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The Legacy Of the Iraq Petroleum Company in Oman

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Front cover: The abandoned derrick of Ghaba - 1, a towering landmark on the skyline of Al Wusta. This is the derrick that drilled Fahud - 1 and which was taken apart piece by piece and re-assembled at Ghaba. A similar derrick was left at Haima. Two of the most obvious symbols of IPC's legacy.

The Legacy
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in Oman

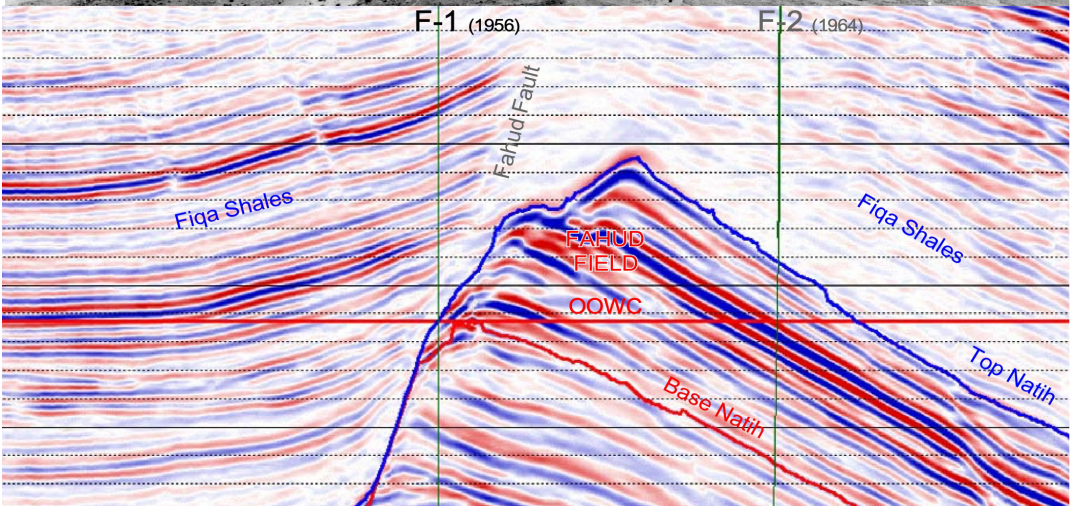
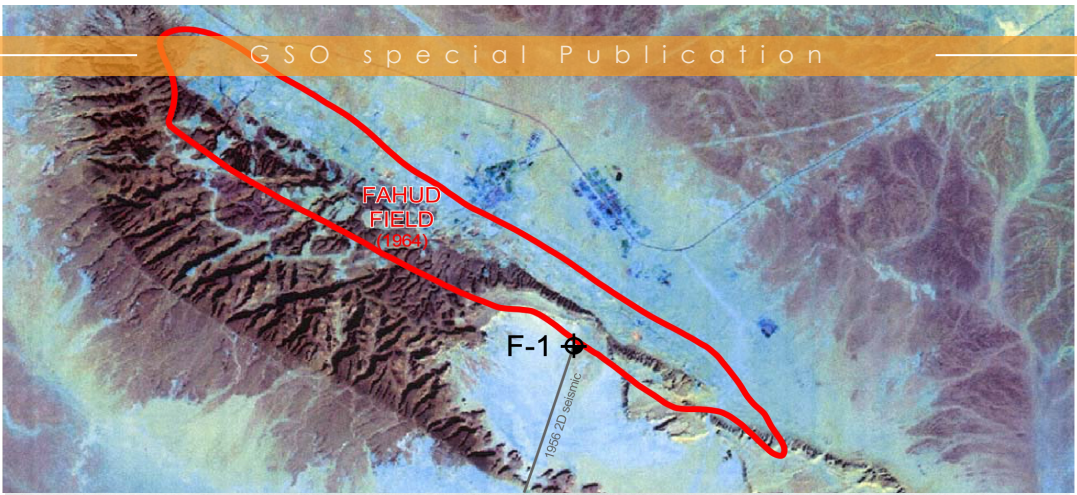
Alan
Heward

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The picture on the right ;

Top- A modern satellite image of Jabal Fahud with the outline of the oil field, the Fahud - 1 (F - 1) location and the 2D seismic line tying the Amairi survey to the well. Middle- F - 1 drilling, looking south towards the IPC camp and airstrip (PDO archive picture 1966). Base- Recent, SSW-NNE 3D seismic line showing the location of F - 1 drilled close to the original oil-water contact (OOWC) in the Natih Fm. F - 2 was the discovery well of the billion barrel Fahud field (*GSO Field Guide No.16, January 2006*).



■ The Legacy of the Iraq Petroleum Company in Oman

The Iraq Petroleum Company (IPC) was active in Oman from June 1937 to September 1960 and, despite an outward lack of success, laid many of the foundations for the discovery of oil and the peace and prosperity that has followed.

IPC, formerly the Turkish Petroleum Company, was established in 1912 to obtain oil concessions in Iraq. An exploration concession was granted in 1925 and the giant Kirkuk field discovered two years later. IPC was based in London and its purpose was to provide its oil-company shareholders with cheap oil. ¹ With the discovery of oil in Bahrain in 1932, IPC sought to obtain concessions in Arabia to be able to have some 'influence' over the market and price of oil. ² A subsidiary, Petroleum Concessions Ltd (PCL), was established to hold concessions outside of Iraq that fell within the bounds of the former Ottoman empire. Within this 'Red Line Agreement' area, the shareholders agreed to only act jointly together, not in competition.

■ Concessions in Arabia

Having rejected the prospects of oil in Bahrain and missed-out to smaller American companies in Saudi Arabia and the Kuwait-Saudi Neutral Zone, IPC was keen to obtain concessions elsewhere in Arabia. This they did, wherever they could, between 1935 and 1939. ³ An agreement was reached with H.M. Sultan Said in June 1937 and shortly afterwards the concessions for Muscat and Oman, and Dhofar, were transferred to PCL's subsidiary, Petroleum Development (Oman and Dhofar; Figs 1 & 2). There was little opportunity before WW2 for geologists to visit Oman or the Trucial States. IPC was keen to examine Jabals Faiyah and Hafit lying to the west of the mountains, but were frustrated by tribal rivalries and restrictions placed on their use of motor vehicles in Oman by the Sultan. A geological party visited Oman in 1938 and travelled by camel up the Batinah plain through Wadi Umar to Yankul,

¹ Shareholders (JV partners)- Anglo-Persian (BP) 23.75%, Royal Dutch Shell 23.75%, CFP (French Interest: Total) 23.75%, NEDC (American Interest, originally 6 companies, later 2: Jersey Standard: Exxon and Socony Vacuum: Mobil) 23.75%, Gulbenkian (Pandi, later Partex) 5%.

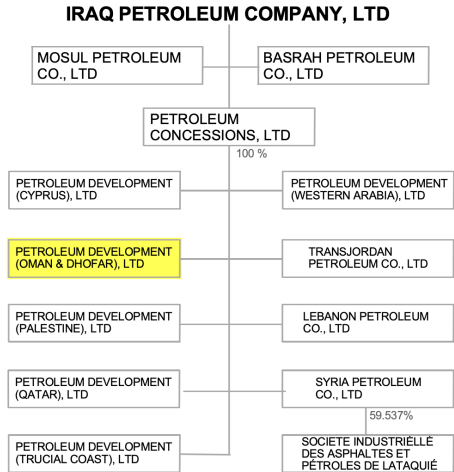
² Longrigg, S.H. 1968. *Oil in the Middle East- Its Discovery and Development*. 3rd Edition, Oxford Univ. Press, p. 113.

³ Qatar- 1935; Western Saudi Arabia- 1936; Dubai, Sharjah, Muscat and Oman, and Dhofar- 1937; Yemen, Ras Al Khaimah and Kalba- 1938; Abu Dhabi and Ajman- 1939.

A)



B)



C)

IPC's Oil Production from Iraq and Qatar

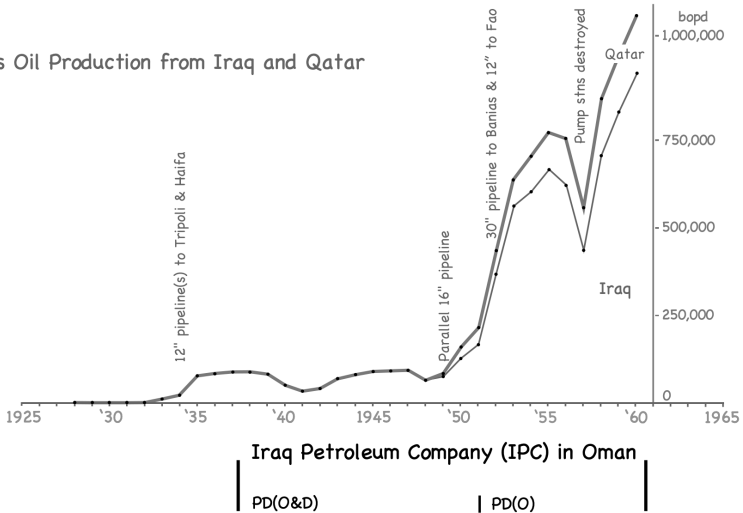


Fig. 1A) Sketch of IPC's Head Office in the 1950s, 214 Oxford Street, London W1 (*The Crescent, Oct. 1951, p. 17. Reproduced with permission of the BP Archive*). B) Organogram for the Iraq Petroleum Company. Petroleum Concessions Ltd held all the concessions for the operating subsidiaries outside of Iraq. C) IPC's oil production from Iraq and Qatar in the period when they were active exploring in Oman.

