for me and possibly other women geologists in Australia. Of course, being a woman, and despite the tremendous responsibility placed upon me with the transfer to Canberra, I was given a salary of about half of that which Chapman received. Later the Chairman of the Public Service Board told me that I was being put on trial. Later on he congratulated me on the success I was making in my new position.

I gradually concentrated my work on Micropalaeontology, which included foraminifera, ostracoda, radiolaria, conodonts and diatoms and for some years I was the only professional micropalaeontologist on the Australian mainland,

I was becoming greatly interested in the Tertiary microfaunas, especially the larger foraminifera which were being widely used by the Dutch micropalaeontologists for stratigraphical correlation in the Indo-Pacific region. I also realised that it was necessary to be conversant with Permian and Cretaceous assemblages because of the increased interest in the search for oil and coal and even water, in different parts of Australia.

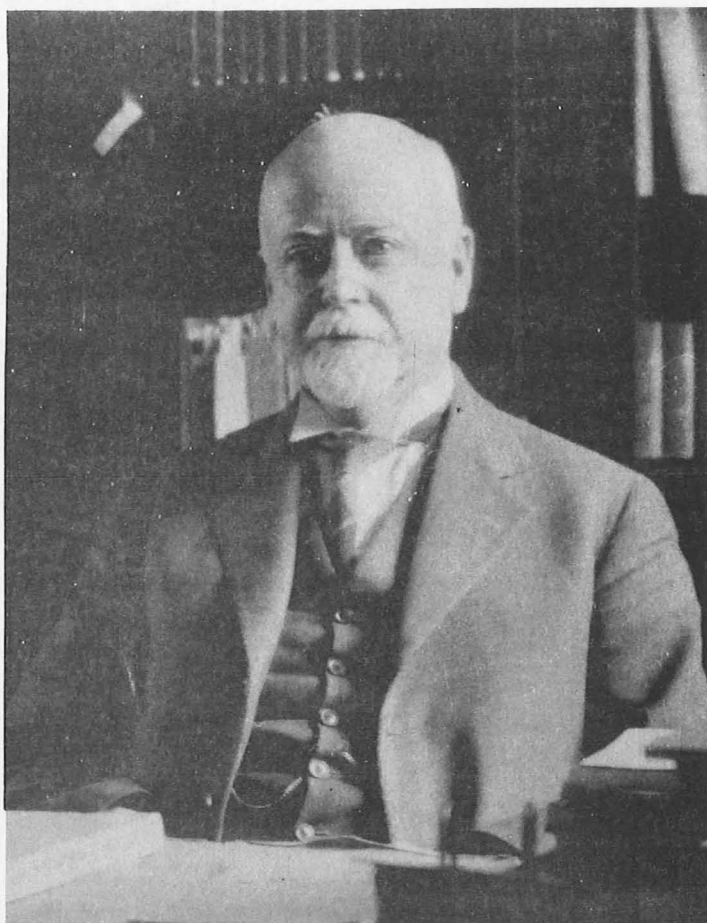
Two Dutch workers, I.M. Van der Vlerk and J.H.F. Umbgrove, in 1927, recognized that the larger foraminifera in the Tertiary rocks of the Indo-Pacific region, exhibited characters different from those found in Europe and had been deposited under different ecological conditions. Chapman and I had come to this way of thinking when we were investigating the fossiliferous limestones sent to us by the Anglo-Persian Oil Company geologists from Papua and New Guinea. We felt that we could apply the "letter classification" suggested by these Dutch micropalaeontologists, to these limestones. The results of these investigations were published by the Anglo-Persian Oil Company in 1930. Later, in 1932, we applied this method of classification to subsurface sediments examined from bores in Lakes Entrance area in Victoria (Chapman and Crespin, 1932).

When working at the National Museum, I discovered that the building stone used in the Law Courts building at the corner of Russell and Latrobe Streets teemed with tests of larger foraminifera. Amongst these tests were many of the genus Lepidocyclina. I often wished I could remove a few for examination. The stone had been quarried at Batesford near Geelong.

As I became more and more interested in the larger foraminifera, I felt the need to discuss some of my Indo-Pacific problems with authorities in the Netherlands East Indies. Early in 1939, I was given permission to visit Java and Sumatra, to meet Dr Tan Sin Hok in Bandoeng, Java, and Dr Hans E. Thalmann in Palembang, Sumatra. Later in 1951, I was given the opportunity to discuss these problems in America with Professor Storrs Cole of Cornell University at Ithaca and with my old friend, Professor T. Wayland Vaughan, in Washington.

During my long period of investigations of both macro- and microfossils, developments in techniques, more especially in micropalaeontology have been phenomenal. These advances have been developed primarily because of the use of microfossils in economic investigations especially in the widespread search for oil. I realise this when I visit the laboratories at the Bureau of Mineral Resources, after more than ten years retirement.

In the 1920s. most of our microscopic examination was carried out with the aid of a monocular microscope, which was very strenuous. In the early 1930s, Mr Chapman and I were given the use of a binocular instrument, no longer wanted by the Anglo-Persian Oil Company, in Port Moresby, because of its retirement from the area. A modern instrument was not available to me until 1946. The use of microfossils in oil investigation becomes more and more specialised for such factors as environment have to be considered, not only on land but in offshore drilling.



Dr W.G. Woolnough - First Commonwealth Geological
Adviser, 1927 - 1941.

3. THE NATIONAL MUSEUM ERA 1927-1935

Earlier in this story, it was mentioned that, in 1926, the Commonwealth Government decided to further the search for oil and other minerals in Australia, Papua and New Guinea, and created the Geological Branch of the then Department of Home and Territories. The late Dr W.G. Woolnough, Professor of Geology at the University of Western Australia, was appointed the first Commonwealth Geological Adviser, with his headquarters in Canberra. Mr Hossfeld of Adelaide, South Australia, was appointed Assistant Geologist, but resigned in 1935. It was further decided to form a Palaeontological Section of this Branch, and in June 1927, Frederick Chapman, Palaeontologist to the National Museum, Melbourne, was seconded from the Victorian Government to the Commonwealth Government, to become the first Commonwealth Palaeontologist, with headquarters at the National Museum, Melbourne. On December 1st 1927, I was appointed Assistant Palaeontologist, thus beginning my long association of 34 years in the Commonwealth Government and the search for oil in Australia, Papua and New Guinea. All appointments were temporary, being reviewed every three to six months,

The National Museum, Melbourne, was chosen as the headquarters for the Palaeontological Section, because of the extensive collections of fossils, both macro-and microfossils, from all parts of Australia, Papua and New Guinea which were available for reference and which had been put together by Mr Chapman over a period of 25 years. Furthermore, comprehensive collections of scientific literature, necessary for reference, were available in the library of the National Museum itself as well as in the adjacent National Library of Victoria. Mr Chapman himself, had a magnificent library of publications on microfossils which on his death was purchased by the Bureau.

In the search for oil, early attention was focussed on the Tertiary deposits in south-eastern Australia, Papua and New Guinea, and on the Permian sediments of northwestern Australia. Material received for examination from Oil Company geologists included both macro-and microfossils. With Mr Chapman having such a wide knowledge of both these groups, whether Tertiary or Permian, it was necessary for me to improve my knowledge of fossils of different ages, if I were going to make a success of my appointment. Specialists in individual groups of fossils were not readily available to study microfossils as has been the case in the Bureau of Mineral Resources since 1946. However, the results of investigations carried out by Chapman and me on both surface and sub-surface sediments gradually came to be dominated by microfossils.

Chapman's world-wide knowledge of foraminiferal assemblages was illustrated during the second world war, when his son, Brigadier Wilfred Chapman, who was in the North African campaign, would send him small pieces of fossiliferous rocks to give his father some indication as to where he was at that time.

When I reflect on those early days in the National Museum, from 1927 to 1935, I still wonder how so much basic palaeontological investigation was carried out in substandard accommodation, and with such poor equipment. To wash friable sediments it was necessary to go down two flights of stairs to the basement or take the risk of using the first hydraulic lift in Melbourne, for us to obtain running water.

Later the authorities in Canberra had agreed to put in a trough with running water in the basement. The residue, after washing, was then taken upstairs again and dried in a shallow dish over the flame of a small methylated spirits lamp. For a few years thin sections of limestones and other hard rocks, were made by rubbing fragments of the rocks down by hand on a glass plate covered with carborundum, in our small office. Later, arrangements were made with the Victorian Mines Department for its technician to prepare thin sections for us.

During the winter, one sat in one's overcoat, and at times I wore a beret for warmth. We had one electric radiator between three of us (we had a typist). The office was in one of the galleries and we worked behind a partition about eight feet high at the end of the gallery. The draught overhead was terrific.

In the early days, we passed through the depression era. Our salaries were reduced overnight. I was reduced to six pounds a week. They were difficult times for us all. One would walk a long distance to save a threepenny tram fare.

Our first microscope was a monocular one, and I often wonder how I have managed to retain my good eyesight. In 1930, after the withdrawal of the Anglo-Persian Oil Company from Papua, many company maps and some apparatus were sent to Dr Woolnough in Canberra. In that collection was a binocular microscope of early vintage. However, we found it an improvement on our original instrument. The monocular one is amongst the antiques of nearly fifty years ago now in the Bureau of Mineral Resources.

During those years, however, the fossiliferous material forwarded to us gradually accumulated and we became pressed for space. We acquired extra cabinets and these were placed in the basement.

The location of the Palaeontological Section being at the National Museum for eight years, made our small office the mecca of many geologists and palaeontologists from all parts of Australia and overseas. Most of them were associated with the search for oil and it gave me a unique opportunity to meet and learn from them all.

The most notable visitor was the late Professor Sir Edgeworth David of the University of Sydney. He usually called to see us on his return trip from Adelaide, where he was studying the Pre-Cambrian rocks. I often wondered the reaction of his wife when he returned home, as he usually wrapped his specimens of the hard slaty rocks in spare pairs of socks! Sir Edgeworth had many fascinating stories to tell, not the least interesting being a happening when he was on the Central Pacific Atoll, Funafuti in the Ellice Group in 1904. He was attached to an expedition to that atoll which was studying the origin of coral reefs. The party made a collection of conch shells (Strombus) which are common in the shallow, warm waters of the Pacific Ocean. These shells were placed outside the tents. One morning the party awoke to find they had disappeared, - the hermit crabs had made a midnight raid and had walked off with their new homes. On one of my visits to Fiji, a small island boat was tied up at the wharf at Suva. It was on its way to Funafuti.

How I wished that I were a passenger to this interesting atoll. More recently (1972), it was lashed by a terrific hurricane with winds of over one hundred miles an hour. Dwellings on the atoll were flattened.

Geologists of the Anglo-Persian Oil Company and later the Australasian Petroleum Company and Island Exploration Company, on their way to and from Papua and New Guinea called in for consultations, as Mr Chapman and I were engaged in the examination of Tertiary rocks from those areas for the Companies. The results of this work were published in Volume 2 of the A.P.O.C. reports on their investigations from 1927-1929. The issue of these two volumes was restricted to 100 copies. I was the recipient of one of them but unfortunately it was burnt in the disastrous fire at the Bureau of Mineral Resources in Canberra in April 1953. The visiting geologists included B.K.N. Wyllie, chief geologist of A.P.O.C., together with J.N. Montgomery, J. Nason-Jones, S. Papp, W. Gray, and R.K. Richardson. G.A.V. Stanley who was attached to Oil Search Limited of Sydney, and later of A.P.C. visited ^{US} at least once a year. Other visiting geologists connected with oil investigations in Western Australia included H.G. Raggatt, E.A. Rudd and D. Dale Condit of Oil Search Limited, and E. Jablonski and C. Bremner from Vacuum Oil Company.

From time to time either Mr Chapman or I accompanied the Director of the Victorian Geological Survey, W.J. Baragwanath, or the geologist in charge of drilling operations, J. Binney, to East Gippsland, especially the Lakes Entrance and Bairnsdale areas where drilling was being undertaken partly by the Geological Survey and partly by small companies searching for oil. Most of the drilling was by the rotary method, and many beautiful cores were available for examination. When these cores were forwarded to Melbourne, they were divided, one part being retained by the Geological Survey, and the other part was sent to us at the National Museum for palaeontological examination. Cores from a bore drilled by the Kalimna Oil Company on Rigby Island in the Gippsland Lakes, were 10 inches in diameter; the usual diameter was three inches. The cost of drilling in those days was cheap according to present day standards; the average cost was about one pound per foot.

On our visits to East Gippsland, our headquarters was the Club Hotel, Lakes Entrance, where meals were excellent but the mosquitoes very troublesome. At the end of the day the bar was the meeting place for those engaged in drilling operations and weary geologists. Tariffs were very reasonable, the cheapest of all being at the old Metung Hotel, at Metung, where dinner, bed and breakfast cost five shillings!

Those were interesting days, when we travelled to Bairnsdale by train. There, one of the Survey's geologists, Mr Jack Easton, met us in an old Geological Survey car. The driver was apt to take his eyes off these rough and winding roads much too often to the distress of the Director. I found travelling with Mr Baragwanath fascinating. He always had stories to tell of the early days in Gippsland, the location of old mining shafts - the shaft in which coal was first encountered in Gippsland and of shallow mines in the Strezlecki Ranges which we could see from the train. When I was transferred to Canberra he presented me with a set of six illustrations which had appeared in the early Records of the Geological Survey of Victoria. All were reproduced from original pen and ink drawings. Unfortunately, now I own only three of these historic pictures, the others being burnt in the fire at the Bureau in 1953, when I lost so many of my precious belongings.

In 1932, Harold Stearns together with his wife Norah from the Underground Water Branch of the United States Geological Survey in Honolulu, and an authority on volcanoes, visited Melbourne. The Director of the National Museum, Mr. D.J. Mahony (who, incidentally had collected fossils from many localities during his survey with Professor Griffith Taylor, of the site of the proposed Federal Capital, in 1912) was anxious to show these American visitors something of Victoria. He asked me to join them on a trip to the western District as far west as Camperdown. Stearns was very impressed with the well-known "Stoney Rises" west of Geelong and with the countryside between Colac and Camperdown where there are many small volcanic cones and small lakes. He commented that if such a vista was seen in the United States, it would be called the "Valley of a thousand lakes". Mrs. Stearns presented me with a copy of her publication "An Island is born" - a story of the creation of the Hawaiian Islands. This book is very rare. It was slightly burned in the Bureau fire of 1953, but is now in the care of Dr Cliff Ollier of the Geology Department of the Canberra College of Advanced Education.

Some interesting incidents at the Museum helped to brighten our environment. One was rather outstanding. Two monkeys escaped from the Walter and Eliza Hall Institute, which in those days, was attached to the Melbourne Hospital, with its entrance on to Russell Street. They found their way into the Museum Gallery. There they caused great amusement to onlookers as they would swing from one light fitting to another; but the attendants were not so pleased. It was not until the end of the day that they were captured; but the mystery of their arrival in the Museum was never solved.

However, despite our substandard accommodation it was a delight to walk through the Ceramic and Picture Galleries on our way to the office. These gracious galleries were the scene of a brilliant reception for members of A.N.Z.A.A.S. in Melbourne in 1935.

4. CANBERRA ERA 1936 - 1975

As previously mentioned, on February 10th 1936, I was transferred from the National Museum, Melbourne, to Canberra - The National Capital. I arrived by train at 9 am on a very hot dusty morning of February 11th, to find no one to meet me. The Stationmaster suggested that I telephone the Secretary of the Department of the Interior, Mr J.A. Carrodus, to let him know I had arrived. The Secretary admitted they had quite forgotten I was due that morning. Dr Woolnough hurried down to the station but not before my friend, Mrs. Ludbrook, had arrived. The departmental authorities had made no arrangements for my accommodation, but fortunately Mrs. Ludbrook had done so. I went to the Hotel Ainslie where I was supposed to stay for only two weeks. I stayed there for fifteen years!

More surprises awaited me when Dr Woolnough showed me my office accommodation. The headquarters of the Geological Branch of the Department of the Interior was in the back portion of the building which Melbourne people would recognise as part of the old Jolimont building. In Canberra it was known as the Census Building. The front portion was used by the Census staff and another portion, by the police department. The portion that had been used by the Geological Branch was destroyed by fire a few years ago. It still remains an eyesore on Northbourne Avenue.

I was shown a fairly large bare room, no table or chair only an empty box, with sticky black malthoid covering the concrete floor, and as it was a very hot day, the malthoid was really sticky. I got in touch with the Secretary, and in a day or so I received floor coverings including linoleum for the room and a carpet for under my table. A very handsome table arrived later. The conveyance carrying my collection of cabinets, and numerous boxes, arrived from Melbourne in a few days. The whole situation at the office was very depressing.

Apparatus for cutting rock sections had been made by Dr Woolnough himself, quite a Heath-Robinson affair. All work had to be done by hand. He had even built shelving for his scientific papers with his own hands. He had a draftsman-clerk, H.B. Hawkins, to assist him. Before long I was given a typist. An Assistant Palaeontologist, Miss J. Gilbert-Tomlinson, was appointed in 1937.

Shortly after my arrival in Canberra and when I was almost settled, the Oil Advisory Committee was created, consisting of Dr Woolnough as Chairman, with Dr Keith Ward, Director of the Mines Department of South Australia, and Dr Arthur Wade, an English petroleum geologist who had been working for the Freney-Kimberley Oil Company in Western Australia, and with Mr H. Barrenger of the Department of the Interior as Secretary. Dr Wade was given a room in the Geological Branch, making our accommodation worse than before. Later in 1936, the members of the Oil Advisory Committee (or the "three W's" as we knew them) travelled across to Perth. I accompanied them to study some Permian sedimentary rocks for microfossils. Dr Wade had collected these rocks in the Kimberleys and they were housed in the Geology Department of the University of Western Australia. Whilst in Perth I was able to have consultations with the Geological Survey of Western Australia, as I was at that time, engaged in the micropalaeontological investigation of samples from water bores in the vicinity of Perth, for the Survey.

In 1939 I received permission from the Minister of the Interior, to visit Java and Sumatra for discussions with Dr Tan Sin Hok in Bandoeng, Java, and with Dr Hans Thalmann in Palembang, Sumatra. (see Section 6).

In 1940, Dr H.G. Raggatt of the Geological Survey of New South Wales, joined the Geological Branch as Assistant Commonwealth Geologist to Dr Woolnough, and on retirement of Dr Woolnough in 1941, Dr Raggatt succeeded him as Commonwealth Geologist. In 1941, the Geological Branch was reorganized, becoming the Mineral Resources Survey, with Dr Raggatt as Director and Mr P.B. Nye, formerly Executive Officer of the North Australia Survey, as Assistant Director.

