

ARMIN ALEKSANDER ÖPIK (1898–1983)

Biographical synopsis

Armin Aleksander Öpik was born at Lontova, in the Province of Viru, Estonia, on 24 June 1898, into a family prominent in politics and public service.

He graduated from the Nicolai Gymnasium (semi-classical high school) as laureat with gold medal in 1917. From 1922 to 1926, he studied geology and mineralogy in the Faculty of Mathematics and Natural History in the Estonian State University at Tartu. After obtaining the degree of Magister Mineralogiae (1926), he was appointed as Reader in Geology and Mineralogy (1926–1930), and went on to obtain his Doctor Philosophiae Naturalis (1928) and Privat Docent, which gave him the right to be responsible for academic teaching in 1929. He was then appointed Professor of Geology and Palaeontology and Director of the Geological Institute and Museum, which positions he held until the Russian occupation of 1944. Concurrently, Öpik was a member of the Geological Committee, a body set up by law to advise the Estonian Department of Mines on all aspects of economic geology, including the organisation and supervision of field activities in engineering geology and the search for minerals, oil, and water. This position he held from 1932 until the German occupation in 1941. During these years, he was also the Editor of the journal *Eesti Loodus* and President of the Naturalists' Society, University of Tartu.



About 1939

this period was one of great productivity, yielding a flow of papers and monographs on a wide range of predominantly Early Palaeozoic fossil groups: algae, brachiopods (both articulate and inarticulate), bryozoans, conodonts, crinoids, graptolites, ichnofossils, molluscs, ostracodes, poriferans, and, particularly, trilobites. This was the time that saw Öpik pioneer conodont studies in Europe, explore the functional morphology of trilobites, and produce such enduring standard references as 'Brachiopoda Protremata der estlandischen Ordovizischen Kukuruse Stufe' (1930), 'Über die Plectellinen' (1932), 'Über Plectamboniten' (1933), 'Über Klitamboniten' (1934), and 'Trilobiten aus Estland' (1937), and, in the economic field, 'Der Estlandische Obolenphosphorit' (1929). The palaeontological works are monographs of great stature and quality. A three-volume textbook on the Geology of Estonia was completed in 1941, but, unfortunately, was never published.

In 1944, Öpik left Estonia, and between 1945 and 1948 lived in displaced persons' camps in Germany, first at Neustadt, north of Lubeck. Subsequently, we find him assisting his brother E.J. Öpik in organising a university for camp youths at Pinneberg, near Hamburg, where he was instrumental in teaching geology. We also find him working with Professor Serge von Bubnoff, Geotektonisches Institut der Deutschen Akademie der Wissenschaften, Berlin, in compiling a regional geology of Europe (published under the title 'Fennosarmatia' in 1952).

In April 1948, at the age of 50, Öpik arrived with his family in Melbourne. This event was largely due to the efforts of Professor Curt Teichert, who having known Öpik since 1926, had alerted Sir Harold Raggatt, then Director of BMR, to Öpik's situation in Germany. From the time of their arrival and confirmation of Öpik's appointment by the Public Service Board, the family lived in yet another camp, at Bonegilla, near Albury, and, subsequently, with the Teichert's in Melbourne. During that time, however, Öpik's first major Australian work, a monograph on the Llandoveryan (Early Silurian) fauna at



1922

During the period 1925–1944, Öpik devoted his considerable energies to the geology of Estonia and neighbouring regions, publishing 75 scientific papers, in Estonian, German, or Czech, on all aspects of Estonian regional geology, particularly Cambrian stratigraphy and sedimentology; the glacial history of the Baltic region; economic geology, including studies of phosphate, refractory clays, oil shale, and gravel resources; geophysics, including magnetics; continental drift; and palaeontology. The last was his favourite discipline, and for it

Heathcote, Victoria, was commenced and completed two years later. On his transfer to Canberra in March 1949, he began studies on the Ordovician–Devonian stratigraphy of the Australian Capital Territory, simultaneously with other Bureau work and largely in his own time. These studies, published between 1954 and 1958, materially aided engineering geology in the rapidly developing ACT, and enhanced his involvement with the local geological community.