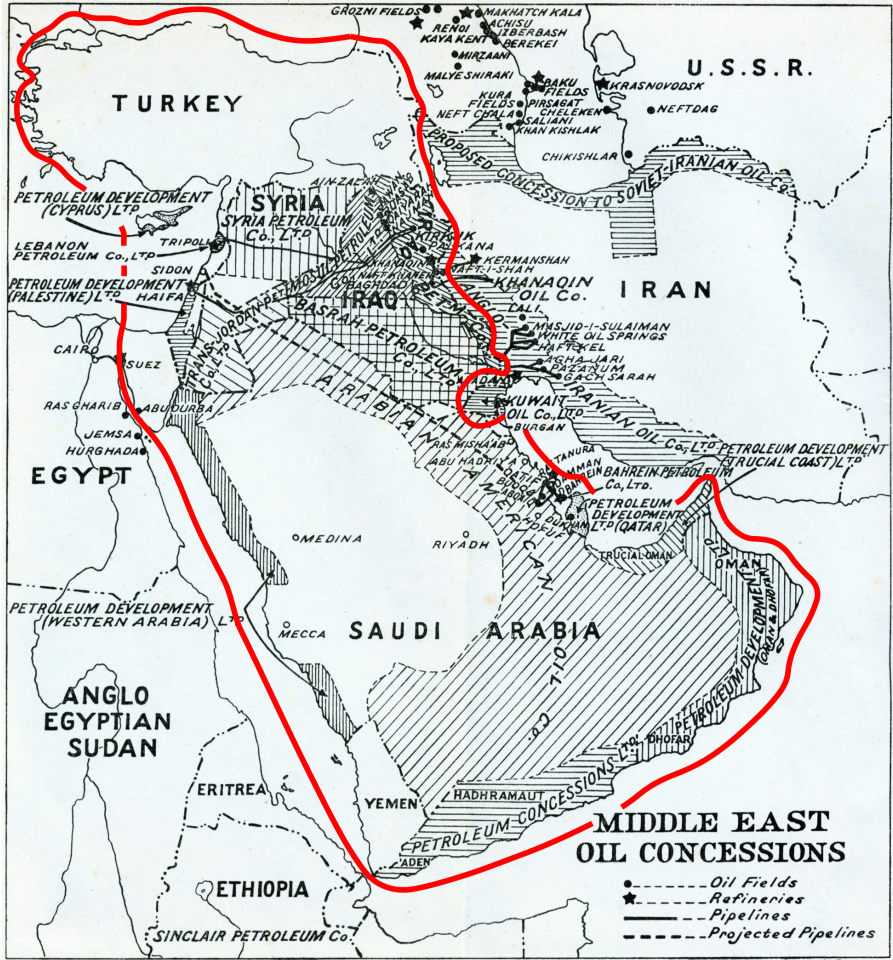


Fig. 2) Map of Middle East oil concessions in 1948 from the Iraq Petroleum Company Handbook, St. Clements Press, London. There were few agreed boundaries between countries in Arabia (they had not been necessary) or indeed defined limits of oil concessions. Hence, the inaccurate depiction of a rather slender PD(O&D) concession, and Musandam in the PD(TC) concession. The Red Line Agreement Area has been added, though the agreement was abrogated in November 1948 after Gulbenkian accepted various 'sweeteners' and assurances.

Dhank, and on to Hafit.⁴ There they met with another party that had driven through Abu Dhabi to Buraimi (Fig. 3). The Oman party journeyed back to Sohar via Wadi Jizzi. Both groups were disappointed by the amount of new geological information they could add to what G.M. Lees and K.W. Gray had described 13 years previously.⁵ Oil was discovered by IPC in Qatar in 1939.⁶ Dhukan was the favourite discovery of the company's chief geologist of the time, Norval Baker, who described it as '*a fine anticline in a remote and desolate place*'. He liked what he saw of Jabal Hafit too.

The initial exploration period of the Oman and Dhofar agreements expired during WW2, and when they were converted into full-fledged concessions the Sultan sought to encourage activity. But, after the war, there was a shortage of oilfield equipment, steel and US dollars in Europe and priority was given to areas where oil had already been discovered. IPC geologists were still interested in gaining access to the foothill folds of the Al Hajar, whereas H.M. Sultan Said was keenest for them to explore in Dhofar. The Sultan invited a former Director of the Geological Survey of India, Sir Cyril Fox, for a two-week oil and mineral resources audit of Dhofar in February 1947. Fox wrote encouraging words about the '*potentialities*' for oil and stressed the need for proper topographical maps and motor transport for any detailed survey. IPC did send a field party to Dhofar, a year later, as part of a wider survey of the Hadramaut-Mahra areas of Yemen. In Oman, they travelled in a 'caravan' of 76 camels more than 700 km, slowly, from Salalah to Shishr, along the rear of the Qara Mountains to Suneik, and then back to Murbat. The geologists observed a lack of suitable structures and seals in the Cretaceous and Tertiary outcrops they examined, and no oil seepages.⁷ The Dhofar concession was relinquished in 1951 and the company's name changed to Petroleum Development (Oman) Ltd (Fig. 3).

⁴ '*By the time the Oman party had reached Buraimi they had accumulated 150 men mounted on camels.*' Heard, D., 2011. From Pearls to Oil. How the oil industry came to the United Arab Emirates. Motivate, Dubai, p. 376.

⁵ G.M. Lees (Abu'l jabal): A Pioneering Geologist in Oman. Al Hajar 22nd Edition, August 2016, 15-27 .

⁶ In the Upper Jurassic Zekrit Fm (now known as the Arab C).

⁷ Wetzel, R. and Morton, D.M., 1947. Geological Expedition to Hadramaut-Mahra and Dhofar. Geological Report 198-199. Petroleum Concessions Ltd, Petroleum Development (Oman and Dhofar) Ltd. They found no trace of oil at the so-called Murbat seep, with its kerosene-like odour, and attributed it to a lost barrel of fuel which were frequently floated ashore there.

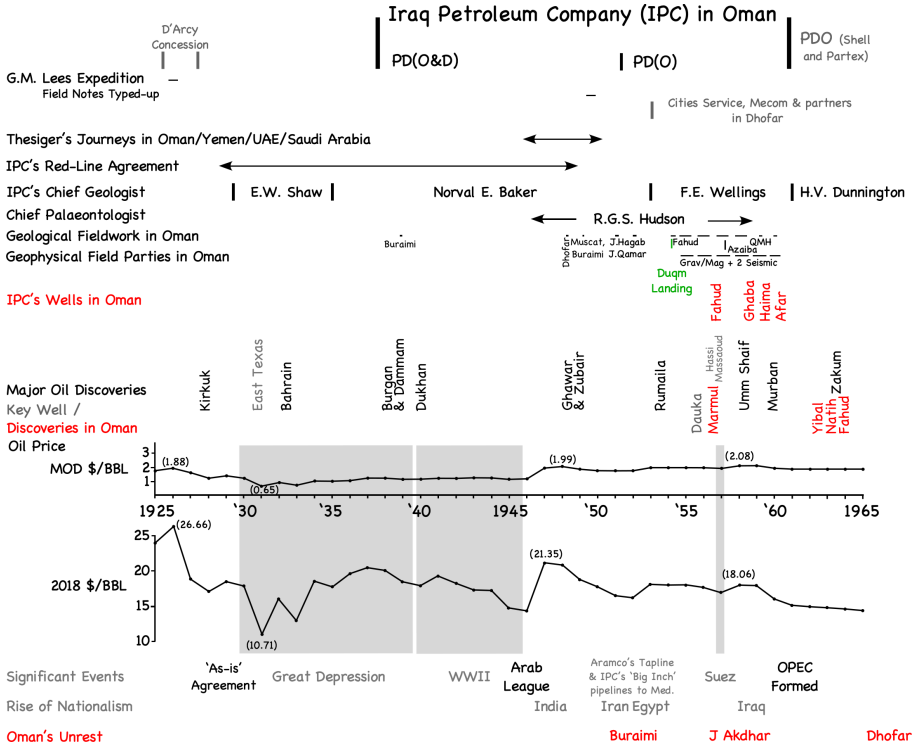


Fig. 3) IPC's activities in Oman 1937-60 in the company, regional and wider context. There was sporadic geological activity in Oman between 1937-53 and then a continuous presence from 1954-1960 when geological, geophysical and drilling activities took place. Ultimately, there was no significant success, but they were close, and probably only a well or two away from discovery. QMH = Qarn Mahatta Humaid.

It was one of the first concessions relinquished by IPC and they soon realised an oversight, that the boundary between Oman and Dhofar had never been defined.⁸

Wilfred Thesiger undertook five journeys in Arabia in the winters of 1946-50 which he recorded in diaries, photographs, papers and his book 'Arabian Sands'. These journeys were made with small numbers of local tribesmen and often without the permission of the regional rulers like Sultan Said or Ibn Saud. Jabal Fahud was first recorded on a map by Thesiger from his 1946-47 journey. It was spotted from the air by F.E. Wellings of IPC on a flight from Masirah to Sharjah in February 1948 (Fig. 4). It soon became the prime target for exploration in Oman. The problem was getting to it. As the company's focus grew on Buraimi and the foothills of the Al Hajar, then so too did the 'ambition' of some tribal leaders to seek independent recognition by the British authorities and their own oil concessions and rentals.⁹ When access to areas of interest in Oman proved difficult, then Thesiger's journeys provided an opportunity to obtain first-hand information. Thus, his latter journeys were part-supported (financially and logistically) by IPC in return for details of the tribes and their allegiances, information on any oil seepages, and rock samples.¹⁰

India became independent in July 1947 and, with that, British interests and influence in the Middle East declined and those of America grew, particularly in Saudi Arabia. There was considerable rivalry, between the two WWII allies, over access to Middle East oil supplies. The Ghawar oil field was discovered in 1948 with its prolific, Late Jurassic, Arab D dolomite reservoir. Under the terms of a new agreement, Aramco was obliged to explore and relinquish 85,000 km² of their concession every three years and, quite naturally, they began to query the undefined boundaries with Abu Dhabi, Oman and the Yemeni states (Fig. 2). In November 1948, IPC's shareholders reached a settlement to end the Red Line Agreement. This allowed the American partners in IPC (Exxon and Mobil) to purchase a 40% share of Aramco and help fund

⁸ The boundary between the Muscat and Oman and the Dhofar concessions remained undefined and a source of dispute until the 1960s. In 1952, H.M. Sultan Said gave the Dhofar concession to Wendell Phillips (WP), a visiting American archaeologist. WP assigned it to Cities Service (+ Arco), retaining a 2.1/2% overriding royalty. Cities Service began geological fieldwork in Dhofar in September 1953. Phillips, W., 1966. Unknown Oman. Longmans, London, 319p. Appendix 1 oil.