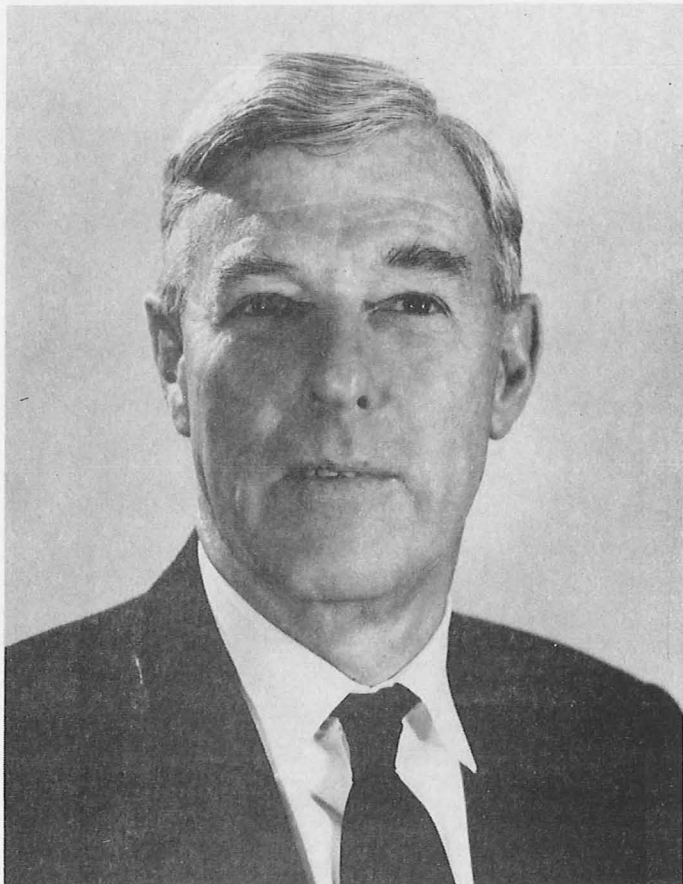
In this section of the story I will touch only briefly on the organization of the Mineral Resources Survey and later the Bureau of Mineral Resources, Geology and Geophysics as this is given in detail by me in the Records of the Australian Academy of Science, volume 2, No.2, 1972.

With the outbreak of war in 1939, the staff of the Geological Branch gradually increased in number, with geologists coming in from New Guinea, and from Northern Australia. We had managed a few more rooms in the Census Building, but the limit had been reached. So in 1945, the Mineral Resources Survey was transferred to Melbourne Buildings in Civic Centre. There we were settled until April 10th 1953, when a disastrous fire gutted some of the rooms, including Dr Opik's and mine. I myself, lost 3000 slides of microfossils. Then we acquired two wings and an annex at the Turner Hostel in Childers Street, where the Bureau remained until its new building on Parkes Way was completed in 1965. In my long career, from 1927 to 1961, I never had the good fortune to be permanently housed with my precious specimens.

It has been interesting watching the progress, and being a part of the growth of Canberra, since February 1936. At that time the population was about 6,000 people; it is now more than 180,000. Life was so different then. Canberra is a city now with numerous suburbs. Many of my favourite haunts, such as where to collect mushrooms, have been built upon and the roads to homes of some of my friends, where I used to spend weekends in which we called "the country" are no longer. Even the small homesteads have disappeared.

Comments on some of the highlights of Canberra in the early days may be of interest. The Capitol Theatre in Manuka was the only theatre and people would have permanently reserved seats for Saturday night. The Civic Theatre was built during 1936; I was at the opening. The only shops in Civic Centre were those in the colonaded part of the city. We would walk from the Hotel Ainslie to Civic Centre and would have competitions as to the number of wildflowers one could find.

During the war, Canberra had a complete blackout. One found oneself driving the car on to nature strips or up the wrong driveway, that is of course, if one had enough petrol to go out in the evenings. I remember pooling petrol with a friend so that we could go across to the Masonic Hall, where there was an exhibition of paintings by the well known artist, Mrs. Carrick Fox. I am fortunate enough to own two of her works.



Dr. H.G. Raggatt, First Director,
Bureau of Mineral Resources, Geology and Geophysics.

The Hotel Ainslie was my home until 1951. When I returned from a visit to America I was transferred to the new hostel, Havelock House. In 1954 I was allotted a flat in Ainslie at 6 Howe Crescent, which became a meeting place for visitors from other States and overseas scientists. However, retirement time was coming closer and closer. In 1965 I acquired a house near the foot of Mount Ainslie, and here I have been able to have a garden and a study. At the time of writing this story, the trees are rich in autumn foliage and rosella parrots with their gay plumage, and other colourful birds are usually about.

I joined the Royal Canberra Golf Club soon after my arrival in Canberra. I had always been a keen player and before I left Melbourne, the Members of the Kew Golf Club made me an Honorary Member. I was very thrilled about this as I was only the second woman to be so honoured. I soon became a member of the Canberra Associates Committee representing the weekend players.

In 1952, micropalaeontology played an important part in the detection of crime. At the request of the Chief Geologist, Dr N.H. Fisher, I co-operated with the Police Department in investigations connected with the blowing open of a safe at the Royal Canberra Golf Club. As the safe was insulated with diatomite, I was asked to use my knowledge of this material, as I had made a specialized study of Australian diatomites during the war, for this mineral was used in the filtration of water for the troops in Northern Australia, Papua and New Guinea. The accused man was unfortunate in having diatomite in the cuffs of his trousers similar to that which was used in insulating the safe; it was an overseas variety. The case received a certain amount of publicity and was quoted by the C.I.B. in Sydney for some time.

I gradually became involved in scientific activities in Canberra. I joined the Royal Society of Australia as it was known until 1954, when The Australian Academy of Science was chartered. We had to surrender the title of Royal Society of Australia because we were not representative of Australian scientists, but we received Royal assent to be known as the Royal Society of Canberra. I was Honorary Secretary for twelve years, and through the strenuous years of the war we had our regular monthly meetings. We even managed to arrange for Sir Howard Florey to address the Society when he was in Canberra for a short time. In 1957 I was elected President of the Society, being the first woman to hold that office. I am now a Life Member of the Society.

On April 10th 1953, a serious fire in Melbourne Buildings, Civic Centre, set back investigations in the Bureau for some time. It apparently started in a room of the Canberra University College immediately above the Bureau. The rooms occupied by Dr Opik, Miss Gilbert-Tomlinson and myself received the full blast of the fire. Many valuable books and specimens were lost. I had just finished cataloguing part of the Chapman Library on Foraminifera for publication in America. The manuscript was on my table which was completely destroyed. Part of the Chapman Collection of historic slides of Foraminifera which were in my room were lost. Amongst the items of sentimental value was a framed card inscribed "Label today, tomorrow you will have forgotten", which had been sent to Mr Chapman by Heron Allen, a foraminifera authority in England, in 1914. This card had pride of place in our office at the National Museum, Melbourne, and later in my room in Melbourne Buildings. The attention of many young geologists was called to those wise words. I was very shocked by this tragic event, so when I received an invitation to attend the Pacific Science Congress in the Philippines, I accepted it.

Also in 1953, I received the Coronation Medal. In 1956, I was awarded the Clarke Medal by the Royal Society of New South Wales for my geological and palaeontological investigations in Australia and its Territories. I was very thrilled with this award.

In 1954, the Geological Society of Australia was formed and I was Honorary Secretary of the Territories Branch in Canberra for one year. I was elected Chairman of the Canberra Branch in 1957. In 1964, I was made an Honorary Member of the Geological Society of Australia, an honour which I greatly appreciated.

In 1955, the Soroptimist Club of Canberra was chartered. Soroptimist International is a world-wide organization of women. I was a charter member of the Canberra Club. I have had the friendship of many outstanding Soroptimist women not only in Australia but throughout the world. I was President of the Canberra Club in 1957. In 1971 I was given Honorary Membership in recognition of the Golden Jubilee Year of Soroptimism. Being a Soroptimist is like being a geologist, a wonderful "Open Sesame" to friendship all over the world.

In 1960, I took some of my long service leave and visited England and the Continent. Shortly after arriving in London, I attended the Soroptimist International Conference, which was very exciting. Three thousand women from all parts of the world in which Soroptimist Clubs have been chartered, were present. We had invitations to the Royal Garden Party at Buckingham Palace and a wonderful night at Guild Hall where we were greeted by the Lord Mayor of London and were shown some of the treasures in that lovely building.

Whilst in London, I attended a meeting of the Royal Microscopical Society of which I had been a Fellow for some years. At this meeting, Honorary Fellow was conferred on me. I felt this was a great honour as I am the only one in Australia.

On my return voyage to Australia and when we were nearing Penang, I received a wireless message telling me that the University of Melbourne had conferred on me the Degree of Doctor of Science. I was quite overwhelmed with this news. That evening there were suitable celebrations. Women, with the degree of Doctor of Science, are few in Australia, and for this reason I was so very thrilled.

Following my retirement in November 1961, the Commonwealth Professional Officers' Association presented me with the Award of Merit. I appreciated this award very much.

The greatest honour I received during my long career as Micro-palaeontologist to the Commonwealth Government, was when Her Majesty, Queen Elizabeth conferred on me the Order of the British Empire (O.B.E.) for Public Service. My name appeared in the New Years Honours List on January 1st, 1969. Congratulations came from all parts of Australia and of the world. This appreciation of my work in the field of Micro-palaeontology, made me very happy.

5. FIELD TRIPS

I always enjoyed my visits to the field to collect further samples of sediments for micropalaeontological examination. In Section 3, I made reference to trips to the Gippsland Lakes area before I was transferred to Canberra in 1936. I continued my visits to the area. I collected from many quarries in the Sale-Bairnsdale area. In some quarries around Sale and Longford, the mosquitoes were enormous. I found the only way I could save my legs at least, was to wrap them in newspapers. They raised huge lumps on my forehead. On some of the bore sites near Lakes Entrance, I occasionally did some of my work in the sheds where the drillers had fires burning.

On one occasion, the Geological Survey of Victoria notified Dr. Raggatt that No.8 Bore Parish of Colquhoun, on the shores of North Arm, should reach the oil-bearing glauconite beds at a certain time on a certain day. Dr Raggatt and I drove down to Lakes Entrance to see this important event. The result was disappointing. However, as the launch took us up to North Arm in the evening, the fish were so numerous that they were jumping into the launch.

The road from Canberra to Lakes Entrance via Cooma, a distance of 275 miles, in those days was very poor, being unsealed as far as Orbost. I have driven back to Canberra through bush fires, fogs and mud. It was a lonely drive when I was on my own. Sometimes I spent the night at Cann River Hotel, other times I would do the trip direct.

On one occasion, Dr Raggatt, Mr & Mrs Noakes and I drove down to Lakes Entrance in the old Chevrolet truck, a relic of the North Australia Survey, and affectionately known as "Leaping Lena". We stayed the night at Bombala where it was intensely cold. In the morning, we found the ink in the inkwell in the hotel office was frozen and as we drove down the Bonang Highway, icicles hung from the branches of the trees.

In 1942, it was decided to construct a shaft at Lakes Entrance to the depth where the oil-bearing glauconite should be encountered. The shaft was circular in shape and was concreted down to the depth of 1,156 feet. Mining was continued down to the depth of 1200 feet. The operation met with little success and was abandoned in 1946. It was estimated that 12,000 tons of fossiliferous sediments were brought to the surface. Mr Noakes and I visited the site about every six weeks to see how the work was progressing. I especially wanted to see and study the changes in sedimentation through which the shaft passed and to collect further samples. The miners used to lay aside samples for me, from each kibble brought to the surface, laying them out in sequence for my inspection. A cage was sometimes used to make the descent into the shaft, at other times a kibble, a large jar-shaped bucket, was used, which I had great difficulty getting into and out of. I went down to the depth of 1200 feet which was the complete depth of the shaft. It was most interesting, especially when the glauconite rock was reached because this rock type does not occur at the surface anywhere in the area. I had a unique opportunity to study the sequence of Tertiary rocks in this part of Victoria.

When returning from one of our trips to Lakes Entrance, the old truck misbehaved shortly after we had left Cooma. The hub axle broke several miles south of Michelago, in the midst of a terrific dust storm. It was dark and we could not locate ourselves because of the dust. We walked back along the road clasping each others hands, looking for the wheel, which we ultimately found. With the shortage of petrol in those days, little traffic was on the road. However, a wood carter came along and agreed to telephone Dr Raggatt in Canberra from Michelago, asking him to arrange for Transport to come and help us next morning. I spent the night sitting up in the front seat, and Mr & Mrs Noakes constructed a wigwam in the back of the truck. Help did arrive next morning. It was so very hot waiting for it although the dust storm had passed. We were very tired and dirty by the time we reached Canberra.

A few years ago I was travelling by ship from Melbourne to Sydney. I thought that we must soon be passing the Victorian coastline between Sale and Lakes Entrance, and maybe I should be able to see the off-shore drilling rig which was operating in that area. I looked over the side of the ship and there was the "Ocean Digger" nearby. I was so very excited and thought how much preliminary micropalaeontological investigation I had carried out on sediments along that coastline over a period of thirty years. The sighting of the "Ocean Digger" gave me a wonderful feeling of satisfaction that my work, after all, had been worthwhile. Also I could not help thinking of the late Sir Edgeworth David, who held the view that if oil should be found in the area, it would be off-shore.

I made two trips to Roma, S.W. Queensland, one in 1947 and the other in 1948. I flew to Brisbane where I had to change planes. One trip was in a D.C.3, the second one in a Dragon Rapide. The trip was a little rough. However, I was interested in the country we flew over.

I was at that time engaged in a micropalaeontological examination of samples from Roma Blocks Oil bores. One of the company geologists, Derek Pitman, accompanied me to the different localities. We made extensive collections along Bungeworgori Creek, west of Roma. We examined bore cores at Mount Bassett, 7 miles north of Roma. When walking through the black soil country, I came across a skeleton of a large dinosaur; these reptiles roamed the area in Jurassic and Lower Cretaceous times, about 100,000,000 years ago. Some of the houses in the Roma area had vertebra bones as door stops. On one visit, I was asked to address the Rotary Club of Roma: I told the story of the dinosaur. Somehow this item got into the news as far away as America. I had letters from different people in the United States claiming relationship with me.

I wanted to visit a locality at Wollumbilla, which was 24 miles east of Roma, where Charles Moore, in 1870, collected the first foraminifera of Lower Cretaceous age in Australia. We collected samples from every creek exposure we passed. One trip we had planned, had to be called off because of heavy rain, which made the black soil country impassable.

In 1950 I spent a fortnight with the Bureau of Mineral Resources field party in the Carnarvon Basin of Northwest Australia. I flew from Perth to Learmonth on Exmouth Gulf in a D.C.3, calling at Geraldton and Carnarvon on the way. After we had left Carnarvon, the Captain of the Aircraft asked me to go into the cockpit so that I would obtain a better view of the country in which I was going to work. In the distance we could see a cloud of red dust which was being raised by the B.M.R. Landrovers. The plane made the trip to Learmonth twice a week with mail and food supplies. Not so far from the airstrip was a group of old RAAF buildings which were being used by Ampol for its workers in that area. The locality was known as "Pot Shot". I had accommodation in these buildings, with a hut to myself. A short distance away were the remains of some of the American air force buildings; I would be called for in mornings by one of the field party. There was much for me to see in a short time. Roads were scarce. There was an unsealed road from Carnarvon with branches to different properties, and it continued up to the North-West Cape Lighthouse. The red dust was terrific. It was a lonely life for the Lighthouse Keeper and his family. The geologists used to try and make "Pot Shot" for the week end so that they could have some bright company with the Lighthouse Keeper's daughter. Out in a countryside miles from anywhere it was a departmental ruling that he had to keep a running time sheet. His only relaxation was coming to meet the plane twice a week. His nearest neighbours were at Yardie Creek Station Homestead and the Lefroys at Exmouth Gulf Station.

One of the first localities I wanted to see was Badjirrajirra Creek, on the way to the lighthouse. When we turned off the so-called main road there was not much of a track to follow. It was very rough with large boulders of limestone. The Landrover did amazing things. However, I was able to see the type of country from which some of my important fossils had come. The gorges were quite spectacular - we made no attempt to climb them.

We visited Mount Lefroy and Mount Trealla, making our own track through the blocks of limestone.

Shortly after my arrival the Lefroys at "Exmouth Gulf Homestead" asked the field party (including me) to an evening meal; this was very pleasant. The Lefroy family has never missed sending me Christmas Greetings since that time. But I shall never forget the red dust: it got into everything. One of the men at "Pot Shot" always had a hot bath waiting for me when I came in from the field.

There was a coral reef a little off shore in Exmouth Gulf. There I was able to study one of the larger foraminifera, Marginopora vertebralis, which was living on the inner side of the reef. It helped in deciding the ecological environment of this form which is also found in Miocene and Pliocene Limestones. At times we found small oysters near the reef. They were good eating.

I stayed for a few days with Mr and Mrs Scott of "Bullara" Station, south of Exmouth Gulf. One evening after I had dropped Alan Condon at his camp I was driving along in the Landrover, and when nearing the homestead saw several kangaroos on the road: I was anxious to take a photograph of them, but as soon as I stopped the engine of the car they bounded away.

Alan Condon wished to show me certain sediments at Winning Pool, still further south: this meant an early start. We called at "Giralia" Homestead at about 9 am, where we were offered early morning refreshment. Later we stopped at "Marrila" Homestead, which was situated in what I thought was very poor country. However, our host offered us a cup of tea and apologised for the absence of his wife who was in Perth. The cups used were of very lovely china, which was not in keeping with the homestead. The bush wireless was out all the way for when we arrived at "Winning" Station, a delicious luncheon was awaiting us. The table was set with some glorious old silver ware. We then set out to examine the rocks we had come to see. I collected some more samples of this radiolarian-bearing rock.

After this, I returned to Learmonth to catch the plane back to Perth, and home to Canberra. I was happy, I had been able to make this field trip which gave me an insight into the type of country from where the rock samples had been sent to Canberra for me to examine, as well as seeing the locality where oil was encountered in a well on Rough Range in November 1953.

6. JAVA AND SUMATRA, 1939.

An event of some importance affecting the Palaeontological, especially the Micropalaeontological approach to oil-field investigation took place in early 1939. Approval was given by the Minister of the Department of the Interior for me to visit Java and Sumatra to discuss problems relating to foraminiferal assemblages of the larger and smaller forms for correlating some of the Tertiary deposits in the Netherlands East Indies with Papua and New Guinea. I was to visit Dr Tan Sin Hok, micropalaeontologist to the Geological Survey of the Netherlands East Indies, with headquarters at Bandoeng, Java, and with Dr Hans Thalmann, at the Headquarters of the Nederlandsche Koninklijke Petroleum Maatschappij (N.K.P.M.) at Palembang, Sumatra. I had been hoping for some time that I could talk to these authorities. Whilst in Java I was the guest of the Netherlands East Indies Government; and in Palembang, a guest of the N.K.P.M.