Australians, however, mostly know of Öpik for his work on the Cambrian and Early Ordovician stratigraphy and palaeontology of northern Australia. This work, developed concurrently with his Silurian studies, was initiated only three months after his arrival in Australia with the opportunity to visit the Tennant Creek and Barkly Tableland areas of the Northern Territory, as part of a joint BMR–CSIRO land-use survey. Subsequently, following his duty statement, which had him ‘carrying out specialist investigations in palaeontology for the Bureau, chiefly in connection with our oil field mapping programme’ his work took him to the Jervois area, east of Alice Springs (1949), the Tennant Creek–Mount Isa region (1949), and the Kimberley district of Western Australia (1950), where he was the first to recognise rocks of Ordovician age. Association with later BMR mapping teams led to visits to the Cambrian terrains of central Australia, particularly the Camooweal, Mount Isa, Urandangi, and Duchess areas, during which he was able to amass the palaeontological collections on which he published until the end.

Between 1952 and 1982, Öpik published 27 contributions to Cambrian stratigraphy and palaeontology, including 12 monographs. Some 294 new specific taxa of Cambrian trilobites alone were described, accounting for 54 per cent of all Cambrian trilobites named up to that time from Australia. He achieved this despite the enormous loss, through fire in 1953, of the bulk of his collected material. Following from the work of Westergard and Whitehouse, Öpik’s studies on Cambrian agnostid trilobites brought prominence to this hitherto much neglected group of fossils. Through diligent observation, he pioneered the study of the functional anatomy of Cambrian trilobites, creating in the process a completely new vocabulary, and giving an innovative professional style to the systematic description of these organisms.

Öpik’s extensive labours won him international recognition early in his career at Tartu. He was a Correspondent of the Geological Society of Finland (1926), Overseas Correspondent of the Paleontological Society of America (1928), and Foreign Member of the Geological Society of London (1938). In 1937, he was a member of the Danish Expedition to northeast Greenland, under L. Koch. As a result of his work on the Cambrian of Australia and trilobites in general, Öpik was awarded the 6th Charles Doolittle Walcott Medal by the U.S. National Academy of Science (1962).

At home, Öpik was elected inaugural President of the Commonwealth and Territories Division of the Geological Society of Australia in 1952. He was admitted to membership of the Australian Academy of Science in 1962, and in 1966 was honoured with the Award of Merit of the Professional Officers’ Association. He also represented Australia as a Voting Member of the International Union of Geological Sciences, Commission on Stratigraphy, Subcommittee on Cambrian Stratigraphy from 1956 until 1982.

The scientific heritage that influenced Öpik undoubtedly stemmed from the great natural historians of the past, who were able to combine their instinct for the exploration of new scientific fields with a capacity for painstaking analysis of



1966

facts. When comparisons are made in years hence, it is probable that Öpik’s research will be seen in a similar light to that of personalities like Alexander von Humboldt or Joachim Barrande.

The basic fact finding and recording were overlain by history, and a shifting philosophy pervades Öpik’s work from the beginning. However, Öpik’s approach differed from that of earlier workers in one very important respect. He extended the basic Scandinavian palaeontological lineage, stretching from Carl von Linne, through Dalman, Angelin, Linnarsson, Brogger, and Tullberg, among others, to a multidisciplinary approach. Hence, we see stratigraphy, biostratigraphy, sedimentology, functional morphology and economic geology all integrated during Öpik’s working life prior to 1948. And this vast scientific platform, unusual in the early decades of the 20th century, was brought to Australia, for our mutual benefit.

Öpik was also a man of exceptional accomplishments in diverse disciplines. Few know of his linguistic abilities (fluency in Estonian, German, Russian, English, and French), of his poetry (first published in 1919), chess playing, studies of the ancient world, philology – readily evident in his taxonomic nomenclature, or philosophy. Most of us knew him as a natural scientist.

In the opening paragraph of the Preface the word charisma is used intentionally and in its literal sense. The definition has come to summarise extraordinary powers, and ‘personal magic of leadership arousing special popular loyalty or enthusiasm’ (Websters, 1979 Edition). However, the original Greek etymology refers to favour and gift, and, certainly, these were imparted by Öpik to those, scientist or not, who were appreciative of his qualities. To them, the true gift of friendship was offered.