⁹ Not only those in the area around Buraimi but also others in Oman, like Suleiman bin Hamyar. IPC had to tread a delicate path to achieve their exploration goals, between the interests on the India Office/British Government, The Sultan, and tribal leaders whose loyalties often wavered. Heard, D., 2019. Oil Men, Territorial Ambitions and Political Agents. Gerlach Press, Berlin, 778p.

¹⁰ Morton, M.Q., 2013. Thesiger and the oilmen: A dilemma of oil exploration in southern Arabia 1930-1955. Oil Industry History, 14, 1-14.

the Trans-Arabia pipeline to the Mediterranean (Tapline) and a significant expansion of oil production from Saudi Arabia.

With concession rentals and oil wealth potentially in the offing, several Rulers of Gulf States proclaimed ownership of the land under their offshore waters. This was disputed by IPC and, in the case of Abu Dhabi, taken to arbitration in Paris in 1951. The arbitrator ruled in Sheikh Shakhbut's favour and the Abu Dhabi offshore concession, beyond a 3-mile limit, was first awarded to Superior Oil and then in 1953 to a subsidiary of Anglo-Iranian, a shareholder in IPC, but no longer bound by the Red Line Agreement. ¹¹

In the spring of 1949, two IPC parties visited Oman, one examining the geology of Ruwi and Saih Hatat, and the second scouting an access route for motor vehicles through Wadi Jizzi to the Dhahirah. Samples from Ruwi provided the first evidence of a Mesozoic age for the Hawasina cherts from fossil radiolarians.¹² Only limited rock sampling was possible on the expedition to Buraimi, and the Jizzi route was deemed unsuitable for motor vehicles except in an emergency.^{13, 14} Buraimi was *rumoured* to be floating on a pool of oil and in April 1949 Saudi Arabia laid claim to the oasis, two thirds of Abu Dhabi and a large part of interior Oman. Deeper drilling by IPC at Dukhan revealed a substantial accumulation of oil and gas in the Late Jurassic Arab D reservoir. That interval became the target reservoir for IPC's exploration in Oman and the Trucial States. Its absence from the outcrops in Dhofar was apparently the main reason the company had decided to relinquish the province. ¹⁵

Company geologists undertook several months of fieldwork in Jabals Hagab and Qamar in the winters of 1951-52. A few days into the trip, Doc. Hudson caused alarm back in the company's Sharjah office when he signalled for two dozen extra rolls of toilet paper. He wanted them to wrap his fossils!¹⁶ The fieldwork was written up by

¹¹ Morton, M.Q., 2016. The Petroleum Gulf. National Archives, Abu Dhabi. 280p.

¹² Davis, A.G., 1950. The age of the Hawasina Series of Oman. Proc. Geol. Assoc., 61 206-17.

¹³ Henderson, E., 1988. This Strange Eventful History: Memoirs of Earlier Days in the UAE and Oman. Quartet Books, London. 184p.

¹⁴ Morton, M.Q., 2006. In the Heart of the Desert. Green Mountain Press, Aylesford. 266p.

¹⁵ Hal Knudsen in Schlumberger in Oman: The First Fifty Years, 2006. Schlumberger Oilfield Services, Oman., p. 24.

¹⁶ Hudson, R.G.S., McGugan, A. and Morton, D.M., 1954. The structure of the Jebel Hagab area, Trucial Oman. Q. J. Geological Society, 110, 121-152.



Fig. 4) Geoscientists (and others) involved in IPC's exploration activities in Oman. **F.E. Wellings**, the Chief Geologist, at the Haushi oil seep in Feb. 1957. Col. **F.R.S. Henson**, foram expert and Sr Research Geologist at Fahud. Henson was a driving force in standardising stratigraphy across the Middle East. **Doc R.G.S. Hudson**, a distinguished palaeontologist and field geologist. Hudson had been the Prof. of Geology at Leeds and had taught several IPC staff. He was forced to resign over a family matter and later joined IPC. The Fahud Survey team in Nov. 1954: **Mike Morton**, leader of the field geological party in Oman from 1954-57. Ted 'Peewee' Melville, Mike's deputy, the first Westerner to find a meteorite in Oman. **Rodney Colomb**, Junior Field Geologist. **Nick Fallon**, Sr Surveyor, established the topo framework. **Don Sheridan**, Junior Field Geologist, who discovered the Haushi oil seep. **Peter Walmsley**, wellsite geologist for Fahud- 1. He made a cine-film of events around the well. **Hermy van de Plaats**, Sr Geophysicist at Fahud. **George Laurance**, Mechanical Engineer, supervising the quarrying of salt at Qarn Sahmah. *Photo credits- M.Q. Morton (1,4), D. Sheridan (2,6), W. Hudson (3), P.J. Walmsley (5), G. Laurance (7).*

R.G.S. Hudson and colleagues and work on the fossil faunas continued for several years afterwards. There is no mention of the Arab and Hith Formations, and the geologists must have realised they were not present in typical granular reservoir and anhydrite seal facies in the Musandam Limestone.¹⁷ It is clear from the discussions of these papers and correspondence between G.M. Lees of Anglo-Iranian and F.E. Wellings and F.R.S. Henson of IPC (Fig. 4), that IPC's most senior geologists disagreed with Lees' concept of nappes for the Hawasina and Semail of the Al Hajar.^{5, 18}

IPC drilled and abandoned three wells in the Trucial States in the early 1950s, Ras Sadr ('51), Jabal Ali ('52) and Murban ('53-54). The latter well did produce some light oil but, with a poor cement job, it was unclear where it was coming from and a fatal accident occurred during testing of the Arab Formation due to a leak of sour gas. The size and significance of the oil discovery in the Cretaceous of Murban would wait six years to be recognised.¹⁹ The Omani village of Hamasa was 'occupied' by Saudi armed-men in August 1952 and the ensuing Buraimi dispute prevented Fahud being approached via the Dhahirah.^{13, 20}

Hudson, R.G.S., Browne, R.V. and Chatton, M., 1954. The structure and stratigraphy of the Jebel Qamar area, Oman. *Proc. Geological Society*, 1513, 99-104.

Heard, D., 2019, op.cit. 9 , Appendix 37. Also, Codrai R., 1994. *Travels to Oman: an Arabian Album*, 119-141.

¹⁷ As we now know, the Arab platform carbonates and Hith sabkha anhydrites do not extend east of central Abu Dhabi. In Oman, there is an unconformity representing much of the Tithonian overlain by the deep-water Rayda Fm of the Kahmah Gp (e.g. see Fig. 25, Murriss, R.J., 1980. *Middle East stratigraphic evolution and oil habitat*. AAPG, Bull., 64, 5, 567-618).

¹⁸ Henson, F.R.S., 1951. Observations on the geology and petroleum occurrences of the Middle East. *Proceedings 3rd World Petroleum Congress (The Hague)*, Section 1, pp. 118-140. Discussion by Lees and Ion, pp. 130-134.

The opinion of R.G.S. Hudson on the concept of nappes is not evident from his papers.

¹⁹ Walmsley, P.J., 2012. Trucial Coast -1954 Tales from Tarif. *IPC Society Newsletter*, 153, January , 2012, 20-24.

Elder, S. 1963. Umm Shaif oilfield. *History of exploration and development*. *J. Inst. Petrol.*, 49, 308-315. See discussion by F.E. Wellings, p. 315.

Heard, D., 2019, op. cit. 9 , pp. 375-378.

²⁰ Morton, M.Q., 2013. *Buraimi: The Struggle for Power, Influence and Oil in Arabia*. I. B. Taurus, London, 286p.

Eventually, with Sultan Said's agreement, it was decided to evaluate Fahud and its adjacent area from a base on the southeast coast.²¹ Duqm was chosen by IPC's Marine Department as a suitable place for a landing and logistics base from the study of aerial photographs. One wonders whether they appreciated its significant swell during the summer monsoon season.

■ The Alphabeticals and the first meteorite (February-May 1954)

And so began six years of intense geological, logistical, geophysical and drilling activity in interior Oman (Fig.3).

*'Until we went in there, it was entirely virgin territory for non-Arabians including geologists. In fact, it was the first desert country I have been to without seeing somebody's previous car tracks.'*²²

On 15th February 1954, two ex-military landing craft were used to land vehicles, personnel and equipment, and a contingent of the Muscat and Oman Field Force (MOFF), on the beach in Duqm (where the port now is).²³ IPC camp was set up on the north side of the bay inland from a headland used by the Jenebi to dry fish ('Stinking Fish Rock', now the base of the northern breakwater).²⁴ The MOFF made their camp at Nafun where there was a brackish water well. The 400-strong contingent of soldiers were there to provide security for IPC personnel in case of any trouble with tribesmen.²⁵ Having established the camp and marked out an airstrip, the geologists began to explore the geology of the southern Huqf and find ways up onto the Jiddat al Harasis. They were surprised by the thickness of non-fossiliferous strata cropping out in the Huqf below the Cretaceous.

²¹ In February 1953, Wilfred Thesiger advised against such a landing whilst Saudi Arabia had a presence in Buraimi fearing it would be resisted by local tribesmen or that they would ask Ibn Saud for protection. Ibn Saud died in November 1953.

²² F.E. Wellings, in discussion of: Morton, D.M. 1959. The Geology of Oman. Proceedings 5th World Petroleum Congress (New York), Section 1, pp. 277-294, p. 293.

²³ This was nothing unusual, except that it was a first for Oman. In the absence of any port facilities, landing craft had been used for several years to land vehicles, equipment and bulky materials on beaches at remote locations in the Trucial States (now the U.A.E.).

²⁴ On the track of Oman's oil pioneers. Al Hajar 11th Edition, February 2008, 6-7. The IPC camp had a sea water distillation unit to provide fresh water. It was company policy not to use local wells for fear of exhausting them. Sheridan, D., 2000. Fahud, The Leopard Mountain- Exploring for Oil in Oman and Libya in the 1950s. Vico Press, Dublin. 256p.