It was agreed that I should fly to Java and Sumatra on April 10th for six weeks. It was an historic flight for me as I had not previously been in an aircraft. I travelled in a Dutch KNILM two-engined Lockheed Hudson, SE. 14, with a crew of four and was the only passenger between Sydney and Sourabaya, East Java. The late Frank Clune in his "To the Isles of Spice" (1944) gives a most colourful account of his visit to Java in 1939. He travelled in the KNILM plane to Java in February, two months prior to my trip.

When recently reading "Tides and Eddies" by Lady Casey (Maie Casey, 1966, p.38), my feelings of being in an aircraft for the first time, was much the same as hers. She commented "Early in 1920, I decided to fly to Paris (she was in London) and thence by train to Cologne. I knew of nobody who had tried this desirable experiment and in fact the passenger aircraft at that time would often be half empty... ..The excitement I felt on being airborne for the first time was a purer and more powerful emotion, the approach to a miracle. As the aircraft left the earth in a movement like the circling of a bird, I wept".

We left Sydney at 4.30 am, the morning of April 10th (35 years ago) arriving at Archerfield airport in Brisbane for breakfast. During that part of the flight, the Captain of the Lockheed came to me and said -"Is this really your first flight?". No meals were served on the plane. We landed at Cloncurry for lunch, where I was met by some of the geologists doing field work under the Aerial, Geological and Geophysical Survey of North Australia. We then flew on to Darwin for dinner and where we stayed the night at a depressing hotel, Don Hotel, which I understand, was hit by the Japanese when they attacked Darwin in 1942. Before dinner I called on the Administrator of the Northern Territory and his wife (Mr & Mrs C.L. Abbott) whom I had known in Canberra.

Next morning whilst awaiting to board our plane for Koepang, Timor, I noticed the Flying Doctor (Dr Clyde Fenton) and his nursing sister, preparing their tiny plane for their day's trip somewhere south of Darwin. I expressed my admiration for their courage in undertaking such work. I have often wondered if people in Southern Australia appreciated the wonderful work the Flying Doctor Service carried out under such conditions.

Breakfast was taken at Koepang, in southwestern Timor. It was very hot; the butter was rancid and other dishes not so pleasant. So I had bread and honey. However, I noticed that the crew was eating fried rice. I soon became accustomed to that dish and now I enjoy it whenever the opportunity presents itself.

Flying across the 510 miles of the Timor Sea from Darwin to Koepang, really fascinated me, and I remember writing to Canberra saying "Here am I flying across the Timor Sea with my crew of four". At Koepang the inhabitants, including women, were building new runways for aircraft; the base of them was coralline limestone. Once we had left Australia, the Dutch crew was most thoughtful for me, flying low over the different islands, such as Flores, Soemba, Soembawa, where a certain breed of ponies were plentiful, Komodo, the home of the giant monitor lizard, Varanus komodoensis, and Lombok. I saw one of these fantastic reptiles at the zoo in Bandoeng, where it was being fed with papaya.

The next landing was at Den Passar Airport, Bali, where we had a delightful lunch. The approach to this small airport was over the sea and with a short runway to a small building. Several flights later, a Qantas D.C.3 landed in the sea, missing the small runway. No lives were lost. I have a letter from a friend in Bandoeng which was salvaged from the plane; it was still quite readable. It would be interesting for me to see the development of these small airports since 1939.

From Den Passar we flew to Sourabaya in east Java, where we had afternoon tea. A rather large Dutchman asked me if I expected anyone to meet me. I said "Yes". (I knew that Dr Woolnough had written to the Shell Company telling them I was passing through that city). In a few moments he returned and said that a car would be awaiting me at Batavia, now Jakarta, which it was. We left Sourabaya with a full complement of passengers. It had been a long and exciting day for me and I was getting tired. I spent the night at the famous Hotel des Indes. Early next morning the Shell Company car was there waiting to take me to the aircraft which would take me across to Palembang, in eastern Sumatra. I was accompanied on this short flight by Dr Tan Sin Hok, who had just arrived from Bandoeng to travel with me. The eastern end of Sumatra was covered with a dense fog and we flew around for nearly an hour. Dr Thalmann said later that it was as well that we did not have to make a forced landing as tigers prowled around that part of the island. Whilst I was in Palembang, one of the boys working on one of the oilfields was taken by a tiger.

We were met at Palembang Airport by Dr Thalmann of N.K.P.M., and by Mr Evers of the Shell Company. An extraordinary situation existed in Palembang, where the staff of these two major oil companies completely ignored one another. When Dr Evers was told by Dr Thalmann that I was the guest of N.K.P.M., except for a game of golf with him, I had no further contact with the Shell Company. I was very disappointed that I was not permitted to visit the Shell Laboratories at Plagio. The two companies' Laboratories were situated on the east bank of the Moesi River, a vast and muddy stream, and one travelled by the company's ferry across to work. The N.K.P.M. Laboratories were at Soengigerong. Dr Tan Sin Hok, as a member of the staff of the Netherlands East Indies Geological Survey, paid a courtesy call on his counterpart at the Shell Laboratories. He spent an hour there and at no time was the subject of Palaeontology mentioned.

This extraordinary situation was carried still further. Thalmann took G.A.V. Stanley of Port Moresby, and me (Tan Sin Hok had returned to Bandoeng) to a charity dance being held on the Dutch ship "Ophir". To our amazement the Standard Vacuum guests danced on the deck on one side of the ship and the Shell guests on the other. I did not think such a situation could possibly exist in the jungles of Sumatra. To go farther, the pipe lines of the two companies coming from the Pendopo and other adjacent fields ran parallel to one another on the side of the road for miles.

In Palembang I stayed at the Hotel Smit which was built in the style of the Hotel Canberra, with wings running out from a central block. I could not help thinking how inappropriate the architectural style of the Hotel Canberra was in our cold climate. It was Sir Lytellton Groom and Lady Groom who persuaded the authorities in Canberra to enclose one side of these walkways. However, at the Hotel Smit, the mosquitoes were so bad they used to bite me whilst in the bath.

Thalmann, Tan Sin Hok, Stanley and I visited Pendopo about 100 miles S.E. of Palembang and the headquarters of field operations of N.K.P.M. We were ferried across the Lembang River, about half way between Palembang and Pendopo. At Pendopo we were greeted by the Chief Geologist, Dr Vermunt. The following day we went to the Selo Field where Dr and Mrs Vermunt had a small house, and where we had a delightful lunch. We were having our photograph taken when I realised I was standing on a wasps nest. Unfortunately, one bit me and I had a very swollen ankle for a few days. On the way to Selo Field, we saw monkeys swinging from tree to tree. It was a thrill for me.

On our return to Pendopo, Thalmann and Tan Sin Hok left us to go back to Palembang, with Tan going the following day back to Bandoeng. Dr Vermunt had arranged for me to see an oil well being brought in on the Pendopo field. This thrilling event was to be at midday. It was terrifically hot and humid standing in the sun in the midst of the dense jungle and I could not help thinking of Noel Coward and his song - "Mad dogs and Englishmen go out in the midday sun". But such inconvenience was quite out-done by the fantastic sight which I was able to witness. Later, at another site at Selo, I was shown the method of storing bore cores before they were forwarded to the laboratories at Palembang.

Back in Palembang it was very hot and the mosquitoes were about in hundreds. I rose at 6 am. and after breakfast, Dr Thalmann would call for me and we would join the ferry to cross the Moesi River to the N.K.P.M. Laboratories. Work commenced at 7 am. and finished about 4 pm. It was very hot in Dr Thalmann's room. However, the boys came around about every hour with cool drinks.

One evening, Dr and Mrs Vermunt invited Stanley and me to their delightful home in Pendopo for dinner. The garden was surrounded by a hedge of gardenias in full bloom, whilst orchids and gardenias decorated the dining table.

Another Dutch geologist and palaeontologist I met in Palembang was Dr Henry James Macgillivray. With a Scotch name like that, I found that many Dutchmen had Scottish ancestors. Mac. was a tall man and when I went to lunch with them, found his wife was as tall as her husband. He escorted me down a narrow street in Palembang, where he bought me a small ivory elephant, which I still have. He insisted that I went with him to sign the Governor-General's visitors book. It was a new one bound in the colours of the House of Orange. My name was the second one to be signed. I often wondered what happened it when the Japanese went into Sumatra. The next time I met Dr Macgillivray was at the International Geological Congress in Copenhagen in 1960. When talking to him I said that I still had the little ivory elephant he gave me in 1939. He told me something of the dreadful events that had happened when the Japanese came in and the trials he and his family had passed through.

It became time for me to leave Sumatra and return to Java. I travelled to Batavia in a sumptuous K.L.M. aircraft on its way out from Holland. It was a beautifully appointed D.C.3, carrying twelve passengers. One reclined in lounge-room type seats covered with gay floral cretonnes. When the steward asked me would I like a copy of the "Sketch" to read, it seemed impossible that it had left London only five days previously.

I spent only a few days at the Hotel des Indes in Batavia as I was anxious to begin my investigations in Bandoeng. The Australian Trade Representative and his wife, Mr and Mrs H.A. Peterson entertained me. At the hotel I did have the famous "rijstafel". One should have company for this occasion. This amazing meal with eighteen Javanese waiters, each carrying an individual course rather overwhelmed me. However, I had four of these delectable dishes. Near the Hotel was an antique shop, with the most wonderful display of articles from all parts of South East Asia. The girl in charge could speak English and told me stories of many of these beautiful goods. I asked her who would buy the huge jars of cloissonee ware, her answer was "wealthy Chinese". I also visited the Pasar or Market, where tempting articles were for sale.

I travelled to Bandoeng by train, spending one night at Buitenzorg (now Bogor) to visit the famous Herbarium there. Situated in Buitenzorg was the palace of the Governor-General of the Netherlands East Indies. It was in the centre of the world-famous Botanic Gardens. The trees in the city were beautiful. I was entranced with the Lotus flowers and leaves on the lake in Government House grounds. The leaves of the Lotus were enormous. In the Herbarium itself was a fantastic show of orchids.

I then continued my journey to Bandoeng. It was an interesting trip. The day I travelled was Queen Wilhemina's birthday and sporting events were taking place at the different towns through which the train passed. I think I was the only European on the train. At one place there was a race meeting in progress; it was very colourful with the bright jackets of the jockeys.

I was met at Bandoeng by Dr Tan Sin Hok, who took me to the Savoy Homan Hotel. Dr N.H. Fisher and his wife from Rabaul arrived shortly after me, but stayed with Dr Stehn, the Chief Vulcanologist to the Netherlands East Indies Geological Survey. Dr Fisher was studying mineral deposits and vulcanological observatories.

Bandoeng was an exciting place. It was one of the centres of science, culture and art in that part of Java. The city itself was surrounded by mountains, many of them being volcanoes. The main method of transport was little horse-drawn vehicles and bicycles. When work in Government Departments finished for the day, there were hundreds of bicycles on the road. Back in 1939 that mode of transport was very common in Canberra. A short distance out of the city was the well known Bosscha Observatory at Lembang. Whilst in Bandoeng I went to an art show. It was most interesting and I only wish I had been able to buy one of the paintings. The lettuce-green colouring of the rice fields, I thought, may have been exaggerated, but when I saw acres and acres of these rice fields, I realised that the colour was absolutely authentic. Also, when looking at the rice fields, it was interesting to see the long lines of ducks waddling through them, destroying the pests that thrived in that sort of country. Apparently, large numbers of ducks were reared and flocks were hired out for this work.

Once again my working day started early. Breakfast at 6 am., work at the Museum commencing at 7.30 am. It continued with a very short break for morning tea until 2.30 pm; when one retired home for a siesta.

Early one morning Dr van der Pijl, a well known botanist, took me on a visit to the Pasar (market). It was a fascinating sight. Amongst the tropical fruit were "Australian pears".

It was interesting being in Java just before World War II. From my window in the Geological Museum, I could see the training of motor cycle squads, up and down the road; there was also night flying by some of the military aircraft. A point that interested me too, was that no Japanese was permitted to belong to a Golf Club in Bandoeng at that time.

The Museum was interesting to work in and there were many well known exhibits. Dr Oostingh, who was absent at that time and who was an authority on Pliocene Mollusca (and in whose room I worked) had some excellent molluscan collections, many of the fossil species being similar to those found in Papua and New Guinea. Then there was the famous Pithecanthropus Erectus, one of the earliest records of the appearance of man in Java. I never heard if these collections were saved during the war. I only know that the palaeontological world lost a distinguished scientist. Dr Tan and his family were interned by the Japanese: ultimately they returned to their home in Bandoeng. One night Tan answered a knock on the front door to be faced with some ho·oligans who tried to reach Eidae, his wife. When Tan objected they shot him dead. His wife and family escaped through the back door and managed to reach the British Red Cross Headquarters. I heard this news from the head of the Dutch Air Force which was stationed in Canberra for part of the war. He had made enquiries for me.

Scientific instruments at the Museum were very modern and I was envious of a wonderful camera which took photographs of thin sections of rocks and fossils. This instrument has been a gift to the Museum from an appreciative Mining Company. When I returned to Canberra I reported on this instrument - ultimately we obtained one very similar to that in Bandoeng.

One day, Mr Dreyfus, a Geological Survey Geologist and Tan took me to a locality near Soekaboemi to collect foraminiferal limestones. It was cold in the early morning and in those days there were no closed-in cars. On the way we visited a coffee plantation and had a cup of coffee to warm us up. Then we passed through huge tea plantations before reaching our destination. I was feeling somewhat exhausted by lunch time, but was not permitted to have a drink of water. However, we found a shady but hot and humid spot on the banks of a large river. There I saw a fantastic sight - three monkeys sitting on a rock. I immediately thought of the "Three wise Monkeys" - "Hear no evil, think no evil, and speak no evil". They moved before I could photograph them. Later in 1964, I was to see the original group engraved above one of the entrances to the beautiful Toshogu shrine at Nikko in Japan.

The Tangkoeban Prahoe (in English- overturned prow), a volcano north of Bandoeng, gave an insight into the work done by vulcanologists. A concrete tunnel penetrated the side of this volcano for some distance. In the tunnel were seismographs, cylinders of oxygen, and tins of biscuits. These were for the men making observations before, during and after the eruption. Observations such as temperature were taken at certain times every day.

I visited the Papandajan volcano, southeast of Bandoeng in company with Dr and Mrs Stehn, and Dr and Mrs Fisher. This volcano is 6,500 feet high. We were able to drive to the height of about 3,000 feet. Here we walked over the most recent crater, with its sulphur mounds, steam, and other features. The soles of our shoes became very hot. We then set out to climb the next 3,000 feet to the Resthouse which was built in one of the old craters and where we were to spend the night. It was extremely cold at night at that elevation. We did have a fire but the bed clothes were most inadequate. I got partially re-dressed to keep myself warm. The Resthouse was in a delightful setting with blue hydrangeas and marigolds in full bloom. Unfortunately the sulphur fumes affected my nose very badly.

One weekend I took myself to Jogjakarta in Central Java, a lovely city. From there I made a visit to the famous Buddhist Temple, the Borobudur and the Hindu Temple, the Prambanan. The Borobudur, meaning "many Buddhas", was built in 850 A.D. It is difficult to describe this amazing structure, with its wonderful Stupas and figures of Buddha. This monument is crowned with an immense Stupa. This temple was crumbling away in places. A Society for the restoration of historic monuments was active in Bandoeng, Dr Tan Sin Hok being a member of this Society.

I would like to quote Frank Clunes' comments on this amazing edifice (p.189). "My first impression on viewing the whole (monument) was "I don't believe it!" "It seemed incredible that human beings could possibly have erected such a structure, so huge, yet delicate and elaborate"

The Prambanan is smaller than the Borobudur. It was built by the Hindus in the ninth century. It is very beautiful with superb carvings of human beings, animals, birds and flowers. To see these two monuments and the amazing ornamentation, makes one feel humble when one thinks of the many centuries ago in which they were built, the time which the work must have taken, and the amazing craftsmanship of the men who created such monuments.

On the way to those wonderful and unforgettable monuments, I passed the well known and beautifully shaped volcano, the Merapi, the Mountain of Fire.

One of the things that fascinated me in this city of Jogjakarta, was the lovely silver ware or Jogya silver, as it was known. I must admit that I own a few pieces of this beautiful craftsmanship. Also there was the glorious batik fabrics. Two pieces that I brought home with me are still lovely. Then there were the charming buffalo-hide articles. I feel that my small collection of beautiful pieces, which I managed to acquire back in 1939 is something worth having. There was little mass production in those days.

Back in Bandoeng I spent a few nights with my friends, Tan Sin Hok and his wife. It was pleasant to be in a home and Tan was a connoisseur of liqueurs. But was the bed hard! No soft mattress, the undersheet was thrown over bare boards.

Time had come for me to leave this lovely part of Java. When I returned to Batavia, my friends, Mr and Mrs Peterson gave me a farewell party, which was very pleasant. They had arranged to have some extra chairs from the Harmonie Club. It was an amusing sight to see the arrival of these chairs in a small cart being drawn by a small pony.

I set out for my return to Canberra. The plane this time had a full complement of passengers, many coming from Germany and other European countries. We stayed a night at Den Passar Hotel, but there was no time to see anything of the city. Fortunately there was a small stall at the hotel with some beautiful articles. I was able to buy one of the beautiful wood carvings of a Bali head. We left next morning at 4 am. for Koepang for breakfast and then for lunch in Darwin. What a change from Den Passar on my way to Java; we had hot fried fish and hot tomatoes. We spent the night at Cloncurry in Queensland, leaving next morning in time to have breakfast in the hangar at Longreach. We reached Sydney that afternoon. I am so glad to have seen these lovely islands when they were unspoiled. There were few tourists about in those days of 1939.

During the war, Wirth's Circus came to Canberra. Sitting in the row of seats in front of me was the Captain of the aircraft, Captain van Bremen, who brought me back to Sydney in June 1939. He was stationed here with part of the Dutch Air Force for a short time.

7. VISIT TO UNITED STATES, 1951

The Director of the Bureau, Dr H.G. Raggatt, was very keen for me to visit the United States, to have discussions with micropalaeontologists attached to scientific institutions and to oil companies, to study collections of microfossils especially the foraminifera and to attend the Meeting of the American Association of Petroleum Geologists and the Society of Economic Paleontologists and Mineralogists to be held at St Louis, Missouri, in April 1951.

When it was originally suggested I should make this visit, I was invited to address the Eastern Division of the A.A.P.G. in New York, which I regarded as a great honour. Dr Raggatt had considerable difficulty with the authorities in Canberra in trying to arrange this visit. I think this was due partly to the fact that I was a woman, and it was contrary to departmental policy to send women overseas in those days.