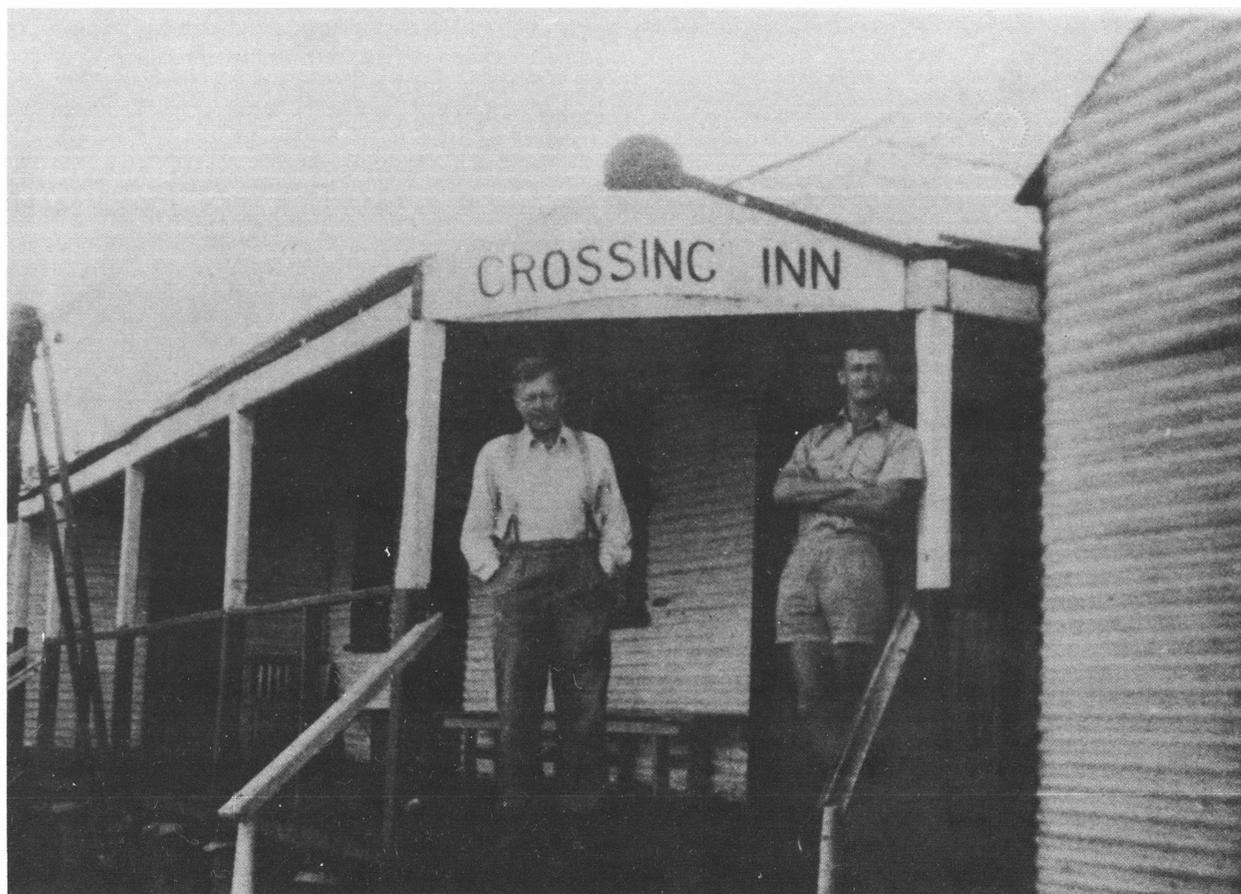
The Australian context

'I am a bit old - 49 years - but healthy' wrote A.A. Öpik from a Displaced Persons Camp (DPAC 1227, Neustadt, Germany) to Dr Curt Teichert (then Senior Lecturer in Geology at the University of Melbourne) on 8 June 1947. He continued 'I believe that I may be useful as a palaeontologist and geologist in Australia and would be glad to work there . . . At the moment we (his wife, one daughter and son) can expect to go to England as unskilled workers'.

Teichert, who had known Öpik since 1926, contacted Dr H.G. Raggatt, the then Director of the Bureau of Mineral Resources, and catalysed the event that was to put Australian palaeontology in the vanguard of international research - the recruitment of an internationally acclaimed scientist, who, until the Russian occupation of 1944, was the Professor of Geology & Palaeontology at the University of Tartu, Estonia.