²⁵ The MOFF were under the authority of H.M. The Sultan, but their costs were paid for by IPC.

It was during one of these excursions that they came across large, well-rounded, boulders of igneous rocks near Bai, which we now know as Al Khlata glacial deposits.

H.M. the Sultan visited Duqm on 18th March by boat from Salalah. He came to inspect the 'readiness' of the MOFF soldiers and to discuss the company's plans. In a handwritten letter after the visit, he forbade the geologists from venturing north of Sirab (20.1° N), for the time being, or west into Dhofar (beyond a line from Tarfa to Ras Sharbatat). In a postscript, he encouraged the company to find adequate supplies of fresh water.¹³

Having been frustrated in their goal of examining Fahud, the geologists concentrated their efforts in the southern Huqf, the 'Alphabeticals', and a visit to Qarn Sahmah to check that it was a salt dome as it appeared from the air. The 'Alphabeticals' were 11 topographic features on the Jiddat al Harasis that could be recognised from aerial photographs (Fig. 5A, 'A'-'K'). The photographs were not located geographically and the features had to be found by driving around in the desert. There were no tracks and sometimes the features turned out to be tens of kilometres from where they were thought to be. It was in April, when driving from alphabetical 'H' (Misfar) to a favourite camping site, that 'Peewee' Melville and Don Sheridan discovered the first meteorite known from Oman when the front wheel of their Landrover collided with it (Figs 4 and 5A).²⁶ Alphabeticals 'J and K' (Qaaharail and Marmul) lay west of Tarfa and probably within the recently-signed concession of Dhofar Cities Service. F.E. Wellings, by then IPC's Chief Geologist, decided they should be mapped anyway, in case they were of interest, and the company's 'political people' could influence the location of the yet-to-be-fixed boundary between Oman and Dhofar.

²⁶ Emails from Peewee Melville in June 2017, a few months before he died. The 16 kg fragment of the Ghubara meteorite was sent to IPC's head office in London and donated to the Natural History Museum (BM. 1954, 207). The specimen's record reads 'It was presented by the Iraq Petroleum Co. Ltd. of London, through Dr R.G.S. Hudson, in October 1954. It was collected by E.M. Melville and D.J. Sheridan.' Several more pieces of stony chondrite were recovered from the Ghubara area (near Sadad) over the next few years. One of them, collected by Mike Morton, is to be displayed at the 'Oman Across the Ages' Museum in Nizwa.

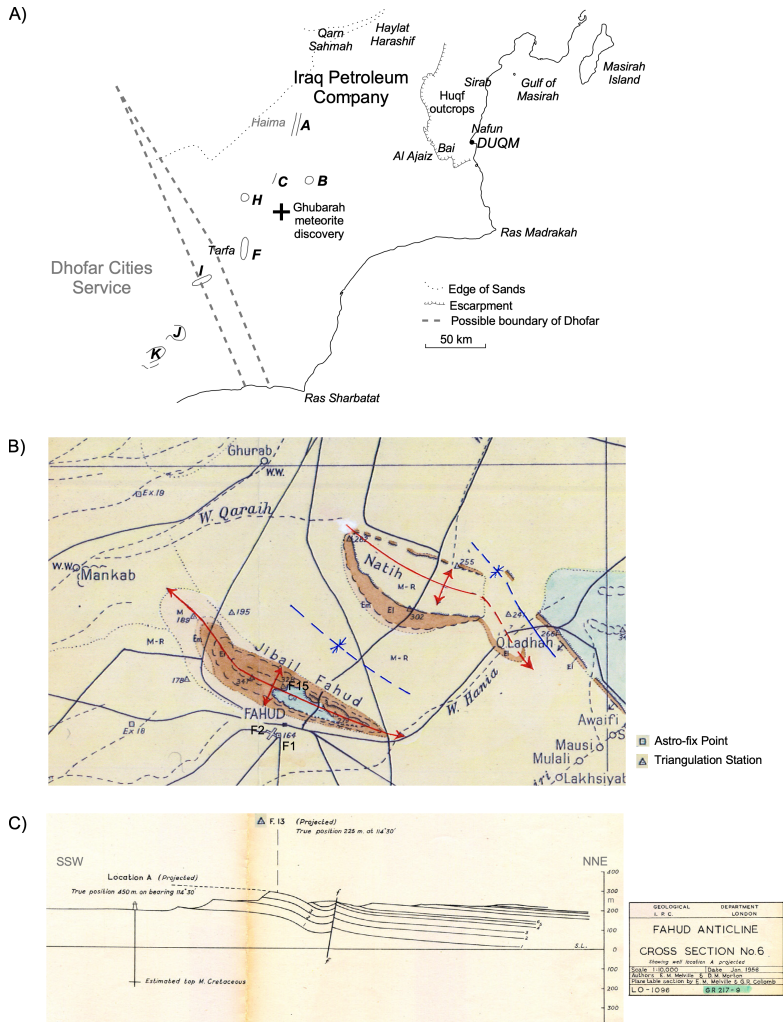


Fig. 5) Geological activities. A) The south Oman ‘alphabeticals’ and the possible boundaries with Dhofar. B) Part of a map of the Fahud area from 1956 showing the grid of astro-fix points and triangulation stations established by Nick Fallon for topographic control. A peg at the SE corner of the IPC dirt airstrip (astro-fix point F1) was the origin point for the Oman topographic system. The elevation of F1 was determined as 154 m by barometer and later corrected +10 m with an elevation surveyed through from Duqm by Ray G41. F15 is a key triangulation station on the axis of the Fahud jibal still in use today. C) The northern part of plane-table section 6 on which Fahud - 1 (Location A) was located slightly off-crest. F13 is a triangulation station northwest of F15.

■ Fahud reached at last (October 1954-December 1955), first geophysics

The geologists returned to Duqm in October for the new field season. A geophysical party also arrived, from southern Iraq, to begin acquiring gravity and magnetic data (Ray G41). They started work on the coastal strip around Duqm. In the 'Party Line' newsletter some of the crew wrote: *'After two days of flying (from Tripoli in Lebanon) we were deposited in south eastern Arabia (the Oman) at a flourishing metropolis called DUQM. If you had not heard of it before, don't worry, 'cos neither had we!'* Their first camp, near the coast, was plagued by flies *'the likes of which was never seen before.'* The crew was relieved when the camp was moved 50 km inland onto the Jiddat.²⁷

Earlier in 1954, the Imam (Muhammad bin Abdullah Al Khalili) had died and forces loyal to new leaders of the Imamate²⁸ occupied Ibri and Tan'am. Sheikhs from the Duru sought help from The Sultan to regain their authority and date gardens. This change of circumstances provided an opportunity for The Sultan to allow the soldiers of the MOFF to travel northwards towards Ibri and for the IPC field geologists to examine Jabal Fahud. A build-up of petrol, water and supplies was made at Haylat Harashif, and on 22nd October 1954 a move was made towards Fahud and Ibri. Don Sheridan recorded his first sight of the jabal: *'The object of our professional desires since the landings in February now lay before us like a huge, smooth, arch-backed whale, overpowering in its immensity. There was not much to say. We were looking at a creation of God that few humans had ever seen.'*²⁹

F.E. Wellings (Fig. 4) gave instructions the jabal should be mapped by the plane-table and alidade method, to produce a structure-contour map from which a drill site could be picked. The plane-table cross-sections were to be spaced at 1-mile intervals in the crestal area, increasing to 2-mile spacing towards the plunges. They were to be controlled by a longitudinal section. The Natih and Maradi structures were to be mapped in a similar manner.³⁰

²⁷ Extracts from crew newsletters compiled by Peter Knox in 2009- PDO and Early Geophysical Activity in Oman.

²⁸ Imam Ghalib bin Ali Al Hinai, his brother Talib, and Suleiman bin Hamyar. Saleh bin Isa al Harthi and his younger brother, Ibrahim bin Isa, were also supportive.

²⁹ Sheridan, D.J., 2000. Fahud- The Leopard Mountain.: Oil Exploration in Oman and Libya in the 1950s. Vico Press, Dublin, 256p.

³⁰ Morton, D.M. et al., 1956. Structural surveys in the Fahud area of central Oman. IPC Geological report 217, August 1956, 52p.

A basic triangulation system had to be established over Fahud before the geologists could begin work. The task was undertaken by the senior surveyor, Nick Fallon, and included F1 the origin of the Oman topographic system that is in use today (Figs 4 and 5B). Colonel Henson arrived to determine the ages of the Fahud outcrops from fossil foraminifera. Having done this, some of the geologists went off with the 'Colonel' to visit the salt domes and outcrops around Ibri. They visited Bat and found Jurassic-age Musandam Limestone in pellety porous facies, a potential reservoir for Fahud. What they did not realise, because of their rejection of Lees' ideas of nappes, is that they were looking at allochthonous grainstones in the Hawasina (Guwayza Fm, Hamrat Duru Gp).

Meanwhile 'Peewee' Melville and Rodney Colomb (Fig. 4) began to plane-table 11 cross-sections across Fahud. When the other geologists returned, Mike Morton and Don Sheridan formed another plane-table team. Shortly after their return, an aircraft arrived carrying Stephen Gibson, MD of IPC, and F.E. Wellings. They met in a tent and the only matter on the agenda was Jabal Fahud. The MD summed-up: *'If your mapping confirms the structure and a magnetometer survey confirms no igneous rock at depth, we drill.'*²⁹

The geologists and their Omani assistants spent most of the hours of daylight in the field for the next two to three weeks. They identified several markers which could be followed laterally around the plunge areas, making a longitudinal section unnecessary.³¹ A magnetometer survey by two of the G41 crew showed there was no igneous rock at depth. By mid-December the geological work was complete and Mike Morton left for London to draw up sections and a map from which a location for Fahud - 1 was picked in the New Year. Location A was chosen in the eroded core of the anticline on the shallower northern flank, off-crest (to avoid any gas cap), and away from any surface faults or calcite veins (Fig. 5C).³⁰ It was F.E. who decided it should be off-crest, much to the annoyance of the Acting Senior Geologist in Dukhan, Max Chatton, who referred to it in his monthly report as *'the Chief Geologist's eccentric location.'*³²

³¹ Three of these markers are vuggy, concretionary intervals ('Boulder Beds') in the Umm Er Radhuma Fm. GSO Field Guide No. 16- Spudding-in of Fahud -1, 18 January 1956 , 50th anniversary field trip to Jabal Fahud, 19-20th January 2006.