An exception to this policy was the appointment of Miss Lilian Foley to the News and Information Bureau in New York in 1950. Miss Foley was a well-known figure in the National Library in Canberra and it was generally thought that she would become Commonwealth Librarian. But no, she was given the appointment in New York. I met her from time to time in New York and she arranged for me to make a broadcast over the N.B.C.

The meeting of A.A.P.G. in New York was postponed three times with the hope that I could make the trip. Ultimately it was agreed that I should visit the United States for two months. This decision was made a few days before Dr Raggatt himself left for Washington D.C. to be present at an International Raw Materials Conference.

I left Canberra early in April, 1951, flying to San Francisco, a distance of 7591 miles from Sydney, by B.C.P.A., D.C.6 aircraft "Endeavour" via Nandi (Fiji), Canton Island and Honolulu. Passengers on the flight were presented with a Certificate from "King Neptune" to celebrate the crossing of the Equator at "Canton Island Time, 5.07 am. on the sixth day of April, 1951, conferring the Freedom of the Royal Demesne (Sky Section) upon passenger, Irene Crespin".

At San Francisco, I immediately transferred to a Constellation for New York via Dallas, Texas. I was met by Miss Angelina Messina of the Department of Micropaleontology, American Museum of Natural History. Canberra authorities evidently reconsidered the decision as to the length of stay in United States for they extended it to three months. Dr Preston Cloud, of the U.S. Geological Survey, whom I had met at the Seventh Pacific Congress in New Zealand, in 1949, arranged my itinerary.

At this point it is of interest to comment on the transformation in aircraft design since I made my first flight in April 1939 to Java. This flight was made in a two-engined KNILM Lockheed Hudson which could carry twelve passengers. On this occasion I was the only passenger to Sourabaya, east Java. There was no night flying and all meals were taken on the ground. Between that flight and the one to U.S.A.

I had been on internal ones travelling in D.C.3s, and in a Dragon Rapide between Brisbane and Roma. The B.C.P.A. which carried me to San Francisco was considered a large plane. Meals were rarely served in the aircraft. However, at night, seats were so arranged that they could be turned into sleeping berths, both upper and lower. Lunch was served shortly after we left Sydney. Dinner was taken at Nandi (Fiji) in a small building a short distance from the equally small airport building. It was very hot at Nandi, but one could not forget the meal - hot roast lamb and plum pudding. On a recent flight from Sydney to Nandi, about one hundred passengers were on board, the flight taking about three and a half hours. But what a difference between the airport at Nandi in 1951 and that of 1971.

The meeting of the Eastern Division of the American Association of Petroleum Geologists in New York, was held on the second evening after my arrival in the Mining Industry Building down town. Dr Raggatt came from Washington for this momentous event as far as I was concerned, and introduced me to the audience of distinguished petroleum geologists and geophysicists, remarking that I was not quite sure whether I was in New York or Canberra! I only know that I was extremely nervous. As far as I know, no Australian geologist or micropalaeontologist has had the honour to address the A.A.P.G. in New York.

Before leaving Canberra, Murray Johnstone, a geologist at that time attached to the Bureau of Mineral Resources, loaned me a 35 mm colour film he had taken in Northwest Australia during his geological investigations in the Cape Range area. This film proved to be a most successful adjunct to my talks for it illustrated so clearly the topography of that part of Australia about which very little was known overseas.

I accompanied Dr Raggatt on his return to Washington as he wished to introduce me to geologists and palaeontologists at the United States Geological Survey and the United States National Museum, with whom I would be having discussions later on. During my short visit, we spent a day at the country residence of Dr and Mrs Frank Reeves, at "Kimberley", Blue Ridge, Virginia. Dr Reeves was well known to us as he had been engaged in geological work in the search for oil in Western Australia, especially in the Kimberley area. The house was a hundred years old with a staircase built of logs of wood. Deer roamed outside the boundary fence. Much to the annoyance of Dr Reeves some of them had broken down the wire fence which surrounded the property and had played havoc in his vegetable garden.

I returned to New York from Washington on the day that General Macarthur paid his first visit to that city since the end of World War II. I managed to make my way through the enormous crowds that lined Fifth Avenue, to the Australian Consulate office in Rockefeller Centre. From the Consulate office window I viewed the most fantastic sight I had ever seen or ever hope to see again, with marching girls, police escorts, Cardinal Spellman running down the steps of St Patrick's Cathedral to embrace the General and the ticker tape reception. An interesting incident was the speed with which the cleaning of the streets of ticker tape was done by the civic authorities. In less than ten minutes, the streets were clean again.

NEW YORK

New York became my headquarters for a few weeks. From there, I visited Cornell University at Ithaca, New York State, and St Louis, Missouri for the meeting of the American Association of Petroleum Geologists and the Society of Economic Paleontologists and Mineralogists.

Most of my time in New York was spent in the Department of Micropaleontology at the American Museum of Natural History. The Museum itself was full of magnificent collections including delightful dioramas, that I could not resist wandering through the galleries. One afternoon I sat quietly in the Dinosaur Gallery, gazing at these amazing reptiles which roamed the earth during the Mesozoic era, some hundred million years ago.

Dr Brooks Ellis was head of the Department of Micropaleontology with Miss Angelina Messina as his assistant. The setup in that Department was tremendously interesting. I was able to see the preparation of materials for publication of the famous "Catalogue of Foraminifera", which appeared first in 1946, and which was edited by Ellis and Messina. This work was carried out in an unexpectedly confined space. As a matter of fact the whole setup was cramped; yet this magnificent work was produced there. Dr Ellis has retired; my good friend Angelina Messina passed away suddenly at a Meeting.

Also available in this Department were small samples of fossiliferous material from all parts of the world, even Tertiary sediments from Victoria, Australia.

In another section Mr Zach Arnold was investigating the habits of living foraminifera. It was interesting to see the method of locomotion of these minute organisms.

On one occasion I addressed the Geology students at the New York State University. I was able to use a small collection of slides of Australian Tertiary deposits.

Whilst in New York, I visited the Geology Department at Columbia University. I was entertained at lunch by Professor Coryell, an ostracod specialist, who took me to the Library of the Geological Society of America. Whilst at Columbia I realised how much private investigation on microfossils was carried out during the long vacation, by University micropaleontologists, for companies engaged in the search for oil.

Angelina Messina showed me many sides of life in New York, such as shopping, visiting Broadway at night, and various theatres. We also relaxed after a long day's work by visiting well known places for some refreshment. Dr Brooks Ellis accompanied us to the Stork Club, and on one occasion when we visited the St Regis Hotel, a rather broken-down old violinist, stood behind my chair and played "Waltzing Matilda". Somehow he must have overheard a remark from one of us about Australia.

Occasionally I took the opportunity to visit Fifth Avenue shops, which one always heard about. These included Tiffany's the jewellers, where I was followed around by a detective, Ciro's the jewellers, Saks Fifth Avenue, (there was also one on 42nd Street) and the Rockefeller Centre. The gardens running from Fifth Avenue towards the central part of the Centre were always gay with flowers. One day there were tulips and hyacinths. When Dr Raggatt came from Washington to New York for my lecture, I suggested he saw them. We found these bulbs had been replaced by an assortment of other flowers. What a tremendous job changing the pots every other day.

With New York as my headquarters, I visited Cornell University, Ithaca, New York State, to have talks with Professor Storrs Cole. I was the guest of the Faculty of Science and stayed in the Statler Building, presented to the University by the Statler Corporation as the headquarters for the study of Hotel Management. The office staff consisted of young men learning the trade and I thought that one of them who attended me had a long way to go before he reached the top of his profession. In the Dining Room, which was used by the staff of the Faculty of Science, the waitresses were girls learning the trade.

Once again the Geology Department building was by no means modern. However, I was able to discuss problems of the Indo-Pacific larger Tertiary Foraminifera with Professor Storrs Cole who at that time was studying Tertiary limestones from Saipan, Guam and other islands in the Pacific under the supervision of the United States.

My interest was really aroused when I found Professor Cole describing as a new species, a Lepidocyclina with a very large thin test. I had already found this species in the Cape Range area of North Western Australia and had handed to Ruth Todd in Washington the manuscript of a paper describing it, and for publication in "Micropalaeontology". This form was later found in the Philippines where it was called Lepidocyclina "potatochipensis".

The campus at Cornell University is bisected by a deep canyon made by one of the rivers. The countryside is picturesque with its deep canyons cutting through flatly bedded, highly fossiliferous Palaeozoic sediments.

I had hoped that, being in the vicinity of Niagara Falls, I would be able to visit this well known locality. However, the Australian representative in New York told me that I had to choose between visiting Niagara Falls and the Grand Canyon, Arizona, which I had also hoped to see. I was very sad about this attitude of the Consulate, so I decided on the latter. I felt envious when I heard of the change of attitude towards travel for male geologists. I still regard myself somewhat as a pioneer amongst women in relation to departmental privileges in the field of geology and micropalaeontology.

WASHINGTON

From New York I moved to Washington to study at the United States National Museum and the United States Geological Survey. Dr G.A. Cooper, the well known authority on fossil brachiopods was in charge of the extensive collections at the Museum. One day when he was showing

me the collection of fossils and minerals, he remarked that the acquisition of these collections was dependent entirely upon the whims of the Senator under whom the Museum was placed. The public would query the amount of money paid for such collections.

As in most Museums, storing space was very limited. My mind went back to the days of the National Museum, Melbourne. At the U.S. National Museum it was quite a feat wending ones' way amongst cabinets in the long corridors, off which the different laboratories were located.

Micropaleontologists, Ruth Todd and Doris Low of the U.S. Geological Survey, had their headquarters there. An adjoining room was the famous Cushman Collection of Foraminifera from all parts of the world. I was able to study the type specimens of Bolivina crespinae described by J.A. Cushman in 1936.

In an adjacent room were A.R. Loeblich and his wife Helen Tappan, who, at that time, were authorities on Lower Cretaceous foraminifera. Further along the corridor was Dr G. Sohn, the ostracod specialist. In another room was Dr Lloyd Henbest an authority on the larger Palaeozoic foraminifera, the Fusulinidae. Dr Julia Gardner, well known for her work on Mollusca had a room nearby, and Dr Bassler, the authority on Bryozoa also had a room off this corridor.

It was indeed fascinating and I felt privileged to be associated with these specialists in micropalaeontology and larger fossils.

At the United States Geological Survey, I met several of my old colleagues, including Preston Cloud, Joshua Tracey and Charles Johnston, all of whom were in New Zealand in 1949. These geologists had a theme song "Goodnight Irene", which was sung at awkward moments for me. I also had the great pleasure of meeting once again, Dr T. Wayland Vaughan, an authority on larger foraminifera who had been of great assistance to me in my work on these forms. I first met him at the Second Pan-Pacific Science Congress in Melbourne in 1923.

At the U.S. Geological Survey, I was able to discuss with Dr K. Lohman the problems of the minute forms, the diatoms, and the rock, diatomite. In his laboratory, because of the minuteness of diatoms and that they can be collected in any sort of environment, all investigations were carried out under strict precautions against contamination. I reflected sadly on what had happened to some of my precious samples of diatomite in the Museum at the Bureau of Mineral Resources shortly before I left Canberra.

My special interest in diatoms and diatomite (or diatomaceous earth) was the result of my investigations during the war years when I studied them to see if the Australian diatomites had any value as filter media for water used by the army in the more tropical parts of Australia and in Papua and New Guinea. Prior to this investigation, all diatomite suitable for filtration was imported from the United States.

Whilst in Washington, I had the honour to address the Paleontological Society of America. All available geologists and paleontologists were present, even my old friend, Dr T. Wayland Vaughan.

I did have the opportunity of seeing something of the countryside with Dr Julia Gardner and Dr Preston Cloud, who took me on a sightseeing and collecting trip to Chesapeake Bay.

Ruth Todd and Doris Low took me to Mount Vernon, the historic home of George Washington. I was interested to see the use of the shrub Kalmia, was put along parts of the road. The shrubs were in full bloom and were planted in perfectly kept lawns.

PRINCETON

I made a short visit from Washington to Princeton, New Jersey, to meet Professor Benjamin Howell of Princeton University, who had examined and described fossil sponges from Western Australia in 1956 and 1957. Once again I was the guest of the Faculty of Science. I stayed at the Princeton Inn which overlooked a golf course. Under my window was a garden of violets and tulips. Masses of the yellow Forsythia brightened the streets. Spring was just around the corner. Some of the Dogwoods in the gardens were lovely. When I visited the Geology Department, I had to climb up a broad but old stairway - half way up these stairs I looked out of the window to see the most glorious sight of pink and white Dogwoods I have ever seen.

I gave a short address to members of the Geology Department and was fortunate enough to hear a talk by one of the geologists who had just returned from investigations at the Parícutin volcano in Mexico. Also visiting the University was Dr G.D. Osborne of the Geology Department, Sydney University. To give me a change from the usual coffee at the afternoon break, he arranged to have tea. "Australian Tea Today" was his notice. It was all very pleasant and I enjoyed the usual geological hospitality.

TEXAS.

From Washington, I flew to Austin, in Texas, changing from a Constellation to a D.C.3 plane at Houston when we had to turn back and change aircraft. This is the only time that I have had this happen to me. I was met by Mr W. George, the head of the Underground Water Branch of the U.S. Geological Survey in Texas. The weather was beginning to get rather hot, as it was mid-June and summer time. However, the Driscoll Hotel where I stayed was air-conditioned.

I planned to work at the Bureau of Economic Geology within the University of Texas and to study the collections of foraminifera made by Mrs Helen Jeanne Plummer, a well known micropalaeontologist. I was sad to learn that she had died a short time before my arrival. We corresponded with one another for some years. She was very helpful when I had to investigate Palaeozoic faunas as well as the Palaeocene. My earliest contact with her dated back to 1932.

All type material was made available to me. Professor Stenzel and Dr Keith Young showed me some of the type localities of sections described by Mrs Plummer. Dr Young also took me to the type locality of one of the larger Cretaceous foraminifera. We had to climb a rather steep hill and it was very hot. After finding a few specimens Dr Young suggested that we call it a day.

Professor Stenzel was an authority on fossil oysters. He worked in a room near the Bureau of Economic Geology. I was able to see his collection. One collection of oysters from the Lower Tertiary was very similar to specimens in the glauconite beds in bores at Lakes Entrance, Victoria. This gave me food for thought about the age of the Victorian specimens. I met Professor Stenzel again at Copenhagen in 1960.

From Austin I made two trips to San Antonio. The first, was to meet Miss Hedwig Kniker, one of the earliest women micropalaeontologists in America, who lived at Sequin, a short distance from San Antonio. We lunched together and later she showed me many delightful spots in that city. She introduced me to delicacies made with pecan nuts.

My second visit was to address a lunch time meeting of the Geological Society of San Antonio.

San Antonio is a city full of history with an admixture of old and modern buildings. The picturesque San Antonio River meanders through the city and seems to divide it into two parts. The course of the smooth flowing stream is confined within two walls, with delightful bridges crossing it in many places, reminding one of Venice in miniature. The old portion of the city has a Spanish history, which is shown in the old stone buildings, such as the Alamo, built in 1718, and many old churches or Missions, some falling into disrepair. I was able to see so much of the city during my first visit as Mr George had driven me from Austin on that occasion.

When I had finished my investigations in Austin, I went to Houston, a busy centre of the petroleum industry. Again Mr George was my guide. We stayed at the Rice Hotel. When this hotel was opened, men without a coat were not permitted to enter. However, when the management realised how much they depended upon the petroleum geologists and others associated with the petroleum industry for trade, this rule had to be relaxed.

Whilst in Houston I visited different laboratories including the Humble Oil Company, where I was shown interesting methods of preparing samples of sediments for microscopical examination. We paid a visit to Galveston, on the Gulf of Mexico, and one of the main bathing beaches. The beach sand was black in colour. I realised how fortunate Australians are with their beautiful bathing beaches. The same condition applies to the famous Waikiki Beach at Honolulu where much of the white sand has been imported from Australia.

From Houston, I travelled by train across the States to Los Angeles, I had to change trains at Dallas for I was going to the Grand Canyon, in Arizona. As it was necessary to spend the day at Dallas, I was able to see something of this important and wealthy Texan city.

At a town called Williams, those passengers going to the Grand Canyon were transferred to a branch line. We arrived at the Grand Canyon at dawn, going direct to the hotel which was our headquarters for the day. It is impossible to describe the vista across the Canyon with the sun rising and the fantastic array of colours. I could not possibly describe my feeling at that time nor at any time during that day. The Colorado River, which was 3000 feet below us, looked like a piece of ribbon. The beds exposed in that 3000 feet section ranged from the Cretaceous at the top down to the Palaeozoic at the river level. I was happy that I had chosen the Grand Canyon rather than Niagara Falls.

I was very surprised to discover that this train journey to Los Angeles passed through miles and miles of desert country, through New Mexico, Arizona and into California. When we passed into Southern California, through towns such as San Bernardino and others to Los Angeles, groves of citrus fruits, including oranges and lemons, appeared all being irrigated by underground water.

CALIFORNIA

I was met at Los Angeles by Dr Mason Hill of Richfield Oil Company, whom I had met in Canberra. He guided me to the laboratories of different oil companies and I was able to meet several micropalaeontologists including Boris Laiming of Texas Oil Company, Louis Simon, G.C. Church of Union Oil Company, and M.L. Natland of Richfield Oil Co. The main Oil fields were in the Long Beach area. From the laboratories of Richfield we looked across to the famous field of Signal Hill. It was difficult to see the derricks through the smog, which, I was told, usually cleared away about 3.30 pm.: and this it did for me. I visited the Union Oilfield and others nearer the beach. With the derricks so close to one another, it was a sight I could hardly believe I would ever see.

Dr Hill drove me to Bakersfield, about 100 miles north of Los Angeles and the centre of another large oilfield. We stayed the night at the El Tejon Hotel, where I addressed the San Joaquin Geological Society after a dinner meeting. I was quite overwhelmed with this big gathering of petroleum geologists and micropalaeontologists. The following morning I visited field laboratories. It was all intensely interesting.

Whilst in Los Angeles, I had the honour to address a joint meeting of the Pacific Section of the American Association of Petroleum Geologists and the Society of Economic Paleontologists and Mineralogists. I spoke on the Tertiary and Cretaceous Stratigraphy of the North West Basin, Western Australia, and used both slides and my film.

During my stay in Los Angeles, Dr Hill assigned one of his staff to show me something of the city and its surroundings. We drove along the famous Sunset Boulevard and visited the fabulous shops. Then we went to the well known Farmers Market. This was fascinating. What appealed to me most of all were the huge strawberries dipped in chocolate. The price of one of these was the equivalent to two shillings and six pence in Australian money! I had only two.

After travelling through Santa Monica we returned through Beverley Hills so that I could call on Mr Frank Morgan of Richfield Oil. On either side of the street were homes of film people. Mr & Mrs Morgan took us to dinner at an exclusive restaurant in the San Fernando Valley.