As soon as it was known that Öpik was interested in working in Australia, Raggatt wrote to the then Ministry of Post-War Reconstruction on 2nd September 1947 (and they to the Department of Immigration) to have Öpik interviewed and brought to Australia, referring as he did to the 'small band of palaeontologists in this country and nearly all attached to university staff . . . and who have shown no disposition to apply for appointment in this Bureau. I think, therefore that if experienced personnel can be recruited from abroad our own work will be advanced and real contribution will be made to a field of research in which there is a very limited number of workers in Australia.' The considerable advance in Australian geoscience which accrued is justification for Raggatt's high hopes.

The report of the interview carried out in the DPA Camp of a 'well-built, athletic, quiet man, who does not look his age . . . leader, strong personality . . . impression of 'bulldog' characteristics both physically and mentally . . . could be a staunch friend and indefatigable worker very suited to this field' summed up the man who was shortly to come to Australia. After a fairly rapid (for the bureaucracy) correspondence and action by the immigration people, Professor Öpik arrived in Melbourne with his family on the 24th April 1948. It was noted even before he arrived that there had been 'no discussion concerning salary . . . suggested as Geologist Grade 2: £ 558-630 minimum of the range'. This was typical of the gentlemen who never concerned himself with material goods and money: the discovery of new knowledge and the advancement of science were the important things to him. However, he was not free of bureaucracy, and even the well-meaning Dr Raggatt was asked to 'report upon the negotiations and nature and extent of any obligations . . . entered into with Professor Öpik . . . as arrangements . . . have been made without the authority of the Minister (of Post-War Reconstruction)'. So a definite commencement date was not immediately available until the Public Service Board had agreed. Approval was finally given for Öpik to start work in Melbourne, where he took up duty on the 21st of June 1948, 'on an exempt basis with a salary of £ 558 (£ 640 actual) per annum subject to Professor Öpik's engagement being in an approved position . . . which the Department is unable to fill . . . through lack of suitably qualified personnel, and providing his engagement will not be continued in the position should a qualified permanent officer become available or the services become available of a person with suitable qualifications who is a natural born or naturalised British subject and is available for a temporary employment'. It



With Jack Cuthbert at Fitzroy Crossing Inn, 1949.

seems unbelievable in hindsight, but this was government procedure, and in those days, permanency of office was zealously guarded.

Typical of his determination, whilst at the Training and Reception Centre at Bonegilla, to which he had been sent, Öpik busied himself with the geology of the Bonegilla, Victoria district, by mapping and making fossil collections that led to one of his early papers on Australian geology. One of Öpik's earliest letters to Dr Raggatt, dated 16 May 1948, bears out his dedication to geological knowledge, in spite of the difficulties of settling his family in a strange country. Part of the handwritten letter follows:

Mean while the director of the School
Mr. Pittman took me twice to a geological
trip by car in the neighbourhood of the
Hume Weir, some geological exposures I met
on my walks and so I got a look over some
of the granites and schists of this country.

Although it is a very pleasant place here
I am feeling the call of my duties and so
I am now at the full disposal of
Yours.

With kind regards I am
Yours sincerely
A. Öpik

Sunday, 16th May
1948.

Following its foundation in 1946, the Bureau of Mineral Resources became identified with the introduction of new field survey techniques and methods in the development of systematic geological and geophysical knowledge in Australia. Two techniques particularly stimulated field accuracy and coverage: one, the availability of systematic aerial photography and base maps; and the other, the change in available transport, with aircraft and 4-wheel-drive vehicles enabling difficult and outback areas to be properly surveyed. These points are overlooked today, when it is taken for granted that up-to-date photography and suitable transport are always available. What could have been more opportune than to have a person of Öpik's flair and ability join, in its infancy, this new force in geological mapping by BMR and the State geological surveys. His field work throughout Australia in the subsequent years and his publications give some insight into the enthusiasm and new discoveries that emanated from him. Not only was he instrumental in finding and interpreting key geological exposures, but he engendered a sense of enthusiasm among his colleagues and an instinct for finding the necessary fossil in apparently non-fossiliferous strata that opened the eyes of so many Australian field geologists.