³² Max was Swiss and whilst his English was very good, it did not extend to all its subtleties. Peter Walmsley email to Alan Heward (27 June 2020).

The geologists returned to Oman in January and spent the remainder of the field season plane-table mapping Natih and Maradi, marking-out airstrips and water wells, administering the ever-growing Fahud camp and reconnoitring other accessible geology. The open eastern end of the Natih anticline made it a less attractive surface feature to drill than Fahud. When camped near Awaifi in April 1955, the geologists witnessed two flash-floods down Wadi Amairi.²⁹ They also made an aerial reconnaissance of Cities Service upcoming Dauka exploration location.³³ Geophysical work inland from Duqm was suspended in March and the party moved to Fahud. The gravity data they recorded showed that Fahud was in a basin of unknown extent. An airlift of >1,000 tons of equipment, supplies and personnel, from Umm Said in Qatar to Fahud, began in February 1955 and continued throughout the year with several flights a day.

Calouste Gulbenkian (Mr 5%), a founder of IPC and a suspicious and stubborn negotiator, died in July 1955. Often negotiations became protracted and litigious as he sought to protect his minority interest but, by doing so, he became the world's richest man. His art, very considerable wealth and oil interests were transferred to the Gulbenkian Foundation in the final years of his declining health. Partex, the upstream oil company, was wholly owned by the foundation.³⁴

The field season resumed in October with the camp growing day by day and a drilling rig being assembled, piece by piece, that would soon spud Fahud - 1. Over the summer, townspeople from Ibri had raised the issue of water supply to the Fahud camp which was being taken from the falaj in the town by tanker. Fortunately, this matter was resolved by the discovery of potable water by drilling at Awaifi. The Buraimi dispute ended in October when the Saudis and a few sympathisers were expelled from Hamasa and sent back to Saudi Arabia.³⁵ With this, the evaluation of

³³ Dauka - 1, Oman's first oil exploration well, was spudded on 15th April and abandoned on 30th December 1955. It was located on a surface feature, close to the edge sands in the north of the DCSPC's concession in the hope it would encounter the Arab Zone, as in Saudi Arabia. Further work by structural drilling and by seismic showed that the feature had no closure at depth.¹⁵

³⁴ Conlin, J., 2019. Mr Five Per Cent: The Many Lives of Calouste Gulbenkian: The World's Richest Man. Profile Books, 402p.
Partex' was sold to PTTEP in 2019 for around \$622 million.

³⁵ The British Government (and IPC) put significant effort and resource into preparing for an Arbitration Tribunal over Buraimi in 1954-5. Sizeable areas of Abu Dhabi and Oman were at stake. The 'Arabian Research Division' of Aramco did the same on behalf of the Saudi claim. When the integrity of the tribunal process became suspect, military action was taken to resolve the situation. Morton, M.Q., 2013, op. cit.²⁰

outcrops in the northern Dhahirah became a possibility. Geological fieldwork also began at Haushi in the northern Huqf, the nearest, easily accessible, deep geology to Fahud. The first impressions of the geology there were of a thick sequence of Palaeozoic, boulder beds like those of the southern Huqf (Al Khlata) and a truncated Jurassic succession, missing the Arab Zone. Faunas collected from the Permian Khuff and Gharif Formations (Haushi Limestone) were again worked on by experts (worldwide) for several years.³⁶

Major items of the drilling equipment were flown in to Fahud by a huge transport aircraft during November (draw-works, rotary table, crown block etc.).³⁷ H.M. Sultan Said and a motorised convoy including The Times correspondent James Morris, visited the Fahud rig and camp in December 1955. The Sultan was on a triumphal tour through Adam, Nizwa and Ibri, and a historic meeting with Sheikh Shakhbut in Buraimi.³⁸ It was Sultan Said's first and only visit to the Interior of Oman. Dhofar Cities Service exploration well, Dauka - 1, was abandoned in December, having tested only water, and in Q4, DSCPC began to record the first seismic in Oman, over the Marmul structure, the next prospect they proposed to drill.

³⁶ Ammonoids- A.K. Miller and W.M. Furnish, 1957; trilobites- R. Goldring, 1957; brachiopods- R.G.S. Hudson and M. Sudbury, 1959.

³⁷ At the end of WW2, British companies struggled to source oil-field equipment. The main manufacturers were American and there was a shortage of US dollars in Europe to purchase such items. The Ideal rigs used by IPC were manufactured in the U.K., under license from National Supply of the US. Paxman 12TP engines, used in WW2 tank landing craft, powered the rigs and pumps. The huge transport aircraft used to move the largest items was the prototype of the Blackburn Beverley which was under development. The Fahud run was considered an excellent trial for the new plane. The Ideal 100 rig that drilled Fahud, was later moved to Ghaba where its derrick remains (see front cover).

³⁸ Morris, J., 1957. Sultan in Oman. Faber & Faber, London. 165p. The description of Fahud camp and rig, and the comparison of Cities Service' (American) and IPC's (British) operations, are interesting (pp 70-85). The Sultan's tour was after his military forces (MOFF and the Batinah Force) had occupied the towns of Ibri, Nizwa and Rustaq, Imam Ghalib had abdicated and Talib had fled to Saudi Arabia. Suleiman bin Hamyar met the Sultan at Nizwa on 24 Dec.'55 to 'pledge' his allegiance, a meeting graphically described by Morris (pp. 105-107).

■ Fahud drilling, first evidence of oil and first IPC seismic

Fahud - 1 (F - 1) spudded on 18th January 1956 with F.E. Wellings and other dignitaries in attendance. There were high expectations in IPC and amongst others in Oman and UK who understood the significance of the well (Fig. 6B). It was 'all hands to the task' at each casing point, opening and emptying thousands of sacks of cement into the hoppers. The first of 36 cores was cut in the Fiqa Shale below the casing shoe and the first wireline logs recorded before the second casing depth at 1314 m in the Lower Cretaceous.³⁹

Meanwhile, the first evidence of oil in Oman had been discovered by Don Sheridan and Tom Jameson at a surface seepage of bitumen at Haushi. The news of the find, in the Lower Cretaceous, was radioed through to Fahud in the company's telegraphic code (Bentley's Second Phase), to stop the 'ever-listening, *Aramco, knowing.*'⁴⁰ The first oil shows in F - 1 followed shortly afterwards in cores from the Natih and Shuaiba Formations. They were not recognised as significant as the target of the well was the Jurassic Arab Zone and the Cretaceous was not yet known as an important oil reservoir interval in south eastern Arabia.⁴¹ That would come a few years later with commercial discoveries in Abu Dhabi at Umm Shaif (1958) and Murban (1960).

In February, SSL seismic party 15, recently mobilised from Iraq, began work on the gravel plain south of Fahud. They shot 385 km of 2D dynamite seismic data in a coarse 25 km grid extending from F - 1 to the edge of the Umm as Samim (Fig. 7A). The results were disappointing in that no, good, 'geophysical' follow-up location to F - 1 could be identified.⁴² A shallow horizon 'A' was mapped and thought to be faulted under the southern flank of the Fahud anticline. This fitted the company 'interpretation' of the Fahud structure being a drape-fold over a horst block. The

³⁹ It was IPC's policy to core for stratigraphical control every 100 m or so, or whenever hydrocarbon shows were encountered.

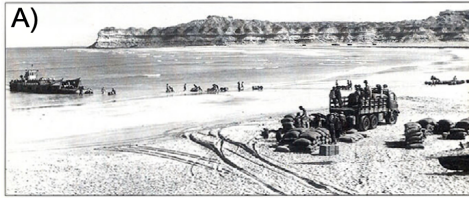
Walmsley, P.J. Oman 1956-58 cine film. Walmsley, P. and Crocker, H. in Schlumberger in Oman: The First Fifty Years, 2006. Schlumberger Oilfield Services, Oman. 241p.

⁴⁰ Sheridan, D.J. and Jameson, T.B.H., 1956. Report on bitumen seepage near Haushi, northern Huqf. IPC Interim Report DS/3, February 1952, 1p.

Sheridan, D.J. (1929-2008) obituary. Al Hajar 12th Edition, June 2008, 4-5.

⁴¹ The Cretaceous shows in Fahud - 1 were not tested due to the hole conditions in the overlying Fiqa Shales and the unavailability (in Oman) of 15" packers.

⁴² Had the survey extended 25 km further west the Yibal structure should have become apparent.



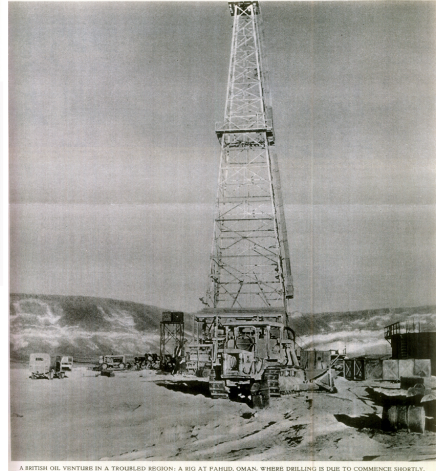
Duqm Beach Head



Duqm Camp



Geological field camp near Izki at the head of the Wadi Semail, Oman, 1956.



A BRITON OIL VENTURE IN A TROUBLED REGION: A RIG AT FAHUD, OMAN, WHERE DRILLING IS DUE TO COMMENCE SHORTLY.