Dr Hans Thalmann, a Swiss micropalaeontologist whom I had met in Palembang, Sumatra in 1939, called for me one day and took me to his home in Pasadena for lunch. He had invited other micropalaeontologists to meet me. It was very pleasant to be with him and his wife again after so many years. I was also interested to see Pasadena as it is the headquarters of many scientific organizations.

From Los Angeles, I went south to La Jolla to spend a few days with Dr and Mrs Francis Shepard, whom I had met in New Zealand in 1949. Dr Shepard's headquarters was Scripps Institution of Oceanography, where I met Miss Frances Parker a worker on Recent Foraminifera. Dr Shepard has done much to advance underwater investigations of sediments and sub-surface geology.

La Jolla is a colourful place near the border with Mexico. Houses were painted mostly in pink and the gardens and side walks being very gay with red and pink geraniums. It is situated on high cliffs which form the eastern margin of the Pacific Ocean.

I had a few more days in Los Angeles and then travelled by train to San Francisco on the last stage of my trip. There I visited different oil companies, including Tidewater Company and Richmond Oil Company. One of the women geologists from the latter company was detailed to look after me. To me one of the most exciting things about San Francisco was the cable tram up California Street to the Hotel "The top of the Mark". The cable trams took me back to the days when I lived in Melbourne.

However, much of my time was spent at Stanford University at Palo Alto, where I met Professor R.M. Kleinpell, geologist and micropalaeontologist who had worked in the Philippines and whose work on the "Miocene Stratigraphy of California", I had based certain parts of my Bulletin on Gippsland, Victoria, (Crespin, 1943). I also met Miss Myra Keen, a prominent worker on larger fossils. So that I could see some of the Tertiary sections along the coast, I was taken for a drive along the picturesque Seventeen Mile Road, from Monterey south to Carmel. We passed through the well known Pebble Point Golf Club belonging to Bob Hope.

I visited the University of California at Berkley where I attended a Symposium on "Evolution" and saw the palaeontological collection there.

However, it was time for me to be thinking of returning home. I concluded my trip by going to a theatre to see "Guys and Dolls". I had a seat in the upper circle and as the stage was so far away, we were given Opera Glasses to use.

I had much to ponder on for a long time to come.

8. INTERNATIONAL SCIENTIFIC CONFERENCES

In recalling some of the important scientific meetings I have attended, outstanding are the four Pacific Science Congresses and the International Geological Congress which was held in Copenhagen in 1960. To have been able to converse with and join in discussions with many distinguished scientists of different disciplines from Institutions and countries bordering the Pacific and Indian Oceans and from Europe, has indeed made my life the richer and at the same time extending my knowledge of the geology and palaeontology of the Indo-Pacific region, in which I had become so interested.

I also considered that to be able to attend such gatherings was a privilege because contacts one made with scientists beyond Australia broadened one's knowledge on different aspects of one's own discipline. Some scientists seem to be satisfied with their every day associations especially in these days of specialization. Personal contacts if possible, are as important as those made by means of literature. A background on the study of other branches of science too, is essential to a specialist.

When I became associated with Frederick Chapman in the formation of the Palaeontological Section of the newly formed Geological Branch in 1927, I found my interest in micropalaeontology steadily growing. However, in those days it was necessary for me to be conversant with all groups of fossils, large and small and of different ages, as collections from the companies associated with oil search contained material not only for micropalaeontological examination but also large collections of macrofossils, frequently associated with microfaunas. Such a background was not only invaluable to me but a necessity until the appointment of specialists to the newly created Bureau of Mineral Resources, Geology and Geophysics in 1946, with the appointment later of the foremost Lower Palaeozoic palaeontologist, Dr A.A. Opik.

(a) The first Science Congress I attended was the Second Pan-Pacific Science Congress (as it was then known), which was held in Australia in 1923, with one session at the University of Melbourne from August 15th to August 22nd., and another session at the University of Sydney from August 23rd to September 3rd.

This Congress was the second one to be held, the first one being in Honolulu, Hawaii, in August 1920. That meeting was a pronounced success, and as a result, a small committee was appointed consisting of one member of each of the six countries represented at the Congress. The Committee became the Pacific Science Council.

However, it is of interest to Australian Scientists to learn that the first steps towards the formation of such a body as the Pacific Science Congress, were taken during the meeting of the British Association for the Advancement of Science held in Australia in 1914, just prior to the First World War.

The President of the Congress in Australia was Sir David Orme Masson, Professor of Chemistry at the University of Melbourne. The Chairman of the Melbourne Session was Professor W.E. Agar, Professor of Zoology at the Melbourne University. The Chairman of the Sydney Session was Professor Sir T. Edgeworth David. It is appropriate to quote here a comment made by the Governor of New South Wales at that time (Sir Walter Davidson, K.C.M.G.) who was opening the Session in Sydney on August 23rd, 1923 - "Everywhere and encouraging all is our preux chevalier Professor (and Lieutenant-Colonel) Sir Edgeworth David, the pioneer of Funafuti, an explorer of Antarctica, a sapper and miner on the battle front and the scientific discoverer of the Maitland Coalfields". These words put concisely the feeling of all of us who were privileged to know and to have the friendship of this great geologist.

It was during this Congress in Australia that problems relating to the formation of a permanent organization of scientific research in the Pacific region, were resolved.

During the Melbourne Meeting, news was received of the occurrence of the disastrous earthquake in Japan. A gloom was cast over proceedings as many Japanese delegates were at the Congress. Dr Omuri, Professor of Seismology at the Imperial University of Tokyo, had delivered a public lecture on earthquakes the evening before news of the disaster was known. Although he forecast the possibility of an earthquake in Japan in the near future, he did not expect the catastrophe quite so soon. Back in 1923, communication with overseas countries was not readily available. Furthermore, all overseas visitors had to travel by ship. So it was several weeks before Dr Omuri could return to Japan.

I accompanied the geologists on an excursion to Woodend and Mount Macedon northwest of Melbourne. One of my family offered me the use of their car. I had three Japanese as passengers. Even in those days their cameras seemed to be in continuous use.

Several well known geologists were in the party including Professor Pat Marshall and Professor W.N. Benson from New Zealand, Professor W.H. Hobbs and Professor T. Wayland Vaughan from U.S.A., Professor H. Brouwer from Holland (whom I met again in the Philippines in 1953 and Copenhagen in 1960); Professor Skeats and Dr H.S. Summers from Melbourne.

The Hospitality Committee for the Melbourne Meeting was chaired by Lady Masson who graciously asked me to assist her. I remember being with her at the Spencer Railway Station to meet delegates arriving on the Sydney Express. She approached one man and asked him if he was from Japan. "No" was the haughty reply "I am a citizen of the United States". It was Professor Elicano from the Philippines. A Congress reception was held in the lovely surroundings of the Botanic Gardens.

(b) I did not attend the Sixth Pacific Science Congress in San Francisco in 1939, but I submitted a short paper relating to the Tertiary sequence of rocks in Papua and New Guinea (Crespin, 1939). This contribution was prepared during my visit in the early part of that year to the Geological Survey Museum, Bandoeng, Java, where I was having discussions on problems of the Indo-Pacific Tertiary correlation with Dr Tan Sin Hok micropalaeontologist to the Netherlands East Indies Geological Survey.

(c) Mr R.F. Thyer and I were delegates from the Bureau of Mineral Resources to the Seventh Pacific Science Congress held in New Zealand in 1949, the first since the end of the Second World War. Sessions were held in Auckland, in the North Island and in Christchurch in the South Island, between February 2nd and March 4th.

Among the American Geologists attending were Professor J.W. Gregory who was largely responsible for the formation of the Pacific Science Congress at Honolulu in 1920; Preston Cloud, Joshua Tracey, Charles Johnston of the United States Geological Survey, together with Dr Francis Shepard of Scripps Institution of Oceanography, at La Jolla, whose guest I was when in U.S.A. in 1951; Dr J. Westerveld, Professor Kuenen and Dr Berlage from Holland; all of whom I met again in Copenhagen in 1960; and Professor Charles Jacob of France who spoke on the Geology of Indo-China. I had the honour of chairing the meeting when Professor Jacob, speaking in French, addressed the session in Auckland. Fortunately Dr Lilley of New Zealand did an instantaneous translation. The Professor hardly ever took breath; the audience knew how I felt during this ordeal, and under their breaths they said - "Couldn't I stop him".

It was during a discussion of a paper I had prepared (Crespin 1950), and read at the International Geological Congress in 1948, that steps were taken to form a Standing Committee to report on the Datum Planes in the Geological History of the Pacific region. I was appointed to that committee.

The delegates visited different localities on the way south to Wellington and Christchurch. Many of us were to witness the most spectacular event during the Congress - the eruption of the volcano Ngauruhoe, near the centre of the North Island. This eruption gave vulcanologists a wonderful opportunity to study such a phenomena at close hand. Some of them climbed up the slopes of the volcano to within a hundred feet of the crater when rocks ejected from the crater came a little too close for safety. One party of scientists spent the night at the resort at Lake Taupo and with the aid of very strong binoculars belonging to Dr Shepard, we were able to view the performance of the volcano from a comfortable distance. When Dr Raggatt and I were visiting Washington in 1951, Dr Preston Cloud showed us a movie film he had taken during that time.

(d) The most colourful of the Pacific Science Congresses that I attended was the Eighth Meeting held in the Philippines from November 16th to November 23rd, 1953. Sessions were held at the University of the Philippines, Dillman, Quezon City, outside Manila.

I was honoured with an invitation to attend from the National Research Council of the Philippines. Unfortunately I was not a delegate from the Bureau of Mineral Resources, its delegate being Mr Jack Thompson from New Guinea. However, I was made an accredited member of the Australian National Research Council under the leadership of Professor Elkin of Sydney University, who was an official delegate to the Fourth Far Eastern Prehistoric Congress which was being held conjointly with the Pacific Science Congress. I made my own arrangements for travel to and from the Congress but was assisted by the National Research Council of the Philippines with my expenses during my stay. Needless to say, that my accommodation was not in the recognized hotels. Rather it was in a room over a restaurant; there was no air conditioning and it was very hot upstairs.

It was important that I should be at the Congress as I had been appointed Convenor of the Symposium on Geological History, Palaeontology and Stratigraphy of the Pacific Basin. However, I was entrusted by the Bureau with a Kodachrome slide illustrating the advances being made in mapping the surface geology of the Australian Continent and to be shown at the Symposium on Geologic Mapping in the Pacific. It was during this session that, as chairman, I had the trying time of keeping the peace between Professor Kobayashi of Japan and Dr Wang of Taiwan. There was a tense feeling amongst the Philippines delegates as to what sort of reception Japanese delegates were going to receive. For safety reasons all Japanese delegates were housed at the Y.M.C.A. However, at the opening session of the Congress, the President, Dean Patricinio Valenzuela, was very tactful and every courtesy was shown to the delegates.

Manila itself was full of surprises. Some delegates were accommodated at the Manila Hotel. On their arrival they were greeted by a large banner stretched across the entrance "Welcome to the Eighth Pacific Science Congress and the Fourth Far Eastern Prehistoric Pacific Congress". A few days later this was changed to "Welcome to Rocky Marciano" (the boxer).

The city was colourful with its teeming crowds, especially near the market, and with its small taxis, "Jeepneys", which were converted jeeps painted in gay colours and each vehicle being suitably named.

Again I found friends amongst the delegates, including Professor Brouwer and Professor Kuenen from Holland, Preston Cloud, Charles Johnston, Jos Tracey, Gordon McDonald and R. Cushman Murphy from America, Jim Healey and Dr Powell from New Zealand, Dr de Neve from Java and Dr F. Fitch from Sarawak.

The Eighth Pacific Science Congress followed close on the end of World War II, and war damage was apparent in different parts of Manila. The headquarters of the Bureau of Mines had suffered badly. The outside walls of some parts of the building were pock-marked by bullets. The Bureau was at this time housed in a temporary wooden building and facilities for carrying out investigations were few. Only one microscope was available for use. Investigations by the Bureau were guided by American scientists, including geologist Earl Irving and palaeontologist, Marvin Weller. When I called in about 1967, accommodation had greatly improved.

The Congress was held at the University of the Philippines (known as U.P.), which had been built with assistance from the Americans. There was even a nine hole golf course on the Campus!

The most colourful of the social events was the reception to delegates given by the President of the Philippines, President Quirino, at Malacana - the Presidential Palace in Manila. The broad marble staircase, flanked at the foot of the stairs by two marble figures of lions, the soft blue carpet and beautiful chandeliers were unforgettable. But how hot it was in the reception rooms. At least I had my picture taken with the President.

Excursions arranged for the geologists were exciting. Delegates were entertained by the Philippines Society of Mining and Metallurgy and Geological Engineers, and the Philippine Geological Society with a day's trip to Taganay City and the Taal Vista Lodge. The view overlooked Lake Bonbon and Taal Volcano. It was superb and so was the luncheon prepared for us on the lawns. On the return trip to Manila we called at the Catholic Church of Las Pinas. Firstly, the New Zealanders wished to study the rock "ignimbrite" in the walls of the church, and which is also found in New Zealand. And secondly, to see the famous bamboo organ in the church. A delegate from Macao, Father Cherzi, played this beautiful instrument for us.

Another excursion took us across Lake Bonbon to Taal Volcano. We travelled across the lake in a canoe-shaped boat, propelled by an old car engine. When we reached the island, an escort of Philippine soldiers was awaiting us. This protection was because a guerilla group, known as the "Huks" were troublesome at that time in the praecincts of Manila. Some of the party including myself, did not go up to the crater of Taal, but explored the sulphur mounds and springs near at hand. Taal erupted a few years ago, with considerable loss of life.

The most exciting and comprehensive excursion was by air to the islands south from Luzon to Mindanao. Sixteen geologists travelled in the personal plane (D.C. 3) belonging to the Chief of the Philippines Air Force. The trip had to be re-routed because of a cyclone. We spent the first night at Cebu City, in the Island of Cebu. Next day we examined some of the geology of the island. I had wanted for some time to be able to visit this locality to collect specimens of the larger foraminifera, Lepidocyclina cebuensis, from the lime-stones. (Crespin, 1956).

From Cebu, the party flew to Zamboanga City, on the western tip of the island of Mindanao. We lunched at a pleasant hotel on the water front and later visited the market where we created considerable interest. During a drive around the city, I noticed that every house, however small, displayed orchids whenever they could be grown, either in the garden or in hanging baskets. This part of Mindanao was the home of Moro handicraft. I felt I could have stayed a little longer in Zamboanga than the few hours we had.

We then flew on to Cagayan de Oro, capital of Misamis Province in Mindanao. This flight gave us a wonderful opportunity to study the coral islands and atolls from the air. Cagayan de Oro was an interesting city but not as attractive as others we had already visited. Here I left the party for two days because I wished to return to Cebu to examine and collect more of the Lepidocyclina-bearing limestone. The rest of the party crossed to Camyuin Island to see the well known volcano Hibok Hibok. Whilst awaiting a plane to call for me and take me back to Cebu, it was arranged that one of the staff from the Delmonte Company (U.S.A.) should show me over the pineapple plantation and canning factory. I was taken to the Country Club (on the plantation) for a cool drink. It was pineapple juice out of a tin! On entering the factory I was relieved of my camera. No photographs were permitted to be taken inside the building. The method of processing the pineapple was completely hygienic. From the time the pineapple was picked at the plantation it was not touched by human hands in the cannery. The setup was truly fascinating.

I then boarded a Philippine Airlines plane for Cebu. We flew over the island of Bohol with its fascinating rounded hills called "Haycocks". Roberto Gray and Marvin Weller of the Bureau of Mines met me and we went collecting samples of the limestone I wanted. Later the next day, the rest of the party from Cagayan de Oro and Hibok-Hibok picked me up at the Cebu airport.

Instead of going direct to Manila, we visited Legaspi in the southern part of the island of Luzon, to see one of the most perfectly symmetrically-shaped volcanoes in the world; - the Mayon Volcano. Our pilot gave us a real thrill as he encircled this 8,000-foot high volcano several times until we could see into the crater itself. It was just one of those memorable sights one sees in a lifetime.

Legaspi is also a centre for native handicrafts manufactured from hemp. Many beautiful and tempting articles were on display. We returned to Manila the following day, back to the teeming crowds and to humidity.

Before leaving Manila for home, the Australian, British and Canadian Ministers entertained us at a late afternoon party. It was here that we heard the exciting news that oil had been discovered in a bore at Rough Range, Carnarvon Basin, Western Australia. I had visited this area in 1950. A farewell gift to me from the Director of the Bureau of Mines was a box of cigars.

(e) In 1971, the Twelfth Pacific Science Congress was held in Canberra, A.C.T., from August 18th to August 27th, in most inclement weather. The meeting celebrated the fiftieth Anniversary of the formation of the Pacific Science Association. Approximately 700 overseas scientists attended but only about 400 from Australia. This was in sharp contrast to the 500 Australians in 1923, who attended the first meeting in Australia when one considered the growth of population since that time. When checking the list of members present at the first meeting nearly fifty years ago, I discovered that Professor Elkin and I were the only ones of the original members who attended the Twelfth Meeting. Many of the original members are with us no more, and others were not able to attend.

A few overseas visitors whom I met at previous congresses were present, such as Dr R. Cushman Murphy, the noted authority on Birds, from the United States, Dr F.R. Fosberg of the Smithsonian Institution, Washington, D.C., and Mr G.C. Ruhle of the United States National Parks Service. The Jubilee Address was given by Dr N.A. Peterson of Scripps Institution of Oceanography, the subject being "Navigation by Man and Ocean". He told a fascinating story of the spreading of the Ocean Floor. Furthermore, the subject illustrated to many in the audience of the important part geology holds in respect to the Pacific Science Congress. It will possibly be another fifty years before another Pacific Science Congress will be in Canberra. I am fortunate to have attended four of these Congresses.

(f) I had hoped to attend the Eighteenth International Geological Congress in Great Britain in 1948, together with Dr Raggatt and Dr Fisher. I had prepared a paper on "Foraminifera in Australian Stratigraphy" (Crespin, 1950) but approval was not given for me to make the trip. Dr Raggatt presented the paper on my behalf.

The Twenty-first International Geological Congress was held in Norden (Denmark and Sweden) in August 1960, to which Dr Fisher and I were delegates from the Bureau of Mineral Resources. I was greeted by geologists, palaeontologists and micropalaeontologists with whom I had corresponded or had met over many years. Amongst them was the Dutch Professor H.J. MacGillivray, whom I had not seen since I visited Palembang, Sumatra in April 1939, Dr Drooger from Utrecht, Professor Cuvillier from Paris and Professor Fritz Brotzen from Stockholm. My constant companion was my good friend Miss Angelina Messina from the American Museum of Natural History, New York.