Öpik travelled to the real outback on 23 August 1948 – 'next work will be the collection of Cambrian fossils (trilobites etc) in the Northern Territory and particularly in the district to the east of Tennant Creek' wrote P.B. Nye, then the Assistant Director of BMR; 'D.M. Traves, one of the ablest field geologists in BMR, will meet and conduct you'. Traves later described meeting the great man at Tennant Creek and taking him to Gum Ridge, east of the town. 'Late in the afternoon Öpik and I set out back along the Barkly Highway and well after dark arrived at the Ranken River where we made camp. I was unloading the vehicle so he asked in very broken English whether he could get firewood for the evening meal. About 10 minutes later he arrived back with a huge armful of green branches that he had broken off trees! We boiled the billy (after getting some dry wood) and threw out our swags under the stars and so he spent his first night in the Australian bush. The following day we went up the Ranken River towards Ranken Store and Öpik collected his first Cambrian fossils in Australia.'

This early traverse started Öpik's craving for geological field work in Northern Australia with its many tantalising problems and the opportunity to unravel the stratigraphy of such a large continent. He visited the Jervois Range, Mt Isa, and Cammowale areas in 1949, and it was on one of these trips with Dr Frank Joklik that he won a bet, the stake being beers: Joklik, who had heard of the prowess of Öpik in finding fossils, bet him he could not find trilobites in ridges considered to be of Precambrian quartzite west of Mt Isa. Öpik true to form, and knowing that there had been a cover of Cambrian strata spreading west from the Barkly Tableland, soon turned up some chert that contained magnificent faunas in valleys between the quartzites – the extension of the Beetle Creek locality. Joklik lost the bet and the locality has become known in the annals as the '3-Beers' locality, always a source of amusement for Öpik thereafter, as Joklik never bet on anything but certainties.

Doug Traves recounts a story of when they travelled across northern Australia when Öpik (who was not known as a very good bush driver) was able to take the wheel for half an hour to rest the driver – on the condition that he did not do more than 30 miles per hour. 'He would start off and become so intent on steering that his foot would get heavier and heavier. I could not attract his attention so I would just lean over and turn the key off when we were above 40 m.p.h. He would keep steering and push his foot down harder until finally the vehicle would stop. He would then take his hands off the steering wheel, turn around and say 'What is wrong?' I would again explain to him about the speed and then we would start off again. The above episode was repeated numerous times but what amazed me was that until the vehicle actually stopped he would not wake up to what had happened – his concentration on steering was so great.'

I was privileged to be in charge of a field party whose prime objective was to work out the stratigraphy of the Undilla basin (part of the Georgina) in 1953, but my real responsibility was to look after the 'old man'. This became an experience of a lifetime, as he was so knowledgeable about life in general, the birds and the vegetation, the stars and bush lore – much of which he had gained after only a few years in our country. He had a magical touch to find fossils where others could not, and his hammer, lens, rucksack and paper (for wrapping the precious finds) were always with him. We collected tens of 44-gallon drums of tenderly wrapped fossils during this season, and the numerous crushed fingers were almost a joy to bear in seeing Öpik explode with pleasure on the sight of the new faunas we were turning up. In trying to explain to him that my job was to give him as much 'scientific freedom' as was possible in field conditions (that is, I would look after all the



At Morstone Station, Queensland, with manager and his wife and staff, and John Casey, 1953.



With Joyce Gilbert-Tomlinson, sifting through ashes of fire in BMR building, 1953.

logistics and camp organisation), I was not aware until later, the real meaning of 'freedom' for one who had had his career and work curtailed in his country of birth.

Apart from his many scientific achievements, he became a friend and philosopher to many of the local sheep and cattle property owners, who were enthralled with his tales of the sea (his father was a harbour master) and his general love and observations of nature; his ability at chess became as widely known as was his ability in fossil collecting, and many an evening was enlivened by the master taking on the rest of the camp. He was also known as a proficient fisherman who could land a yellow-belly (perch) in the streams flowing to Lake Eyre or a barramundi in the coastal flowing streams. Öpik was also admired by the children of the outback properties, not only for his physical size but also for his ability to tell tales, and make drawings, and for his uncanny knack with a pair of scissors in folding and cutting paper to make rows of dolls and other fascinating arrays of objects.