Fig. 6) IPC locations, A) Duqm, manually offloading sacks from a landing craft. Duqm camp, part huts and part tents. B) Fahud - 1 makes the front page of a newspaper in Jan. 1956. C) Geological camp at Izki, Q4 1956, awaiting permission to enter Wadi Muya'adin. Photo credits- G. Laurance (A), *The Illustrated London News* (B), P.J. Walmsley (C).



Fig. 6) D) The spudding-in of Ghaba-1 on 3 Mar. 1958 with rig crew, locals and visiting dignitaries (Admiral Sir John Cunningham, Chairman of IPC, a thoughtful WOBL (with the striped tie), and a.n.other). IPC's Chairman was in Oman to have an audience with The Sultan to try to save WOBL's job. He failed and WOBL resigned the next day. Inset shows numbered beams so the derrick could be re-assembled. E) Workers attempting to mine salt at Qarn Sahmah to make salt-saturated mud for Haima - 1. IPC paid Sheikh Ali bin Hilal of the Duru 10 rupees for each barrel of salt mined (£8/bbl in today's money). F) Woodfield Rambler rig and mobile camp at Afar - 1, spring 1960. *Photo credits- G. Laurance (A,D&E), The Illustrated London News (B), P.J. Walmsley (C), and The Crescent, May 1960, p. 16 (F; Reproduced with permission of the BP Archive).*

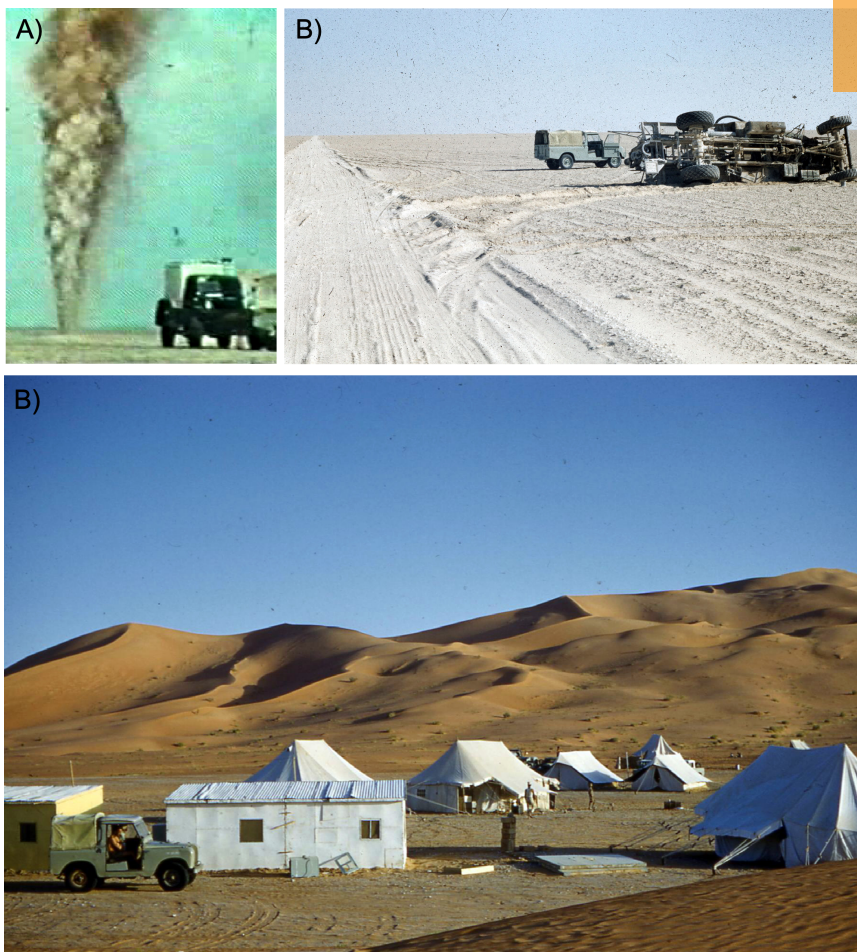


Fig. 7) Geophysical activities. A) Firing a dynamite shothole and recording truck at Fahud. B) Rollover of a seismic shothole drilling rig near Haima. C) Geophysical camp of Ray party G236 in the Sahmah sands, near Zauliyah. *Photo credits- P.J. Walmsley (A), G. Laurance (B), N. Lee (C).*

seismic line was not extended beyond the F - 1 well over the northern flank of the jabal perhaps because the survey was planned to identify the next drilling location or due to cost.⁴³ After completing the Amairi survey, the seismic crew moved to the Qarn Alam area (salt dome country, towards the Haushi oil seep). Meanwhile, Ray G40 recorded 24,600 km² of gravity and magnetics data in the Maradi, Barzeman and Majaiyiz areas.⁴⁴

Duqm was proving a less-than-ideal supply base for drilling activities (being remote, lacking facilities, 560 km from Fahud and with its monsoon swell in summer). In March 1956, Mike Morton and PD(O)'s chief representative in Oman - Sir William O'Brien Lindsay (WOBL) scouted a route through the Semail Gap. Soon afterwards a decision was made to grade a road, establish a camp and airstrip at Azaiba, and use Saih al Maleh (Mina Al Fahal) as an all-weather port for off-loading materials. The first single-track Fahud-Izki-Azaiba-MaF road was graded by Bill Barlow and helpers during the remainder of the year with the co-operation of village headmen along the route.⁴⁵

The field geologists continued activities in the Dhahirah and the Sharqiyah, though not without incident, even with soldiers of the MOFF and an emissary of the Sultan present. Cairo radio (Sawt-al-Arab) was broadcasting messages of Arab unity and revolution throughout the Middle East and parties in the region were happy to use their new-found independence or oil wealth to promote their own interests.⁴⁶ The political situation in Oman and the region was deteriorating and the field season finished early, in April. In June, back in London, the geologists developed their programme for the next winter, to allow plenty of time for 'political' arrangements to be made. Exposures in Wadi Mu'aydin were high on their list to help understand

⁴³ Email from Rodney Colomb to Quentin Morton January 2006 *'drilling on the wrong side of the crestal fault was the error of the bean-counters in London who would not agree to pay the costs of man-packing the seismic equipment up over the structure.'*

⁴⁴ Ray G41 moved from Oman to Yemen in Oct. '55 to be replaced by Ray G40 who would remain in Oman until Apr. '60. Extracts from geophysical crew newsletters compiled by Peter Knox in -2009 PDO and Early Geophysical Activity in Oman. Also, monthly exploration and annual geophysical reports in IPC archive, Warwick Univ., U.K.

⁴⁵ Laurance, G., 1999. The Oman - before oil. IPC Society Newsletter, Part 1, January, 101, 24-31, Part 2, April, 102, 18-26.

⁴⁶ And prevent the Governments of Egypt, Saudi Arabia and Aramco being pushed around. Such was the sensitivity over borders that a marker erected in the name of The Sultan at Khasfah in Dhofar on 5th March 1956 was destroyed by raiding party from Saudi Arabia on 3rd April 1957, under orders from Sa'ud ibn Juluwi. The marking is recorded by Wendell Phillips, 1966. Unknown Oman, Longmans, London, photo opp. p. 211, text p. 216 and by Hal Knudsen¹⁵ photos p. 33.

the sequence being penetrated by F - 1 and in the light of the sole, tantalising, description of the geology of Jabal al Akhdar made over a hundred years previously.⁴⁷

By July, it would have been realised that the target Arab Zone reservoirs were missing from F - 1. The high expectations for the well were beginning to fade. Drilling continued and further oil shows were encountered in cores from the Triassic (Sudair Fm). Two drill-stem tests, produced a disappointing flow of hydrocarbon gas and saline formation water.

Heavy, non-commercial, oil was discovered at Marmul in the summer of 1956 in pre-Cretaceous, sandstones.⁴⁸ For several years Cities Service geologists struggled to understand the thick, un-fossiliferous, pre-Cretaceous sequence (Haushi and Haima Gps) they were encountering in Dhofar, above the salt (Ara Fm). Various possibilities were considered of the clastics being Permian and older, or Lower Cretaceous, and the salt being Cambrian, Triassic or Jurassic in age.

■ Access to the Oman Mountains, Fahud abandoned, more geophysics

The geologists assembled in mid-October for the new field season. They set up camp at the southern end of the Semail Gap in anticipation of being able to log and sample Wadi Mu'aydin (Fig. 6C). They began work on tributary wadis along the gap and visited Saih Hatat as they waited for permission to be forthcoming. Don Sheridan spent time with Nick Fallon in the dunes around Qarn Sahmah taking astro-fixes for maps to be made for planning geophysical surveys. Don noted plenty of oryx tracks and, given the lack of vegetation, wondered what they fed on.²⁹

Negotiations for Mu'aydin dragged on and Mike Morton wrote in frustration- '*The Political Department is doing its utmost to secure us access ..., but it would appear that the Muscat Government considers geologists to be rather a nuisance.*' He resorted to collecting pebbles at the mouth of the wadi, finding, apart from limestones, reddish sandstones or quartzites and one possible igneous clast.

⁴⁷ Wellsted, J.R., 1837. Travels in Arabia. Vol. 1. Oman and Nakab el Hajar. Akad. Druck- u. Verlag. 446p. Wellsted's description of the geology on the journey through Wadi Mai'adin from Shuraijah to Birkat al Mawz was the only one available. Lees and Washington Gray were unable to visit the jabal in 1925/6. We can now understand Wellsted's description as- '*3. Alternately mica slate and granite*' (Cryogenian Mistal Fm), '*2. Old Red sandstone, with an occasional micaceous vein*' (Ediacaran Mai'adin Fm) and '*1. Alpine limestone*' (Permian-Cretaceous, Saiq-Natih Fms. Not bad for a 19thC nautical surveyor!

⁴⁸ AAPG Bull., 7, 41, Foreign Developments Issue: Petroleum developments in the Middle East and adjacent countries, pp. 1591-1615.