The Danish Micropalaeontologist at the Museum in Copenhagen, Dr Axel Norvang, was host to many of us and I was able to meet Dr H. Hiltermann of Hanover, Dr Z. Reiss of Israel, Dr Lys of the Institut de Petrole, Paris, and Dr E. Galleatelli of Modena, Italy. It gave me such a wonderful feeling of satisfaction that these authorities from overseas, regarded my contribution to micropalaeontology with respect. At one session I presented a paper on the "Lower Cretaceous Radiolaria in Australia" (Crespin, 1960). In the discussion that followed, it was revealed how closely the deposits containing Lower Cretaceous radiolaria in Australia compared with those in parts of Europe.

The City of Copenhagen, together with its environs, was a glorious place in which to hold such a Congress. To be entertained at an orchestral concert in the famous Tivoli Gardens, to have receptions at the restaurant adjacent to the sculptural masterpiece "The Mermaid", and to visit the environs of the city such as "Elsinore" Castle, the setting for Shakespeare's Play "Hamlet", was a marvellous experience.

A pre-session excursion took us north from Copenhagen to Jutland, to various geological localities and some well known historic buildings.

The post sessional excursion was in Southern Sweden (Scania). We were taken by ferry from Copenhagen to Malmo, where we were met by our leaders, Professor Fritz Brotzen, from the Geological Survey of Sweden and Dr Britta Lundblad of the Geological Institute, Stockholm University. The route taken by the excursion passed through many well known geological localities and interesting cities. We spent nights at Hoganas, Kristianstad, and Ystad, and visited a geological section at the most southerly point in Sweden. It was all very exciting for me.

At the conclusion of the Congress I flew to Leiden, Holland, to spend a few days with my colleague and friend, Professor I.M. Van der Vlerk.

(g) I attended many meetings of the Australian and New Zealand Association for the Advancement of Science in different capital cities. The meeting in Canberra in January 1939 would never be forgotten. The temperature rose to 118 degrees F., accommodation was not very adequate, bush fires were blazing very near the city. On excursions such as to Captain's Flat, car radiators boiled, and delegates became rather exhausted. Some members such as Dr W.G. Woolnough went fire fighting. Overseas visitors included H.G. Wells.

The meeting in Canberra in January 1975 was well attended. Conditions were pleasant, accommodation satisfactory, and plenty of refrigeration.

Because of my interest in A.N.Z.A.A.S. over a long period, Honorary Membership was conferred on me at the Perth Meeting in 1973. I deeply appreciated this honour.

(h) An observation that has impressed me over the period of many years, is that geologists as a group are the most friendly of any scientific disciplines. They are strangers to one another for only a short time, language and racial differences are completely forgotten. I recall the feeling of loneliness I had at the opening session of the American Association of Petroleum Geologists and the Society of Economic Paleontologists at St Louis, Missouri in 1951. Because of the late decision of authorities in Canberra to permit me to go to the United States for this conference, it was difficult for conference authorities to find suitable accommodation for me. It was necessary for me to go to one of the suburbs instead of being in the centre of things.

During the early part of the conference I felt completely lost amongst 3,500 members, however, I did see one person from Australia, Professor Charles Marshall of the Geology Department, at Sydney University. Later I did discover American friends, Mr. Frank Morgan, Chairman of Richfield Oil Company and Dr Mason Hill of the same company, both of whom I had met when they visited Canberra some time previously, and once they found me I was well looked after.

Soon after the opening session I made my way to the offices of the Society of Economic Paleontologists and there I was amongst friends. The first person to greet me was Dr A.K. Miller, an authority on Ammonoids and with whom I had collaborated in a paper on an Eocene Ammonoid from Western Australia (Miller and Crespin, 1939), but we had never met. Dr Miller introduced me to those present and I received a tremendous greeting.

The S.E.P.M. held a few meetings separate from A.A.P.G. I had a paper prepared to present to one session but the Chairman ruled that it had not been in his hands by a certain date, due to my delay in departure from Canberra, so that it had to be withdrawn. I was very disappointed.

During the course of the meeting, I met Mrs Dollie Radler Hall, a consulting geologist of Tulsa, Oklahoma, a pioneer in her sphere of work. She brought in the first well of what was to be a new oilfield in Kay County. A press statement, together with a press photograph ("St Louis Despatch" April 25, 1951) said "Men have no monopoly in the rough and tumble business of scouring the earth for oil as two noted women scientists meeting at a Convention here, have amply proved".

(i) The Eighth International Congress of Electron Microscopy was held in Canberra from 25th to 31st August, 1974. This was the first occasion that such a Congress had been held in Australia. Electron Microscopy is closely associated with the Royal Microscopical Society. As I am an Honorary Fellow of the Royal Microscopical Society, I attended the Opening Ceremony of the Congress and the following Reception. I was honoured with the conferring of Honorary Fellow of the Society in 1960, and as I was in London in 1960 I was able to receive the honour in person.

9. DISCOVERING THE PACIFIC ISLANDS

With my ever increasing interest in the Tertiary stratigraphy of the Pacific region, and in the importance of the larger foraminifera for correlation purposes, whenever the opportunity came my way I made visits to various islands. These trips were made during annual leave. However, since my retirement in 1961, I still take a cruise, at least once a year to various islands. The majority of these have been made in P. & O. ships. The result has been that I have visited at least twenty different islands, some of them more than once, over a period of forty years, and there are still a few I would like to see.

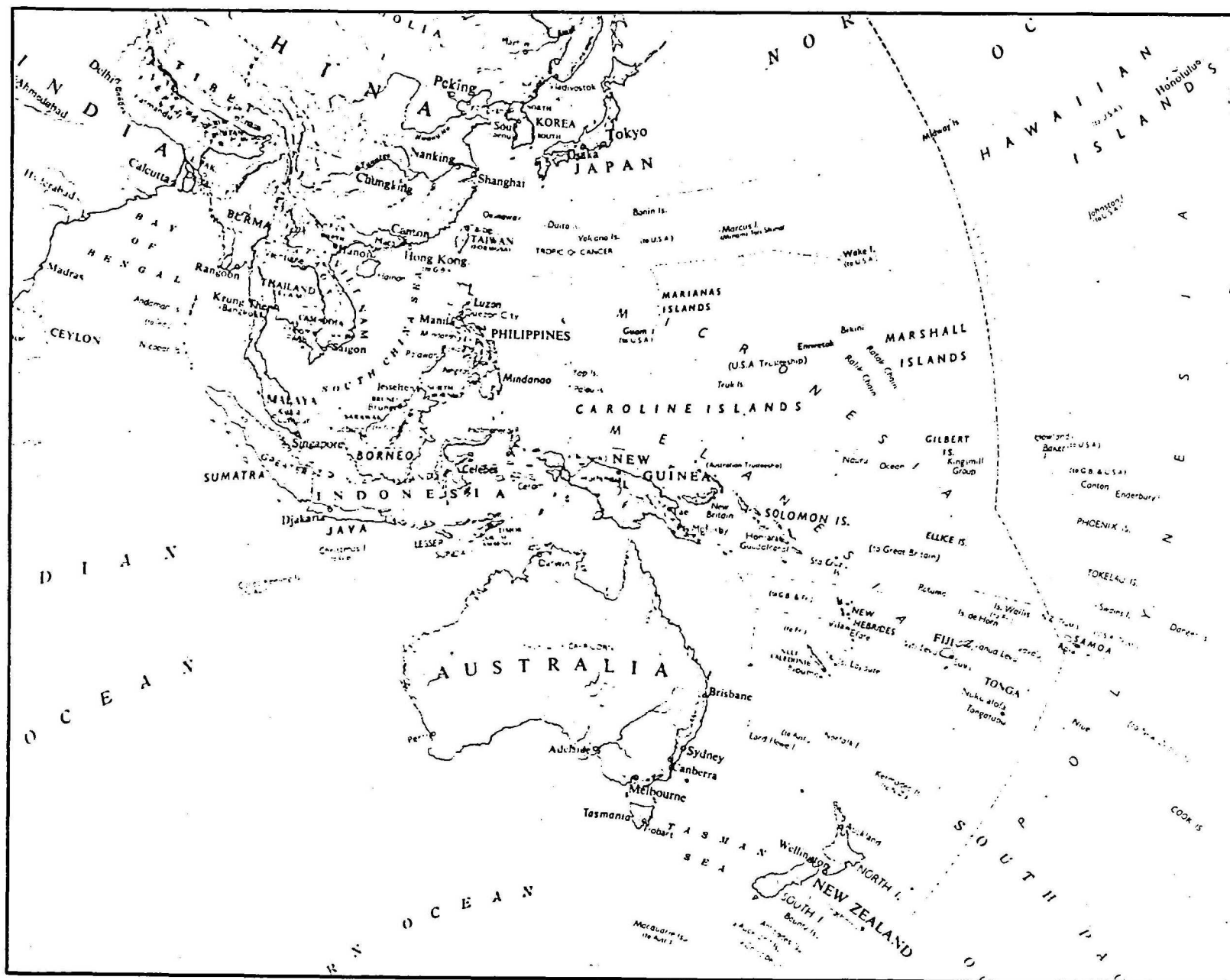
My first overseas trip was to Noumea, New Caledonia and Suva, Fiji, in 1932. I was accompanied by two Melbourne friends.

NOUMEA is the capital of New Caledonia, a colourful tropical French Pacific possession. The island is 700 miles east of the Queensland coast. We arrived shortly after a cyclone had played havoc with the island and especially with Noumea itself. The beautiful flamboyant trees in the city square were almost flattened. In those days and until quite recently, one had to travel from the ship to the shore by launch. When I called there again two or three years ago, I was so pleased to see that a wharf capable of taking large ships and with extensive room for containers, had been built.

On this first trip, we planned to go north to the village of La Foa. We engaged what now would be an ancient Renault. When we reached a large river we found the only bridge across it had been washed away; so we were rowed across to the other bank, where we were picked up by another car. With communications cut by cyclone, we thought the hotel at which we were to have lunch would not be prepared for us, however, the bush wireless had been at work. The setting of the table for lunch was really a surprise. A French touch was that the plates for each course were placed in front of each guest, and every plate and dish on the table were of Limoges china. I felt almost afraid to use them. That evening we were entertained by the citizens of Noumea at the Hotel de Ville. The cyclone had cut off the water supply, so water had to be taken from the ship for refreshments.

The ship entered the harbour through Domba Passage. The harbour is well sheltered but is usually completely spoilt by the yellow fumes from the Nickel Smelters along the foreshore. But on my most recent visit, there was no smoke at all. New Caledonia is the second largest producer of nickel in the world. A delightful French touch in the early days was that at restaurants, tables and chairs were out on the footpath for the use of customers. Now-a-days old wooden shops are flanked by modern ones. Lovely articles are in shops but they are very expensive.

The French in New Caledonia as elsewhere, make little effort to converse in English. With such a large tourist trade this fact is really distressing, especially when on a tour of the island. I have been there many times and only once has the guide for the tour been able to speak English clearly, and she was the wife of one of the French Geologists attached to the Mining Company.



During a visit in 1958, I saw something of the geology of the country around Noumea. I was met by Dr Pierre Koch, a French geologist attached to the Bureau of Mines in Noumea, who had recently visited Canberra. From the jetty where we landed from the launch, he drove me to his office where we changed cars. The official car was one of the small Renaults which could accommodate only two people. Dr Koch wished to show me some limestones on a hilltop which is quite a landmark overlooking the harbour. We drove over a dreadful road with numerous curves. At times I thought we were going around on one wheel. I collected samples of this limestone which was rich in small pelagic foraminifera of Eocene age. Each time I go to Noumea, I look for this landmark.

However, my favourite place to visit is the famous Aquarium which was opened by Dr Catala in 1956. It is the only one of its kind in the world. All exhibits are in large glass troughs and are thriving in salt water which is continually aerated. All specimens come from the depth of between 100 and 150 feet around coral reefs. Some of the fish are fantastic in shape, size and colour. There are beautiful florescent corals, sea anemones and algae. All exhibits are well lighted. Should one visit Noumea, this is something not to be missed.

I have been visiting FIJI for many years, mainly Suva, but I have called at Lautoka and Nandi on the west coast. In my early visits I would collect samples of the rock known as the "Suva Marl" which is fossiliferous and occurs in many roadside sections around Walu Bay. I have examined many rock samples from different parts of the island, forwarded to the Bureau of Mineral Resources in Canberra by the Geological Survey of Fiji, and also some from the adjacent islands such as Savu Savu, which I have visited.

It has been interesting watching Suva develop over the last thirty years. Now there are some very fine buildings, many new hotels and motels, improved roads, and there is the University of the South Pacific. Yet there is something gracious about the old hotels such as the Grand Pacific, with its airy lounges and high ceilings which are part of yester year. Shopping is fascinating, and articles in the Market always tempting. I do enjoy seeing my friends again; and still get very thrilled when I hear the bands playing on the wharf on arrival and departure of the ship.

On a recent visit to Suva, I had a happy experience. My friend Peter Rodda of the Mineral Resources Branch of the Geological Survey of Fiji, arranged that I should visit a Fijian village. We drove as far as the Nausori Airport and then transferred into a boat which acted as a water taxi. We travelled about two miles along the Rewa River, when we pulled into the shore to land. When we arrived at the village, we were taken to the Meeting House where the Headman of the Village was awaiting us. After greetings were over, I was taken to a lovely comfortable chair which had been placed on some beautifully woven mats. The Headman spoke excellent English. Then came the Kava Ceremony. I had to taste this drink which, if I did not would be insulting to my host. Then it came time to leave. I was shown around the settlement, followed by many children. When we caught our water taxi, I looked back and there was the whole village including the head Fijian, waving me farewell. I felt like some royal personage and was quite overcome at the wonderful gesture.

Recently one of the Fijian lads from the Village was in Canberra, so I was able to entertain him in my own home.

TONGA is another island I enjoy. The Tongans are delightful people. The Capital of the Kingdom of Tonga is Nuku'olofa on the island of Tangatapu. Queen Salote's residence was in Nuku'olofa which has developed over the last few years. It now has a fine wharf, the "Queen Salote" Wharf, which is more pleasant than having to go by launch from the ship to the jetty. When I visited the island in 1958, I acquired a unique necklace from a Tongan man on the jetty. It cost me two shillings. It consists entirely of tests of the large shallow warm water foraminifer, Marginopora vertebralis, a form which flourishes on the sheltered side of coral reefs in the tropical Pacific region. It is circular in shape and has a thin test. When the animal dies it leaves a small hole in the centre of the shell. The Tongans have made exciting use of Marginopora. Some of the tests are dyed pink, blue or green, which makes the necklace so attractive. When I attended the International Geological Congress in Copenhagen in 1960, I wore my necklace to the Banquet. It was a talking piece of all micropalaeontologists who saw it.

A few years ago, when my friend and I arrived at the "Mala'e" or Park, we stopped at the first stall to look at the handicraft. A tall Tongan woman said that the stall was being run by the Pan-Pacific and South East Asia Women's Association. I told her I knew of that organization. She asked me where we came from and I said "Canberra". "Oh!" she said, "I have been there twice to Meetings of the Association". She asked if I knew of certain people and how they were. Later I returned to the stall where I was given a pleasant cool drink and a chair on which to sit. I was also given a necklace of shells. The gesture is typical of many of the islanders in the Pacific.

One of the attractive handicrafts is "Tapa" cloth, others are mat and basket weaving of all shapes and sizes.

Another island in the north of the Tongan Group that I have visited is Vava'u. We missed seeing much of this island because of a terrific downpour of tropical rain. The lack of shelter in the vicinity of the wharf meant many of us got very wet. One had to travel by launch from - and to the ship: because of the rain we were unable to visit the Market.

In 1937 I spent a day at PORT MORESBY, Papua, and had talks with geologists from the Australasian Petroleum Company, some of them coming from Daru in western Papua to meet me. They gave me a small party before lunch. After lunch, Mr Montgomery persuaded me to see the Eocene Limestones adjacent to Port Moresby and samples of which were in the rock and fossil collection made by the geologists of A.P.C. and sent to Canberra. I did not enjoy walking through the long kunai grass. However, a Papuan lad went ahead of us to make sure there were no snakes about. When I had to return to the ship which was set at anchor in the Harbour, these geologists came along in the Company's launch and we had a farewell party. One passenger was heard to remark: "Who is that woman with all those men". However, that did not worry me because I was not conscious of the gesture these geologists had made by coming from as far as Daru in Western Papua to greet me.

A few years ago, I did make a short visit to Port Moresby. when I was met by the Geologist in Charge, Mr A. Renwick. The town had altered considerably since my early visit. I was shown over the Geological Office there and later visited the University, which was quite new.

I visited RABAU, New Britain, only once, and that was in 1964. I had examined many rock samples from all parts of New Britain when Dr Fisher was working in the area. I was met by the volcanologist in charge and was taken to headquarters to see the tunnels that had been made by the Japanese during World War II and where some of the precious instruments, such as seismographs, are now kept.

I was very interested to see the volcanoes around the harbour, especially Mother and Daughter of the main volcano, Matupi. Smoke was issuing from one of the craters. The setting of Rabaul is quite attractive, but I would not be very happy living there.

In 1964, I went on a comprehensive cruise in the "George Anson" which took me to Guam, the Philippines, Hong Kong, Taiwan and Japan.

GUAM had always interested me, because of the publications by the United States geologists on the fossiliferous limestones on the island. Guam is in the Mariana Group of Islands and comes under the jurisdiction of the United States of America. I also visited it again in 1971. Unfortunately, I had no contacts there who could indicate to me where these limestones occurred. We landed at Apra Harbour, and much of the country to the north of the island seemed to be occupied by United States defence installations. The tour we took followed the coast to the south and then rounded the southern portion, following the coast north for a distance then went west to the ship. The southern portion is picturesque, much of it being thickly wooded with high mountains, including numerous extinct volcanoes.

Guam is full of history. The Spanish explorer, Magellan, during his circumnavigation of the world, landed at Utamac, on the west coast on May 6th 1521. Utamac was the original site of the Spanish Captial. It is a colourful village with its steepled church and many brightly painted houses.

Beyond the village is Fort Soledad, which overlooks the Pacific Ocean. An old sentry box is on the edge of the cliff. It was constructed entirely of coral limestone and it is still possible to recognize some of the genera of corals.

We continued on our way to Agana, the capital of Guam. It is very old and during World War II, was almost completely destroyed. Since then it has been rebuilt and many interesting shops are there. When wandering through a book shop I found a copy of the Golden series entitled "Sea Shells of the World". I had not seen it anywhere else. This small book has been useful to me in identifying shells in the Pacific region. In fact, I was able to identify a Cowrie I had bought in Tonga a few years ago and found it was a much sort after form, Cypraea mappa.

Nearby Agana, is the fascinating Latta Stone Park, where there is a group of stones known as "Latta Stones", which have been hewn from coral limestone and are capped with coral bowls. It is suggested that these have a relationship with those of Easter Island.