Öpik's extensive studies on the Cambrian of Australia were disastrously interrupted by a fire in April 1953 in the BMR office, which destroyed many of his priceless collections and manuscripts. However, his dedication and tenacity enabled him to gather the pieces from the ashes, recollect, and build again the major works arising from the study, which he presented at the 20th International Geological Congress in Mexico in 1956 in 3 major papers, which included the Cambrian palaeogeography in Australia.

Many Australian scientists identified him with stratigraphy and palaeontology: how naive we were! Many of us did not realise he had a thorough grounding in geoscience, based on his earlier experiences as economic geology adviser to the Estonian government, in fields of engineering geology, refractory minerals, and phosphate surveys, and in the search for petroleum and groundwater, and had also completed some original research in geophysics.

A characteristic of the man in his search for geoscientific truth was that he was never happy in any area unless he was satisfied with the surrounding geology. This was so in the displaced persons camp in Victoria, when, at the age of 50 and handicapped by little knowledge of English, he worked out the geology and presented a paper on Lower Silurian faunas that had a major impact on studies of the Lower Palaeozoic of Australia, all within the space of a mere 12 months. This was to be his characteristic role when he arrived in Canberra. The geology of our 'backyard' is often the last to be addressed; but not so with Öpik. This was his 'weekend' objective, and within years he had parts of the complex geology, structure, and stratigraphy of the Tasman Fold Belt 'tamed' and documented with innumerable fossil localities. He also revealed the practical significance of the local geology for construction materials and potential engineering geology hazards, which played an important part in the planning for the extensive development of the Nation's Capital – a population of 12 000 when Öpik started walking the hills, increasing to nearly a quarter of a million when his career ended.

His scientific studies come alive in his publications. In Australia he is probably most identified with the Cambrian and Ordovician: from the important ramifications of the first Ordovician rocks to be found in the Fitzroy Basin of the Kimberleys in 1949, which opened up the Canning Basin to further petroleum exploration in the 1950s, and the many new Cambrian and Ordovician discoveries in the Amadeus and Georgina Basins, which enabled correlation and environmental interpretation of rocks throughout Australia. His award of

the Charles Doolittle Walcott Medal in 1962 for his contribution to Cambrian geology and palaeontology was a tribute to this research and its application in the search for hydrocarbons. His stratigraphic studies in the Georgina Basin paved the way for the successful search and discovery of phosphate in this province in later years.

Öpik's mammoth task of documenting the Cambrian collections extended well past his 65th birthday, the compulsory retiring age in the Public Service. Because of his exceptional ability and involvement, this was extended for one year and then a further six months; and, subsequently, special contract arrangements were made with him to complete the task. His ability and philosophy, his teaching and his advice, his kind and sympathetic code of living became a goal for all young scientists to emulate. His Australian colleagues, as well as the wide variety of people he met in the bush, will always have strong memories for one of Australia's greatest natural scientists.

J.N. Casey

Personal reminiscences

Father was born in 1898, in Lontova (now Kunda), Estonia, where his father was the harbour master. He was the youngest of eight children. As a child, he was considered backward: because of a speech impediment, he could not make himself understood, and was mocked constantly by others and spanked by his father. Awareness of this speech defect tortured him all his life.

His mother did not let him attend school before his second high school year. She, his elder brothers, and his eldest sister Anna (who was later fluent in 14 languages, including Sanskrit) taught him at home. Later, at school, he was an outstanding scholar and sportsman, being inter-schools champion in athletics and wrestling. He finished school with a gold medal (*cum laude*), but gave this to his mother to buy food. It was during World War I, and food was very scarce and only obtainable for such valuables.