From Wellsted's description the geologists thought they would find boulder beds as in the Huqf and hence feel they had tied down the subsurface geology of interior Oman.⁴⁰

The Suez crisis came to a head in November and, because of British and French involvement, there was sabotage of oil assets in Syria, Qatar, Kuwait and Oman (Fig. 3). The Oman incident involved secretly dropping a spare set of slips down the open hole of F - 1, compounded by the actions of a new and unsuspecting driller. Then followed a lengthy shutdown and fishing operation.⁴⁵ What we now know as the glacial Al Khlata Formation, including small pebbles and possibly diamictite,⁴⁹ was drilled amidst a series of drilling mishaps between December 1956 and February 1957.

Mike Morton and Tom Jameson remained at Izki in the hope of gaining access to Wadi Mu'aydin, while Don Sheridan and Rodney Collomb continued mapping in the northern Huqf and accompanying a Huntings' crew on a three day aeromagnetic survey of IPC's concession. They spotted no new outcrop areas from the air they were not aware of.

In the New Year, after several months of negotiations, the geologists finally obtained agreement to visit Wadi Mu'aydin. What they were allowed to see was minimal, up to some rock overhangs in the Hawasina, not the deeper section they were really interested in.⁵⁰

⁴⁹ Described as grey sandy mudstones.

⁵⁰ Suleiman bin Hamyar had long held personal ambitions to be recognised as an Independent Ruler (Lord of the Green Mountain, King of the Nebhania), to have a similar status to Rulers of the Trucial States and to have his own oil concession (with IPC or any other company e.g. Aminoil). His loyalties wavered between the Imam and the Sultan as he watched events unfold, and his Chevrolet car, the only one in the Interior, may have been a product of Saudi largesse (Wilkinson, J.C., 1987, *The Imamate Tradition of Oman*. Cambridge Univ. Press, pp. 304-306; Morton, 2006, p. 187).¹⁴ In 1948, in discussions with an IPC party, he claimed oil seeps and an unworked gold mine in Wadi Mu'aydin (Letter Bird to Lermite, 15 Mar. 1948. Paxton Coll., GB165-0331, St Anthony's ME archive, Oxford). Later, in an interview in Bahrain in 1953, he claimed '*oil flows to the surface of the earth and the Beduin are accustomed to kindle their fires from it.*' Allowing the geologists to study the outcrops in the wadi would have revealed the substance of such claims and ruined his chances of obtaining his own concession. Wendell Phillips, 1971, in *Oman a History*, Librarie du Liban, Beirut, p. 197, takes a different view of Suleiman's behaviour, and that IPC's interest in Wadi Mu'aydin '*meant (there was) oil in the area and (that) the company wished to drill there.*'

Later in the month, three of the geologists and a political officer embarked on a boat from Muscat to Sur. Based in Sur, they rode out most days by camel. They were stopped from visiting the Eocene coal outcrops in Wadi Musawa by tribesmen wanting their own payments and were shot-at on their return towards Sur. They only managed about 16 hours geology in 13 days and it is hardly surprising they struggled to understand the relationships and ages of the Qalhat basement, the lavas within the Maastrichtian (Qalah Fm), the Ja'alan granite, and the Hawasina-like, Batain Group.

Fahud - 1 ground ever deeper, slowly, through abrasive Palaeozoic sandstones. The wellsite geologist, Peter Walmsley, took cuttings every 3 inches (7.6 cm) to have something to do!⁵¹ Unable to gain access to Wadi Mu'aydin, the field geologists turned their attention to wadis draining the northern flank of Jabal al Akhdar. In March, after lengthy negotiations in Muscat and locally, they managed a day's work near the entrance of Wadi Bani Kharus where they were surprised to find a drivable vehicle track had been cleared.⁵² Politics stopped further logging and sampling there and they turned their attention to the less accessible Wadi Fara/Sahtan. There they worked until heavy rains and floods delayed them. Eventually, they managed to travel through the gorge by camel, the first Europeans to do so. They may have reached the Sahtan 'bowl', as they described jagged, grey-green, un-fossiliferous rocks (Mistal Fm?). They did not find a succession below the Permian they could immediately relate to the Huqf. Mike Morton later interpreted the crumpled cores of the Saih Hatat and Jabal Al Akhdar domes as Upper Palaeozoic⁵³ (rather than the Ediacaran and Cryogenian we now know them to be).

The geophysical crews had been busy making a gravity survey in the Mabrouk area of the Umm as Samim, where the local employees were surprised the vehicles were not swallowed-up by the 'sands'. S15 had finished shooting 2D seismic over the Gharb prospect (later renamed Ghaba). A second seismic crew arrived in March (Ray S56), with vehicles and equipment shipped from southern Iraq to Duqm and

⁵¹ Pers. comm. when on a visit to Fahud with Alan Heward and Ed Follows, 15 Dec. 2006.

⁵² Sheridan, D.J., 2000, op. cit.²⁹, pp. 176-180. Track probably made by the rebels to allow the smuggling of weapons by lorry from the coast or Sharjah to Jabal al Akhdar. Allfree, P.S., 1967, *Warlords of Oman*. Robert Hale, London, p. 94. Innes, N. McL., 1987. *Minister in Oman*, Oleander Press, Cambridge, pp. 112-114, reports of arms landed on the Batinah in 1955.

Phillips, W., 1971. *Oman a History*, Librarie di Liban, Beirut, pp. 186-215.

⁵³ Morton, D.M. 1959. *The Geology of Oman*. Proceedings 5th World Petroleum Congress (New York), Section 1, pp. 277-294.

driven up into Central Oman. The crew arrived by plane a few weeks later.

In May, Fahud - 1, was abandoned at 3729 m having penetrated the Ara Salt. Don Sheridan recalled his feelings when the well was dry *'We were gutted (and) it was made worse a few years later by the discovery of the Fahud field a few hundred metres away. It made one question ones' ability as a geologist.'* Peter Walmsley, who was more involved day-to-day with the well, explained that for him it was not a sudden disappointment, but one realised progressively over time. F.E. Wellings summarised, *'because the stratigraphy (in F - 1) was unpromising (lack of reservoir), we did not drill the neighbouring anticlines (Natih, Maradi) and decided to drill something geophysical elsewhere.'* ²² An unfortunate logic in hindsight. PD(O) began to move the rig derrick, equipment and camp, piece-by-piece, to the next prospect, Ghaba. ⁵⁴ The shareholders must have been starting to question their investment in south eastern Arabia, given the unfavourable results to-date and the deteriorating security situation in Oman. The outlook elsewhere in the Middle East, post-Suez, was not looking good either (Fig. 3).

The Jabal al Akhdar rebellion flared-up in the summer of 1957, initially in the Sharqiyah, and then in the jabal where the Sultan's forces were ambushed. Sultan Said sought help from Britain. Assistance was forthcoming and the rebels retreated to the heights of the jabal from where they began to harass the military and lay land-mines in the roads. The company's supply route to the interior was disrupted; fortunately, they were not trying to support a drilling operation at the time. To maintain activities, IPC chartered a transport aircraft for logistics between airstrips and to fly-in fresh food. Duqm was re-opened as a supply base. There was some good news for The Sultan though, when DCSPC's Marmul-2 flowed 2,000 bopd 22° API oil. Unfortunately, the rate did not last.

After the summer break, the geological field party consisted of Peter Walmsley, Tom Jameson and Cliff Porteus. ⁵⁵ They undertook more work on the Alphabeticals ('A, B, C, F and H', Fig. 5a) and in the Huqf, well away from the unrest. The location of Ghaba - 1 was picked by F.E. Wellings during a visit to Oman in mid-October.

⁵⁴ The steel members of the F - 1 derrick were numbered to allow them to be re-assembled in the right way. The numbers are evident at Ghaba (inset Fig. 6D), but not on the new derrick at Haima.

⁵⁵ Mike Morton had been transferred to Qatar as Area Geologist, but was still involved in Oman and the prognoses of exploration wells. Don Sheridan and Rodney Colomb chose not to renew their contracts and left the company.

It was slightly off-crest on a geophysically-defined closure in salt-dome country. The occurrence of the oil seepage at Haushi which he had visited in February, and oil in pre-Cretaceous sandstones in Dhofar would have influenced his thinking (Fig. 4). Seismic party S15, who had been in Maradi, moved to the Afar area to be further from rebel activity and to follow up leads from gravity and magnetics. Seismic party S56 moved to Haima to begin a survey near Alphabetical 'A'. The crew claimed their campsite had been chosen to give the best view- *'As far as the eye can see there is NOTHING.'* G40 were busy in the Sahmah sands and reported *'apart from the locals being a bit jittery, ... we missed the action.'*⁴⁴

Julian Amery, the British Undersecretary for War, visited Oman in October 1957 and January 1958 for 'crisis' discussions, and the Sultan visited the U.K. in July 1958. An Exchange of Letters was agreed in which Britain would help strengthen the Sultan's armed forces and provide modest funds for development (of roads, health facilities and schools) until revenues from oil were forthcoming. Amery chose colleagues he knew to lead these activities, Col. David Smiley for his military expertise and Col. Hugh Boustead for his abilities in setting up development programmes. In the first nine months of 1958, nearly 200 vehicles, both military and company, were damaged by land mines laid by the rebels. The company built a mine-triggering flail-bulldozer 'in their workshop in Doha, intended to precede convoys of vehicles.⁵⁶ Three small bombs were planted at Azaiba, Saih al Maleh and in Muscat between March and June, causing damage, but fortunately no injuries or loss of life. There was talk of moving to a minimum exploration programme for Oman, given the logistical and security situation, and a breakdown in the relationship between PD(O)'s chief representative in Oman and The Sultan over the concession boundary with Dhofar.⁵⁷

⁵⁶ Laurance, G., 1999, op. cit.⁴⁵. Allfree, P.S., 1967, op. cit.⁵², pp. 98-101. 'Ontos' lay abandoned near the Shell garage opposite the army camp at Izki up until the mid-1970s.

⁵⁷ In the spring of 1958 there were a series of communications between Arco, Sir William O'Brien Lindsay (WOBL, Fig. 6D), the Sultan, Wendell Phillips (WP) and Cities Service over the award of a third concession between the PD(O) and DCSPC concessions to WP and Arco (a partner in DSCPC). The Sultan accused WOBL of going behind his back and communicating directly with other parties. That small wedge of concession was still no-man's land in 1960 (later found to contain the Nimr G, Karim West and Amin oilfields). In April 1958, Sultan Said left for Salalah, never to return to Muscat again.