I have dealt with the PHILIPPINES in some detail in Section 8, but I must make a comment about Cebu City on the Island of Cebu, where we called on our way to Manila in 1964. I was amazed to see the deterioration of conditions in that city. The streets were so dirty and when I saw the hotel at which I had stayed in 1953, I could not believe that I had done so. After walking a short distance along Shoe Street (almost every shop sold shoes) we realised that we were being followed. We noticed a policeman and spoke to him. He suggested that we took a taxi to the Magellan Country Club: this we did and were able to engage a guide and a car. My Bureau of Mines colleagues met me at Manila. It was good to be with them again. Many changes had taken place at the University of the Philippines since 1953, and I was shown some of the new facilities that had been constructed since I had been there.

An interesting change was the new setup of the Filtration Plant. The man in charge told me that it would go against him if there was the slightest suggestion of any impurities being present. There was also a beautiful swimming pool nearby. During the weekends, many visitors came from Manila and other parts of the island of Luzon to this attractive spot.

Then we set out for HONG KONG, sailing down Manila Bay, passed Corrigedor and Bataan, which I had visited in 1953. We were about twelve hours out of Manila when the ship went into a cyclone. It was at its worst during the night. However, I managed to weather it much to the surprise of the ship's nurse, when she came into my cabin next morning. She said she felt sure that I was the only passenger who was awaiting breakfast. I got up before lunch after which I decided I was taking a risk with the sea being so very rough. So I spent the rest of the day in bed.

We managed to make Hong Kong, where we were held up for five days. I was able to spend the time with an old Melbourne University friend, Miss Elma Kelly, who had spent many years in Hong Kong. Knowing that I would be there for a few days, she had arranged a dinner party for me. The guests included the head of the University of Hong Kong, Dr Ride from Western Australia and Professor Davis the head of the Geology Department at the University, whom I had met in the Philippines in 1953. Because of the cyclone, ferries between Hong Kong and Kowloon on the mainland were suspended at 11 p.m. One guest from the mainland side had to spend the night in Hong Kong.

My hostess and I could not leave the apartment for two or three days, because of fallen trees along the road in front of this block of apartments. Later we did manage to do some sightseeing, including Stanley Camp where she was interned for three years during World War II. Then we crossed to Kowloon to visit some well known places on the mainland, including the famous carpet factory which was most interesting. The beautiful carpets in the entrance hall and on the stairways at the Mandarin Hotel, had been woven there. It had taken two sampans to transport them to the island.

Our next port of call was Keelung, TAIWAN. Due to our troubles with the cyclone, we were late in arriving and could only spend a few hours there. However, Dr L.S. Chang, Micropalaeontologist to the Geological Survey of Taiwan, was there to meet me and to drive me to Taipei, the Capital. I managed a quick visit to the University to see Dr Wang of the Department of Geology, whom I had met previously at Manila in 1953. I had little time for sightseeing. The staff of the Geological Survey entertained me at dinner where I had my introduction to "yellow wine". All others in the party drank beer, which seems to be the favourite drink of so many geologists at home and overseas. I was presented with a delightful set of coasters. After a little sightseeing, it was time to return to the ship.

JAPAN. We then sailed to Yokohama and Tokyo, where we were to spend four days. As this was my first visit to Japan I wanted to make the most of these four days, so arranged to spend three nights at the Marunouchi Hotel.

Dr T. Uchio, with whom I had been corresponding for many years and who is the micropalaeontologist at the Institute of Petroleum, University of Tokyo, met me at Yokohama and it was decided that we would visit that fantastic city, Kamakura, where the giant Buddha was to be seen. The crowds of people just amazed me. Two old Japanese ladies asked Dr Uchio would he take a photograph of them standing with me. I could hardly believe it all. He then took me to my hotel; later we went out to dinner and visited the Tokyo Tower.

Dr Uchio had made arrangements for me whilst I was in Tokyo. He had planned to take me to the University. Professor Kobayashi of the Geology Department had told him to bring me to the University by train so that I could experience something of the crowds that travel on the Underground. It really was an experience. Tak. took me to see his laboratory at the Institute of Petroleum, where I found that conditions under which he worked were very crowded and he had little, if any assistance. He had arranged that I should have morning tea with some of the staff of the Geology Department. My old colleague and friend Professor S. Hanzawa, from the Tohoku University at Sendai, about 200 miles north of Tokyo, travelled down to see me. We were both rather overcome meeting one another for the first time after corresponding for nearly thirty years. Professor Hanzawa was an authority on the larger foraminifera from various parts of the Pacific and had helped me on different occasions. Professor Asano, a micropalaeontologist, had also come from Sendai to meet me. And there was Professor Kobayashi, whom I had met previously, and who is an authority of Palaeozoic fossils. There were others but I cannot remember all the names. After looking over different parts of the University and having my photograph taken once again, I was taken to lunch by my friends at the staff dining room at the University. I was then told that the Director of the Geological Survey, Dr Saito, had arranged for me to have the use of a car whilst I was in Tokyo and that it was awaiting me outside. So Dr Uchio and I went shopping and a little sightseeing including Rikugien Garden, where I had my first glimpse of a beautiful Japanese Garden. We were due at the Geological Survey of Japan for afternoon tea. However, we were caught in the most dreadful traffic jam and were late arriving. Later, some of the geologists entertained me at dinner in some picturesque gardens. As far as motor traffic is concerned in Tokyo it is a case for everyone for himself.

I was embarrassed with presents. Professor Hanzawa presented me with a beautiful book on Japanese Architecture and Dr Uchio with a volume of Japanese prints and two trays. Later my friend, Mrs. Sherrard, when in Japan, found a small edition of this volume with the titles in English.

The Director of the Geological Survey gave me a beautiful brass plaque with a design based on an old Grecian one, of men quarrying clay. It was the work of one of Japan's leading sculptors, Mr Ryoji Suga. He also gave me a volume on the "Geology and Mineral Resources of Japan". This was wrapped in a beautiful scarf. Books and other articles were usually carried in a square scarf. It was an attractive way to carry parcels.

Dr Uchio accompanied me to Nikko, 80 miles north of Tokyo. We travelled there by express train, then transferring to a coach. Nikko is a most beautiful place. We visited the famous Toshogu Shrine which is fabulous. It was built in 1336 and is one of the greatest monuments in the history of Japanese Architecture. Over the entrance to the Shrine are the only wooden engravings in it. They depict the "Three Wise Monkeys" - "Hear no evil, Speak no evil, See no evil".

Nikko is also famous for its long avenue of the evergreen trees, Cryptomaria planted in the Seventeenth Century. Cryptomaria has a long history as fossil remains are found in rocks of Permian age and were living more than 200,000,000 years ago.

We then continued the drive up the zigzag "Irphazaka" Driveway. This driveway is six miles up the slope of Mount Nantai. It is an amazing feat of road building. I must say I was a little worried at times going around the sharp curves. I was astonished when we were told to get into an elevator, and descend until we reached a subway to view the Kegon Falls. The sight of these falls was really scenic. Also it was a geologist's delight. On one side it shows the most glorious example of Organ Pipe Structure in the volcanic rocks. We then drove a short distance to see Lake Chusen, which was very picturesque.

On my last day, Tak Uchio, together with one of the geologists from the Survey and a German Geologist (Wolfgang Soames), who was studying sedimentary rocks in Japan, and I drove to Lake Hakone, with the hope that I would see Mount Fuji - but it was hidden by clouds. On two later occasions I had hoped to see this famous volcano, but so far have been unlucky. Hakone was a very pleasant place and the lake a lovely stretch of water. Wolfgang Soames and I decided that the scene reminded us of Lake Lucerne in Switzerland, with the ferries sailing across it. When we stopped at Atami on the coast, we remarked that the scene resembled the Riviera. This tour was a pleasant ending to my Tokyo visit. As I have mentioned, I had made two short tours to Tokyo, but the one in 1964 was outstanding. I did appreciate the wonderful kindness and friendliness of my geological colleagues.

The only other port of call I have made in Japan is Kobe, which is west of Tokyo. It is the largest port city in the Far East and its history dates back to the third century. The usual length of stay in Kobe is two days, so one has to hasten to see all the interesting places. Beyond Kobe there are Kyota and Osaka.

Osaka is one of the largest industrial cities and is second in size to Tokyo. I have spent only one evening there while in Japan, having dinner at one of the exclusive hotels, Hotel Ozaka Grand, and then going to a theatre. In our short drive around the city we passed the Osaka Castle, which is one of the most imposing reconstructions in Japan.

Kyoto is the old capital of Japan. It is such a lovely city. It is the centre of many beautiful handicrafts, such as Cloisonne, Satsumi and Damascene ware. I understand that some of the old handicrafts are not now being prepared in such numbers. I am happy that I own some of the older ones. The last time I was there, one of the older Japanese craftsmen in the Cloisonne Department, told me that the modern trend was for this material to be transparent. When I told him of my two beautiful pieces, he said "Madam, take the greatest care of them". The few hours spent in Kyoto was much too short with so many wonderful things to see and study.

Kyoto has one of the most beautiful shrines in Japan - The Golden Pavilion. It was built in 1397 and was originally covered entirely with gold foil. It was destroyed by fire in 1950 but was entirely rebuilt in 1955. The surrounding gardens are superb.

THE HAWAIIAN ISLANDS

OAHU. I first visited Honolulu on the island of Oahu when flying to the United States in April 1951. More recently I was there on New Years' Day, 1975. The amount of building being undertaken is tremendous, with its large and numerous hotels and motels being erected along Waikiki Beach. The lovely old Royal Hawaiian Hotel is almost encircled with more modern hotels. I had my lunch in the Reef Room of the old Hotel which takes in part of the beach. I always feel, however, that Waikiki Beach cannot be compared with any of our beautiful Australian beaches. As far as I know, the white sand along Waikiki Beach has been imported from Australia. Because of the great amount of volcanic activity that has taken place on this island, the sands are chiefly black in colour. The old volcano crater of Diamond Head, dominates the Waikiki side of the island.

On one occasion when cruising around the Pacific and calling at Honolulu, I was entertained at luncheon by the Soroptomist Club of Honolulu. Dr Frederick, a member of the Club greeted me at the wharf with a delightful lei made of reddish brown seeds. The luncheon was at the Y.W.C.A. Rooms where the President of the Club gave me a spray of brownish berries, which I still cherish.

Dr Frederick had arranged for me to visit the Bernice Bishop Museum, a place I had always wanted to see. When returning from the U.S.A. in 1951, it has been arranged for me to spend two days at this Museum. Unfortunately the Airways Flight had to be altered, so it was nearly twenty years before the opportunity came my way again. There were some wonderful exhibits on view, but I was sad to see several mistakes in the printing of some of the labels of the specimens from Australia.

The following day I spent with Dr Joanna Resig, a micropalaeontologist at the Geology Department at the University of Hawaii at Honolulu. When I returned to the ship, I found a glorious sheaf of tropical flowers in my cabin from her.

KAUAI is a small, almost circular island to the north of Oahu. It is full of legends. It has many rivers, canyons and waterfalls. The main river is the Wailua which provides an excellent waterway for tourist trips. There is a very good Motor Boat Service taking one to many beautiful spots. We only had time to visit one of these, the fantastic Fern Grotto in Wailua River State Park. A small group of islanders in the grotto entertained the visitors with some delightful Hawaiian music.

HAWAII ISLAND is the largest in the Hawaiian Group, and lies to the southeast of Oahu. Hilo is the capital. The old part of the town reminded me rather of an Australian inland town. The island is well known for its active volcanoes, including Mauna Loa and Kilauea. The latter is a flank volcano on Mauna Loa. Mauna Loa is 13,680 feet high, whilst the main crater of Kilauea is only 4,090 feet above sea level. They are both spectacular.

The first time I witnessed the steam and smoke erupting from Kilauea was on a clear day and it was a wonderful sight. Whilst there I was able to meet my friend, Professor Gordon Macdonald of the University of Hawaii in Honolulu who is a well known volcanologist. When there in 1975, it was a most disappointing day, with heavy rain and fog practically all the way from Hilo to the volcanoes. There had been some volcanic activity a few weeks before our arrival.

Before arriving at Hilo, the 'Oriana' circumnavigated the island of Hawaii. On the west coast we passed at slow speed, Kealahou Bay, where on February 14th 1779, Captain Cook was killed by the natives. A monument just above the shoreline marks this historic spot.

The SAMOAN ISLANDS lie approximately south-west of the Hawaiian Islands. Samoa is divided into two parts, Western Samoa and the American Samoa. American Samoa, which takes in the island of Tutuila, is under the jurisdiction of the United States, with a Governor appointed by the President. The Governor's Residence overlooks the beautiful harbour of Pago Pago. I think this harbour is one of the loveliest in the South Pacific, being part of an old crater. The mountain range is flanked by densely wooded peaks, including the mountain known as "Rainmaker", which is 1,717 feet high. The Rainmaker and Pago Pago are featured in Somerset Maugham's story of Sadie Thompson in "Rain".

A Government Television Station is on Mount Alva and a mile long cable car railway connects both sides of the harbour. A delightful touch is that when the ship is leaving Pago Pago, this cable car stops directly overhead and showers petals of frangipani and many other tropical flowers on to the decks of the ship. The Pago Pago American Hotel is a fabulous place and is most interesting. It costs two dollars for the privilege of using the swimming pool.

On one of the islands in Western Samoa, Upolu, is the city of Apia, the capital and principal port. I spent a hurried day there a few years ago, so only had time to see a few of the interesting places. Western Samoa was administered by New Zealand for some years, but now it is a fully independent Polynesian State.

A name usually associated with Western Samoa is that of Robert Louis Stevenson, who retired to Apia from England because of his health. We visited his attractive home, which is situated in pleasant surroundings. It is now used by the Head of State for formal occasions. His tomb lies at the top of a steep hill overlooking Apia and its harbour.

The island of TAHITI is in the Society Group of Islands which are French possessions. It is approximately north-west of Mururoa, the French atomic testing ground in the Pacific. Papeete is the capital. The wharf, where the ships tie up, runs parallel to the main street. I have been to Tahiti twice, but the second occasion was one of excitement. Our ship S.S. "Orcades", had just passed through the narrow entrance to the harbour when the steering gear failed. The ship finished with its bow well embedded in the sandy beach. It took a little time to release her from the beach before we tied up safely.

I have never made a tour around the island which I understand is picturesque. We only had two days there and I had other things I wanted to see. Of course there are fascinating French shops but everything was very expensive. Passengers who patronised the hotels and bars, were almost overcome at the price of a glass of beer.

My desire to visit Tahiti was to see Point Venus on Matevai Bay, a short distance from Papeete, as it was here that Captain James Cook observed the transit of Venus across the sun in June 1769. To me, Captain Cook was the greatest navigator and explorer of all times, in his discoveries in the Pacific Ocean. His mapping of coast lines of different islands such as New Zealand, were almost perfect.

Captain Cook was asked by the Royal Society of London to go to the Pacific Ocean to a spot where it was forecasted that the transit of Venus would take place in June 1769. I also have great admiration for the astronomy members of the Royal Society in being able to pinpoint where the transit of Venus could be observed, for in the 18th century apparatus necessary for such observations was not so perfect as today.

A small monument, with a suitable inscription was built by Cook. It consisted of a cylindrical shaped stone a few feet high, with an orb placed on top. The local administration later fenced in this monument and a plate with an inscription was placed there by the Royal Society in 1901. The inscription reads - "This Memorial erected by Captain James Cook to commemorate the observation of the Transit of Venus, June 3rd 1769, was restored and fenced round by the local Administration at Tahiti and this Plate was placed here by the Royal Society and the Royal Geographical Society in 1901".

I was distressed to see the lack of care taken of this great monument; a French memorial a little distance from this was so well cared for. I do wish that these learned Societies would arrange to have this historic place better looked after.

I understand that the Group of Islands including Tahiti was named the Society Islands because of the Royal Society of London and Royal Geographical Society.

A short distance by launch from Papeete is the glorious island of MOOREA. It is really enchanting. I have been told that there is one other island which is lovelier than this, which is Bora Bora. Perhaps I may visit it some day.

Moorea is a volcanic island and the jagged mountain peaks are most spectacular. They will always stay in my memory. The jetty where we landed is near Cook Bay (Cook called there in 1769), which is a deep indentation of the coast line. It was told to me that this bay was a rest place for U.S. submarines during the Pacific war.

The first occasion when I was there, Moorea had not been spoilt by numerous tourists. However, now the Hotel Bali Hai has been enlarged by American interests. It is situated in well kept grounds.

Moorea is the home of many artists and we were able to visit some of their homes. One artist told me that every other year he exhibits at the Adelaide Festival. I suggested that he called on Canberra on some occasion. He had some lovely pictures on display. Some scenes in the film "South Pacific" were filmed on the island.

Despite the many tourists, Moorea is still my favourite Pacific Island. One has to see it to realise its beauty. The sunsets viewed from Papeete, across to the island are magnificent. On one occasion we did pass it at sunset.

RARATONGA is one of the principal islands in the Cook Group. On one occasion we called there but were advised not to land because of the bad condition of the jetty. Some passengers managed to go ashore. Islanders came on board to entertain us with their dancing; others came with their handicrafts and lovely shells.

CANTON ISLAND is a small coral island at which aircraft used to call to refuel before going on to Honolulu. It lies to the north east of the Ellice Group and is just south of the equator. It is administered jointly by Britain and the United States. The island is so small from the air that one wondered how the plane could land there.

I called there on the way to and from the United States in 1951; but nowadays it is bypassed as the big planes can carry enough fuel from Fiji to Honolulu. On my return trip, we stopped at the island at 7 am. As the plane was close to the beach I was able to hurry down and collect samples of the coral sand.

NUIAFO'OU or Tin Can Island, lies between Samoa and Fiji. Passengers on cruise ships do not land but stop offshore. Islanders row out to the ship to pick up mail which has been placed in tin cans attached to a rope and passed over the side of the ship. Mail from the island replaces the ship's mail and is pulled on board. A special stamp is used for the letters which are addressed to friends in Australia or elsewhere. These may not be delivered for nearly three months as ships do not often call at the island.

To the northeast of Australia are two groups of islands, the Solomon Islands Group and the New Hebrides Group. I have visited ports in both Groups.

HONIARA is situated on the island of Gaudacanal in the Solomon Islands Group. This locality is well known because of its prominence in the Pacific Zone of World War II. Until recently it was necessary to travel by launch from the ship to the jetty, but recently the "Oriana" berthed at the wharf. Numerous stalls were set up near the jetty, including an excellent one by the Boy Scouts. The main market is a little further on under some shady trees. I had been told of the very beautiful wood work done by the Solomon Islanders and that it was unique in the Pacific area. It was really magnificent. A tour took us to a school where the Islanders were being trained in this handicraft. On our way to the school we saw plenty of evidence of the war. Parts of burnt out aircraft were strewn about as well as numerous empty bomb shell cases. It was a vivid evidence of what had happened on the island of Gaudacanal.