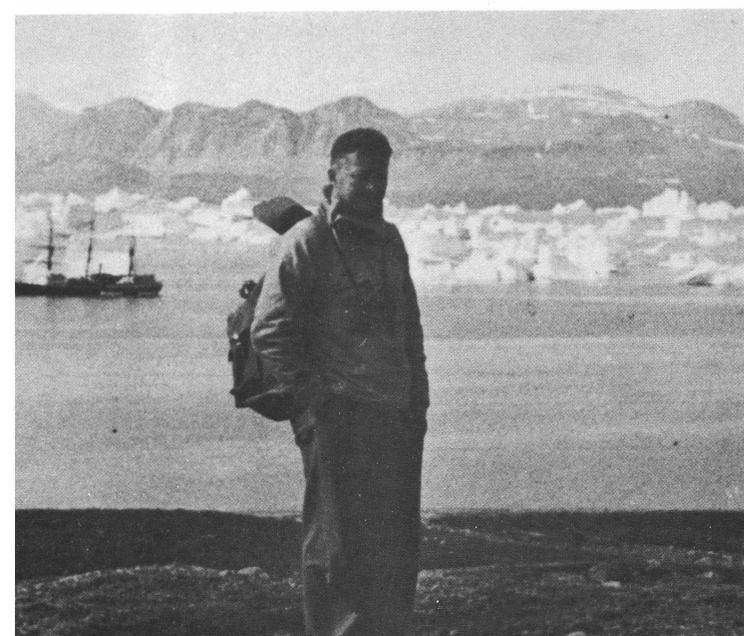
After graduation, father enrolled at Moscow University, and was soon enlisted as an artillery cadet. During the war, he met and married my mother, and, at the end of the war, when Estonia gained her independence, they returned to Tallinn. Lack of money at that time forced him to work as a school teacher and sports instructor. However, when life in Estonia stabilised, he was able to go to Tartu University and resume his studies.

As youngsters, the Öpik boys were all great nature lovers and, whenever weather permitted, they spent their free time roaming the countryside, discovering and enjoying nature. It was during these times that father's eldest brother, Paul, introduced him to fossils, and, in later years, when he went on his summer collecting trips, his father and brothers would often accompany him, help to ship the collections to Tartu, and, in winter, come and admire the classified specimens.

My two sisters and I were born while father was studying at Tartu University. Mother was a great support to him throughout this time, and we often spent whole evenings at the Institute with him. He liked to read his papers to her and show her his trilobites. Often, they would sit at the microscopes, totally engrossed and forgetting that we were sitting, impatient to go home.



Top left. About 1927
Bottom left. Greenland, 1937
Top right. On holiday with family
(rucksack and fishing gear)
Centre right. Museum director, about 1934
Bottom right. Field excursion, 1932



*Top left. Chess with father
Centre left. Tartu University, about 1934
Bottom left. Greenland, 1937
Top right. 1926
Bottom right. About 1934*

After father obtained his degree, he continued at the University, first as a lecturer and subsequently as professor. He was much loved by his students and co-workers, above all for his fairness. One of his former students told me that in her final year her father died and her mother became ill and needed looking after. Because of this she could not study, but father allowed her to graduate on the strength of her previous achievements and to sit the proper exam later in the autumn.

Mother took an active interest in father's work. There was hardly a field trip or special lecture she did not attend. We children were also encouraged to spend our weekends and free time at the Institute, where the museum and laboratory were available for our 'enlightenment' by father's assistant Vladimir Paul (who also subsequently worked for BMR).

As children, we heard father's most fantastic seamen's yarns, and he had never-ending resources, thinking out new games and entertainment to keep us busy. His speciality was to cut out all kinds of fantastic imaginary animals and fierce-looking people for us to colour in and play with. I remember him clearly from the time I was 2 years old, babysitting us three girls, while mother was at the movies or visiting, and writing his Ph.D., one foot rocking Yuta's (my youngest sister) cradle, right hand writing, and the left making the cardboard animals and people move around.

During the summers, father would walk across Estonia in his quest for geology, sail with his father and brothers on the Baltic Sea, and spend only about 3 to 4 weeks with us at our holiday place. When he was with us, we all went on day-long expeditions, either on foot or by boat. Wherever we went, he always carried his rucksack, hammer, newspapers, little calico bags, and his fishing gear. Arriving at our destination, we children roamed the woods, fields, and riverside, while he and mother were engrossed in collecting 'stones'.

Spending his childhood and youth living at Kunda and Tallinn Harbour made him an ardent seafarer, a poet romantic, fatalist and pacifist (from his diary). He always believed in fate – what had to be, had to be, was his saying.

Nearness to nature inspired father enormously in writing poetry. I think he wrote poems about every place he ever visited and also about his main experiences and emotions. He wrote in 4 languages, and his poems were published in Estonia, Canada, and Ireland. (My Uncle Ernst, besides being a scientist – the Astronomer Royal at Armagh, Ireland – is also a composer and has composed music for father's lyrics).

My parents were never interested in money or other worldly goods. All their surplus money was used in helping other people. They gave many yearly scholarships for deserving high school and university students, dressed and fed families who were in distress, sent them in family units for summer holidays, and never talked about it.

Besides his many good characteristics, father had a terrible urge to hoard. Being very sentimental, he never threw out *any* letters received from family or friends, and kept little boxes, travelling tickets, his childhood scrapbooks, our little drawings and childish poems saved from waste-paper baskets, photos, and every other hoardable object. In his big travelling chest we found some of his school work. From this we learned that he had a cheeky sense of humour, which he expressed by drawing caricatures of his teachers and fellow students, and even himself. People who father disliked ceased to exist for him. He was very sure in all his beliefs and there was no power in the world (except my mother) that could change his mind.

Father was a night person. Early in the day he did not function very well, but woke up towards afternoon and was at his intellectual peak during the night. Most of his scientific work was done and written during the night. He usually went to bed between 2 and 3 a.m. I learnt really to know him during his Canberra years, sitting with him at night and talking. It did not matter what we talked about, all our discussions were interesting. He remembered everything he had ever seen, heard or read and gladly shared his knowledge, ideas, and philosophies. During those nights, he also read poetry (aloud), his own and other poets. He did not feel any need for close relationships with other human beings (except the family) as long as he could be part of the mystical vastness. All his feelings are expressed in his poems.

Meanwhile, I have found and read his diaries from 1927 (his study tour across Germany, Czechoslovakia, Norway, Sweden, and Finland), 1932 (Scandinavia), 1937 (Greenland expedition), and 1948 (emigrating to Australia). In all these he wrote of his yearning for wide open spaces, and of the incredible beauty of the ocean, tundras, and forbidding awe-inspiring landforms.

It was also very important for him to be the top man in palaeontology. In the name of palaeontology he would walk anywhere, so that nothing would be missed en route. The weather did not matter, nor the state of his health. Carrying his rucksack full of stones was often a torture because of bad arthritis in the spine. But only in his diaries, did he mention the agonies he suffered for the sake of knowledge.

N. Romot.

Geological publications

This bibliography includes all published references known to us at 30 September 1983, and also papers listed as Records of the Australian Bureau of Mineral Resources, Geology and Geophysics, Canberra.

Between 1925 and 1941 papers were published in four main sources: *Acta et Commentationes Universitatis Tartuensis (Dorpatensis)*, which commenced in 1921 and still exists; *Sitzungsberichte der Naturforscher-Gesellschaft bei der Universität Tartu (Proceedings of the Naturalists' Society of the University of Tartu)*, renamed from Volume 41, in 1934, *Tartu Ülikooli juures oleva Loodusuurijate Seltsi aruanded (Annals of the Naturalists Society, University of Tartu)*, and subsequently (1937) renamed in Russian *Protokoly obshchestva Estestvoispytatelei pri imperatorskom Yurevskom Universitete (Proceedings of the Naturalists Society, University of Tartu)*; and *Eesti Loodus (Estonian Nature)* which commenced in 1933 and still exists. Between 1924 and 1941, papers from the above journals were frequently republished in *Tartu Ülikooli Geoloogia Instituudi toimetused (Publications of the Geological Institute, University of Tartu)*, which appears to have had a much wider distribution than the other sources. Republishing, however, was not concurrent, and, in some cases, papers were republished up to three years after they first appeared.

I am indebted to Professor A. Röömusoks, University of Tartu, for the following publication dates of relevant issues of *Eesti Loodus*: 1933(1), February 1933; 1933(3), October, 1933; 1933(4), December 1933; 1934(1), February 1934; 1934(2), March 1934; 1934(5), December 1934; 1935(1), February 1935; 1935(3), May 1935; 1935(5), December 1935; 1936(2), April

1936; 1936(5), December 1936; 1937(2), March 1937; 1937(3), May 1937; 1937(5), December 1937; vol. 6(1-2), April 1938; vol. 7(4-5), March 1940.

I would also like to thank Mrs M. Eva, Librarian, Geology Library, University of Queensland, for her help in tracing publications, Dr M. Idnurm and Mr P. Õpik for assistance in translating from Estonian, and Mr A. Haupt, who collated a previous bibliography.

J.H. Shergold

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