The town of Honiara is well looked after. There is an excellent small Museum, which had exhibits from other islands in the Group.

I would like to have seen the islands of Rennell and Bellona to the south of Honiara. Some years ago the geologist in charge of the Solomon Islands, Mr John Grover, had sent me limestone samples for micro-examination, from these islands.

VILA is situated on the island of Efate in the New Hebrides Group. The government of the New Hebrides is a condominium and is administered by both British and French. I had always wanted to see Vila entirely from a geological point of view. In 1906, Mr F. Chapman and Sir Douglas Mawson described a rock sample from Shepherd's Hill, Vila. The rock was composed almost entirely of Halimeda, one of the forms of Alga. I was amazed when I saw this locality. A new wharf has been built since those days and the site for it was Shepherd's Hill. A magnificent section of this whitish algal limestone, was exposed for about half a mile. I am not sure of the height of the face of the section. However, one of my long desires had been satisfied.

10. SCIENTIFIC PUBLICATIONS BY IRENE CRESPIN

Appended below is, I hope, a complete list of scientific papers written by me and published in various scientific journals throughout the world. Also listed are those which have been written in collaboration with other scientists interested in palaeontology and sedimentary geology.

Irene Crespin

- 1923 - Excursion to Green Gully, Keilor. Vict. Nat. 40(3), 47-48.
- 1926 - The Geology of Green Gully, Keilor, with special reference to the fossiliferous beds. Proc. roy. Soc. Vict. 38, n.s., 100-124.
- 1936 - The Larger Foraminifera of the Lower Miocene of Victoria. Aust. Bur. Min. Resour. Bull. 3, 3-15.
- 1938 - The occurrence of Lacazina and Biplanispira in the Mandated Territory of New Guinea. Ibid. Bull. 4, 3-8.
- 1938 - A Lower Miocene Limestone from the Ok Ti River, Papua. Ibid. Bull. 4, 9-11.
- 1938 - Tertiary rocks in the North-West Australia. A.N.Z.A.A.S. (Auckland, 1937), 23, Rept. Sect. X., 4.
- 1938 - Upper Cretaceous Foraminifera from the Northwest Basin, Western Australia. J. Paleont. 12(4), 391-395.
- 1939 - A note on the present knowledge of the Tertiary Sequence in Papua and the Mandated Territory of New Guinea. Proc. 6th. Pac. Sci. Congr. (San Francisco), 529-530.
- 1941 - Palaeontological Review of the Holland's Landing Bore, Gippsland. Min. & geol. J., Vict. 2(4), 252-256.
- 1941 - The Genus Cycloclypeus in Victoria. Proc. roy. Soc. Vict. 53(2) n.s. 301-314.
- 1942 - Report by the Commonwealth Palaeontologist on Fossil Collections from New Guinea. Appendix II, in N.H. Fisher and L.C. Noakes, geol. Bull. New Guinea. 3, 36-39.
- 1943 - The genus Lepidocyclina in Victoria. Proc. roy. Soc. Vict. 55(2), 157-180.
- 1943 - The occurrence of the genus Conoclypus in the Northwest Division, Western Australia. J. roy. Soc. W. Aust. 28, 75-77.
- 1943 - Permian Foraminifera from a bore at Coorabin, New South Wales. Aust. J. Sci. 6(2), 65.

Publications
Irene Crespin (Cont.)

- 1943 - The stratigraphy of the Tertiary marine rocks in Gippsland, Victoria. Aust. Bur. Min. Resour. Bull. 4. (mimeographed).
- 1943 - Conodonts from the Waterhouse Range, Central Australia. Trans. roy. Soc. S. Aust. 67(2), 231-232
- 1944 - The occurrence of Cycloclypeus in the Tertiary Deposits of South Australia. Ibid. 68(1), 120-121.
- 1944 - Permian Foraminifera from Oonah, Tasmania. Aust. J. Sci. 7(2), 59.
- 1944 - Some Lower Cretaceous Foraminifera from bores in the Great Artesian Basin, Northern New South Wales. J. Proc. roy Soc. N.S.W. 78, 17-23.
- 1945 - Middle Miocene Limestone from Cape Barren Island. Pap. & Proc. roy. Soc. Tas. 13-14.
- 1945 - Middle Miocene Limestone from King Island, Tasmania. Ibid. 15-18.
- 1945 - Note on age and palaeogeography of Brown Coal Deposits of Gippsland, Victoria. Proc. roy. Soc. Vict. 57(1-2), n.s. 49-56.
- 1945 - The Hutton Creek Bore, Queensland. Aust. Bur. Min. Resour. Rept. 1945/14 (Mimeographed).
- 1945 - The Arcadia Bore, Queensland. Ibid. 1945/15. (Mimeographed).
- 1945 - Preliminary note on a Microfauna from the Lower Cretaceous Deposits in the Great Artesian Basin. Ibid. 1945/16. (Mimeographed).
- 1945 - Some Permian Foraminifera from Eastern Australia. Proc. roy. Soc. Qld. 56(1), 23-30.
- 1945 - Some Permian Ostracoda from Eastern Australia. Ibid. 56(4), 31-36.
- 1946 - Foraminifera and other microfossils from some Tertiary Deposits in the vicinity of Aldinga Bay, South Australia. Trans. roy. Soc. S. Aust., 72(2), 297-301.
- 1946 - A Lower Cretaceous fauna in the North-west Basin, Western Australia. J. Paleont. 20(5), 505-509.
- 1946 - Diatomite. Aust. Bur. Min. Resour. Summary Rept. 12, 5-14.
- 1947 - Foraminifera in the Permian rocks of Australia. Aust. Bur. Min. Resour. Bull. 15. 5-26.
- 1947 - Micropalaeontological examination of No.1 Bore, Dimboola, Western Victoria. Appendix I, in Gloe. State Riv. & Water Suppl. Comm. 1. 149-158.

PublicationsIrene Crespin (Cot.)

- 1948 - Indo-Pacific influences in Australian Tertiary Foraminiferal assemblages. Trans. roy. Soc. S. Aust. 72(1), 133-142.
- 1948 - Notes on the Bryozoa from limestones at Lake Cowan and Norseman, Western Australia. Appendix VI in Tertiary Deposits near Norseman, Western Australia by E. de C. Clarke, C. Teichert and J.H. McWhae. J. roy. Soc. W. Aust. 32, 99-101.
- 1948 - A fossil crab from the Lakes Entrance Shaft, Gippsland, Victoria. Proc. roy. Soc. Vict. 59(1) n.s., 220-222.
- 1949 - A study of Australian Diatomites with special reference to their value as Filter Media. Aust. Bur. Min. Resour. Bull. 7, (Miscell. Ser. 3), 5-46.
- 1950 - Some Tertiary Foraminifera from Victoria. Contr. Cushman Fdn. 1 (3,4). 70-75.
- 1950 - Foraminifera in Australian Stratigraphy. Internat. geol. Cong. 18th sess. Gt. Britain, 1948, 15, 3-8.
- 1950 - Australian Tertiary Microfaunas and their relationships to assemblages elsewhere in the Indo-Pacific region. J. Paleont. 24(4), 421-429.
- 1950 - Some Tertiary Pelecypods from the Lakes Entrance Oil Shaft, Gippsland, Victoria. Proc. roy. Soc. Vict. 60, n.s., 149-156.
- 1951 - Notes on Microfossils. Appendix I, in Sullivan and Opik. Aust. Bur. Min. Resour. Bull. 8, 23.
- 1952 - Discussion - Foraminiferal Zone in the Tertiary of Australia by M.F. Glaessner. Geol. Mag. 89, 225-228.
- 1952 - Two new species of Lepidocyclina from Cape Range, Northwestern Australia. Contr. Cushman Fdn. 3(1), 28-32.
- 1952 - Occurrence of Hantkenina at Torquay, Australia, and age of the "Janjukian" and Anglesean Stages. Contr. Cushman Fdn. 3, (3,4), 144.
- 1953 - Lower Cretaceous Foraminifera from the Great Artesian Basin, Australia. Ibid. 4(1), 26-36.
- 1953 - The Cape Range Structure, Western Australia. Part II. Micropalaeontology. Aust. Bur. Min. Resour. Bull. 21, 43-75.
- 1954 - The Nelson Bore, South-western Victoria, Micropalaeontology and Stratigraphical Succession. Ibid. Rept. 11.
- 1954 - Stratigraphy and Micropalaeontology of the Tertiary rocks between Adelaide and Aldinga. Ibid. Rept. 12.

PublicationsIrene Crespin (Cont.)

- 1955 - A Bibliography of Australian Foraminifera. Micropaleontology, 1(2), 173-188.
- 1955 - Distribution of Lower Cretaceous Foraminifera in bores in the Great Artesian Basin, Northern New South Wales. J. roy. Soc. N.S.W. 89, 78-84.
- 1956 - Fossiliferous rocks from the Nullabor Plains. Aust. Bur. Min. Resour. Rept. 25, 29-42.
- 1956 - Changes in ideas of age of certain Beds in the Australian Tertiaries. Ibid. Rep. 25, 17-25. Also in Nat. Research Council of the Philippines, 1956, 515-522.
- 1956 - Report on samples from Rennell and Bellona Atolls, Solomon Islands. Aust. Bur. Min. Resour. Record 1956/50. Also see White and Warin. Ibid. Bull. 69, 1964.
- 1956 - Report on rock samples from Rennell and Bellona Islands, Ibid. Record 1956/92. Also see White and Warin, Ibid. Bull. 69,
- 1956 - Migration of Foraminifera in Tertiary Times in Australia. Ibid. Report 25, 1-15.
- 1956 - Notes on a Lepidocyclina-bearing rock from Cebu, Philippines. Ibid. Report. 25, 43-46.
- 1956 - Micropalaeontological Investigations in the Bureau of Mineral Resources, Geology and Geophysics, 1927-1952. Ibid. Report 20.
- 1956 - Microfossils from Bore B.M.R.1, St. Heliers. Appendix III in Reynolds. Ibid. Report 28, 24-26.
- 1956 - Microfossils from bore and surface samples from the Muswellbrook area, N.S.W. Appendix IV, in Reynolds. Ibid. Rept. 28, 27-35.
- 1956 - Microfossils from the South west part of the Canning Basin. Appendix C in Traves, Casey and Wells. Ibid. Rept. 29, 54-55.
- 1958 - Microfossils. In Grover, the discovery of Phosphate rock on Bellona Island. Mem. geol. Surv. Brit. Solomon Is. 2, 120-124.
- 1958 - Report on samples from Freney-Kimberley Nerrima No.1 Bore and on scattered outcrop samples. Appendix III, in D.J. Guppy and others. Aust. Bur. Min. Resour. Bull. 36, 108-114.
- 1958 - The occurrence of Hantkenina in Western Australia. Micropalaeontology 4(3), 317-319.
- 1958 - Foraminifera from rock samples from the Fiji Islands. Aust. Bur. Min. Resour. Record 1958/31. (See Ann. Rept. for year 1958. Geol. Surv. Fiji).
- 1958 - Permian Foraminifera of Australia. Aust. Bur. Min. Resour. Bull 48.

PublicationsIrene Crespin (Cont.)

- 1959 - Microfossils in Australian and New Guinea Stratigraphy
J. roy. Soc. N.S.W. 92, 133-147.
- 1960 - Some Recent Foraminifera from Vestfold Hills Antarctica.
Sci. Rept. Tohoku Univ. ser 2. (Geology). Spec. Publ. 4,
(Hanzawa Mem. Vol.). 19-31.
- 1960 - Preliminary Note on Micropalaeontology. In HBR No.1 Bore,
Wreck Island, Queensland. Pet. Search Subsidy Acts. Publ. 4, 12.
- 1960 - Catalogue of Type and Figured Specimens in the Commonwealth
Palaeontological Collection, Canberra. Aust. Bur. Min. Resour.
Rept. 54.
- 1960 - Radiolaria in the Lower Cretaceous Rocks of Australia.
Proc. 21st. Intern. geol. Cong. Copenhagen 6, 27-34.
- 1961 - Micropalaeontology. Karumba A.A.O., No.8 Bore, Northern
Queensland. Pet. Search Subsidy Acts Publ. 3, 18-24.
- 1961 - Upper Devonian Foraminifera from Western Australia.
Paleontology 3(4), 397-409.
- 1961 - Foraminifera from Samphire Marsh No.1 Bore, Canning Basin.
Bur. Min. Resour. Pet. Search Subsidy Acts Publ. 5. Appendix D.
18-21.
- 1962 - Foraminifera in Cores Nos. 1, 2, and 3, from Meda No.2 Well,
Western Australia (WAPET). Ibid. Publ. 7, 25-26. Appendix A.
- 1962 - Lower Cretaceous Foraminifera from Buckabie No.1 Well.
Ibid. Publ. 41, 33-43. Appendix 6.
- 1962 - Lacazinella, a new genus of trematophore foraminifera.
Micropaleontology. 8(3), 337-342.
- 1963 - Lower Cretaceous Arenaceous Foraminifera of Australia.
Aust. Bur. Min. Resour. Bull. 66.
- 1963 - Micropalaeontology of the Maretimo Member, Whaler's Bluff
Formation, Portland, Victoria. Geol. Surv. Vict. Mem. 22
Appendix 2, 145-152.
- 1964 - Foraminifera in Cabawin No.1 Well, in U-K-A, Cabawin No.1.
Queensland. Petrol Search Subsidy Acts. Publ. 43, 39-49.
- 1964 - Catalogue of fossil types and figured specimens in Tasmania.
Aust. Bur. Min. Resour. Rept. 69.
- 1964 - Catalogue of fossil types and figured specimens in Western
Australia. Ibid. Rept. 71.
- 1966 - Additional Bibliography of foraminifera from Australia and
adjacent Indo-Pacific Islands. Acad. Sci. U.S.S.R. of
Micropalaeontology. 10, 29-38.

PublicationsIrene Crespin (Cont.)

- 1967 - Recollections on growth of Commonwealth Interest in Geological Sciences. Aust. Bur. Min. Resour. Rec. 1967/157.
- 1971 - Catalogue of additional type and figured specimens of Protista (Foraminifera Radiolaria and Tintinnina) in the Commonwealth Palaeontological Collection, Canberra. Ibid. Rept. 148.
- 1972 - Catalogue of additional type and figured specimens other than Protista in the Commonwealth Palaeontological Collection. Ibid. Rept. 160.
- 1972 - Recollections on the growth of Commonwealth Interest in the Geological Sciences. Rec. Aust. Acad. Science. 2(2), 1-21.

PUBLICATIONS IN COLLABORATIONI. Crespin & D.J. Belford

- 1957 - New Genera and species of Foraminifera from the Lower Permian of Western Australia. Contr. Cush. Fdn. 8(2), 73-76.

I. Crespin & F. Chapman

- 1927 - Range in time and distribution of the Australian Tertiary Brachiopods. In, J. Allan Thomson, Brachiopod Morphology and Genera (Recent and Tertiary). N.Z. Board of Sci. and Art Manual 7, 298-302.

I. Crespin & W.J. Parr.

- 1941 - Arenaceous Foraminifera from the Permian Rocks of New South Wales. J. & Proc. roy. Soc. N.S.W. 74, 300-311.

I. Crespin & G.A.V. Stanley

- 1966 - Palaeontological Investigations, Papua and New Guinea. A Revision of the list in B.M.R. Rept. 20, with additions to the end of 1965. Aust. Bur. Min. Resour. Record 1966/186.

I. Crespin & B.C. Cotton

- 1952 - The Stratigraphy and Palaeontology of the subsurface deposits of the Adelaide Plains. Appendix III in Miles, Geology and Underground Water Resources of the Adelaide area. Geol. Surv. S. Aust. Bull. 27, 227-249.

Publications in collaboration (Cont.)F. Chapman & I. Crespin

- 1923 - The Australian Rhynchonellacea of the "Nigricans Series" with a special description of the new genus Tegulorhynchia. Proc. roy. Soc. Vict. 35 (n.s.) (2), 170-193.
- 1926 - Preliminary Notes on the Fauna and age of the Plantagenet Beds of Western Australia. A.A.A.S. Rept. (Adelaide Meeting), 17, 319-322.
- 1928 - Description of New or Rare Species, In the Sorrento Bore, Mornington Peninsula. Rec. geol. Surv. Vict. 5(1), 87-195.
- 1930 - Rare Foraminifera from deep borings in the Victorian Tertiaries. Part II. Ibid. 43(1), n.s. 96-100.
- 1932 - Rare Foraminifera from deep borings. Part III. Ibid. 44(1), n.s. 92-99.
- 1932 - The Tertiary Geology of East Gippsland, Victoria, as shown in borings and quarry sections. Dept. of Home Affairs. Aust. Bur. Min. Resour. Bull. 1.
- 1933 - New and rare species of Mollusca from borings in Victoria. Proc. roy. Soc. Vict. 46(1), n.s. 92-99.
- 1934 - The Palaeontology of the Plantagenet Beds of Western Australia. J. roy. Soc. W. Aust. 20, 103-136.
- 1935 - Foraminiferal Limestones of Eocene age from North-west Division, Western Australia. Proc. roy. Soc. Vict. 48(1) n.s. 55-62.
- 1935 - The sequence and age of the Tertiaries of Southern Australia. A.N.Z.A.A.S. (Melbourne Meeting). Rept. 117-126.

B.F. Glenister & I. Crespin

- 1959 - Upper Devonian Microfauna from the Fitzroy Basin, Western Australia. Aust. J. Sci. 21(7), 222-223.

A.K. Miller & I. Crespin

- 1939 - An Aturia from the Northwest Division of Western Australia. J. Pal. 13(1), 79-81.

L.C. Nonkes, A.A. Opik, & I. Crespin.

- 1952 - Bonaparte Gulf Basin, North Western Australia. 19th Inter. geol. Cong. Alger. Symposium on Gondwana Land. 91-106.

Publications in collaboration (Cont.)H.G. Raggatt & I. Crespin.

- 1940 - Discussion on possibilities of heavy minerals correlation of some Permian rocks, New South Wales, by Dorothy Carrol. Bull. Amer. Assoc. Petrol. Geol. 24(9), 1682-1683.
- 1941 - Geological Notes on Natural Gas and Oil Corporation's Bore at Balmain, City of Sydney, New South Wales. Aust. J. Sci. 4(3), 102-103.
- 1943 - Summary of Oil Drilling activities in Australia and New Guinea. Aust. Bur. Min. Resour. Rec. 1943/63 (unpubl.).
- 1952 - Preliminary note on geology of Tertiary rocks between Torquay and Eastern View, Victoria. Aust. J. Sci. 14(5), 143-147.
- 1955 - Stratigraphy of Tertiary rocks between Torquay and Eastern View, Victoria, Proc. roy. Soc. Vict. 67(1), n.s. 75-142.