■ Ghaba - 1 spuds, success in the Cretaceous of Abu Dhabi, another glimmer of hope in Dhofar

Ghaba - 1 (GB - 1) spudded on 3rd March 1958 (Fig. 6D). The first shows of bitumen and oil were recorded a few days later in porous limestones (Shuaiba Fm) beneath the Nahr Umr shale. As in F - 1 cores were cut of intervals of interest and about every 60-100 m otherwise.⁵⁸ About a month was spent trying to cure lost circulation in the Khuff. It was thought that the well might encounter salt and visits were made to Qarat Kibrit to assess the outcrops there in case salt was needed to make up drilling fluid. Bitumen was observed in cuttings of Permian sandstones (Gharif Fm) and there was a minor gas and oil show from an older Palaeozoic sandstone (Barik Fm). Several of the cores from the deeper part of the well contained macro-fossils with graptolites, brachiopods, trilobites and *Cruziana* described (Saih Nihayda and ?Al Bashair Fms).

BP discovered oil offshore Abu Dhabi in the summer of 1958 in the Umm Shaif field, in Cretaceous Thamama and Jurassic Arab carbonate reservoirs.⁵⁹ Dhofar Cities Service continued to appraise the Marmul discovery to try to establish its commerciality. The oil was heavy, production rates were low, and costs for facilities were relatively high in relation to contracts Cities had to lift oil from Kuwait (at \$1.5/bbl MOD). DSCPC thought they had made a commercial discovery of 37° API oil in Dahaban - 1 in a dolomite beneath the salt. Unfortunately, that too led to disappointment when the well promptly drilled back into salt.⁶⁰ It did not 'production test' well either.

In Iraq, there was a revolution on 14th July and the King, members of the royal family and the prime minister were murdered by nationalists. While IPC continued to produce oil in Iraq for another 14 years, it was against a backdrop of increasing demands, a glutted oil market and an unwillingness of shareholders to invest there. The disparate interests of the shareholder companies did not help negotiators reach agreements quickly, as was often required.

⁵⁸ Several of the cores from GB - 1, of intervals not normally cored in more recent years, have proved of significant scientific interest. No cores could be cut, logs run or formation tests made between 790-1340 m as the 16" casing was not landed at base Nahr Umr and 60 m of shale was exposed beneath the casing-shoe leading to hole problems. What is new!

⁵⁹ Elder, S. 1963, op. cit.¹⁹ . The Abu Dhabi offshore concession was by now 66.6% BP and 33.3% CFP (Total).

⁶⁰ Knudsen, H. email to Alan Heward (12 June 2004); and op. cit.¹⁵ , p. 28. Wendell Phillips eulogised about a '*reservoir more magnificent than Kuwait*', perhaps comparing it to Cities existing purchase contracts for oil (BP/IPC Archive PC27E Exploration Jan58-Mar61).

In Oman, the geological field party worked mainly in the northern jabals of the Trucial States and Oman (Qamar, Dibba, Faiyah, and Sumeini) with occasional forays to the Huqf and Sawqrah Bay. The two seismic crews made surveys at Nihayda, Afar and Rayda (Lekhwait High) and did further work in Maradi.⁶¹ The gravity crew worked at Khasfah, Saqirah, Dhahir, Umm al Jiras, Rafash, and Kharma.

Geophysically-based structures at Haima and Afar became contenders for the third exploration well. Haima lay midway between the oil seep at Haushi and DCSPC's pre-Cretaceous oil discovery at Marmul and was thought to be a good general area to explore the southern part of the concession. At Haima, there were two structures either side of Alphabetical 'A', a higher relief one to the east, and a lower relief one to the west. Salt was thought likely to be encountered at shallow depth under the higher-relief structure.⁶² It was more difficult to pick a deep location at Afar from the available seismic data, and the shallow Cretaceous appeared faulted and more suitable for a lighter, mobile rig, drilling potentially more than one well. To speed up the 'move' from Ghaba to the next deep exploration well location, another derrick was mobilised for an Ideal 100 drilling rig.

Two squadrons of Special Forces arrived in Oman in November 1958 to clear the rebels from Jabal al Akhdar. With support from other units of The Sultan's forces, they took the jabal by surprise in January 1959 and the leaders of the rebellion fled to Saudi Arabia. A few pockets of rebellion remained and a lower level of disruption from mine laying and other activities continued for several years.⁶³

Early in 1959, the field geologists (Tony Field, Alex Gethin and Campbell Kennedy) made a 10-km long plane-table survey across the outcrops at Qarn Mahatta Humaid hoping to find a similar stratigraphy to GB - 1. Their profile ran from outcrops of the Buah, across the basinward-dipping Amin, Miqrat and Al Bashair formations to the unconformable Al Khilata 'conglomerates' that cap the Qarn. They did not find

⁶¹ Ray crew (S-56) moved back to Iraq in September and was replaced by a second SSL crew. This was to consolidate Ray's seismic operations in Iraq and SSL's in Oman.

⁶² Haima East penetrated salt at 1460 m when drilled by PDO in 1973.

⁶³ The Jebel Akhdar War Oman 1954-1959.

<https://www.globalsecurity.org/military/library/report/1985/MJB.htm>

Allfree, P.S., op. cit.⁵²

Rebels Surprised – Brilliant but little known British desert action. The Times, 9 April, 1959. Smiley, D., 1975. Arabian Assignment. Cooper, London, 248p.

faunas or trace fossils comparable to those of GB - 1 except for *Cruziana*.⁶⁴ They took geologists from DCSPC around the Huqf to 'exchange' each company's understanding of Oman's geology. GB - 1 ran into drilling problems in March that would have taken time to resolve and an early TD was called (in the ?Al Bashair Fm). The well had found more reservoir (Shuaiba and Khuff carbonates, and Palaeozoic sandstones) than Fahud - 1, but all were disappointingly water-bearing.

By early 1959 DCSPC had drilled ten deep wells (compared to IPC's two). Evidence from Marmul showed that the oil was probably sourced from beneath the salt. Seismic at this level was poor and one of their two crews began recording refraction seismic data to try to improve imaging. DCSPC then turned to seeking basement features and to drilling within a 50-km zone of the border between Dhofar and Oman where up until this time there had been a moratorium on activity (Jarf - 1 and Qaaharail - 1 wells).⁵⁷

A prognosis for a well at Haima West was written by Mike Morton in January 1959, prior to the final location being selected. IPC geologists were by now well-aware of the potential of Cretaceous carbonates (from Abu Dhabi)¹⁹ and of dolomite stringers in the salt (from Dhofar). Haima - 1 (HM - 1) was eventually sited at the crest of the western structure and planned to test the sequence to the salt and below, if possible. With a new derrick and only the drilling equipment and camp to move, the new deep well could spud a few months after the abandonment of GB - 1.

■ Haima - 1 and the beginning of the end for IPC in Oman

HM - 1 spudded on 26th May 1959 to test a 60 m closure of around 70 km². Heavy equipment was transported from Azaiba via the Semail Gap when the security situation allowed. Some materials were shipped to Saih al Maleh, loaded onto Scammel lorries, that were shipped to Duqm, driven off through the surf and then by road to Haima. Suspending the drilling was considered during the monsoon season, but was not necessary. Activities at the well were also supported by regular flights.

⁶⁴ They collected a specimen of *Cruziana* and passed it to the NHM (London; for identification?). It became the type specimen of the distinctive, three-clawed, Cambrian form *Cruziana omanica*. Seilacher, A., 1962. Form und Function des Trilobiten-daktylus. Paläont. Z., 36, 218-27

Mike Morton read his seminal paper on the Geology of (Interior) Oman at the 5th World Petroleum Congress in New York in early June 1959 (Fig. 8). Discussions by Norval Baker (ex IPC Chief Geologist) and Kuendig (Shell) continued to dismiss Lees' ideas of nappes in the Oman Mountains, Ziad Beydoun (ex IPC) queried the age of the salt, might it be Jurassic as in Yemen, and F.E. Wellings (IPC) outlined the rationale behind IPC's exploration in Oman and revealed the testing of gas and condensate from the Thamama reservoir of Murban-2 (Abu Dhabi).⁶⁵

Four locations for the next well at Afar were considered based on subsurface factors and the risk of flooding from Wadi Halfain. Location D was eventually chosen and a new mobile rig ordered (an Ideco Woodfield Rambler). It would require less supplies, but would not be able to drill as deeply. The new rig was brought carefully ashore in Duqm later in the year to prevent sea water getting into the wheel bearings (Fig. 9A). The seismic crews were busy with surveys at Kathir (near Haima), A'bluten (near Al Ghubar and Barik), Rayda, Natih and Maradi. The gravity crew G40 was south of Buraimi with its sister crew (G236) working on the Abu Dhabi side of the border.

A visit was made to Qarn Sahmah in November 1959 to evaluate the resource as salt was predicted to be encountered by HM - 1 at around 3050 m. One hundred tons of salt was estimated to be required for making up drilling fluid and was deemed available at the dome 130 km from Haima. The well drilled out of Palaeozoic sandstones into bitumen-stained dolomites (Ara) and then into evaporites at 3200 m. George Laurance, PD(O)'s chief mechanical engineer, supervised the salt-mining operation, the salt proving much harder than anticipated. When bulldozers barely scratched the surface, he borrowed a seismic shot-hole drilling rig and dynamite to speed up the work. He recorded the salt mining and a visit by Duru miscreants, sent from Ibri by camel to mine salt by traditional means (Figs 4 ,6E).⁶⁶

⁶⁵ Morton, D.M., 1959, op.cit.⁵³ . G.M. Lees retired from Anglo Iranian (BP) in 1953 and died two years later, otherwise he would have certainly defended his views.

Mike Morton's also wrote up his work in abbreviated form in the Oil and Gas Journal, September 28, 1959, v . 57 (40), pp. 146-150. The choice of aerial photograph and headline was prophetic (see page 41).

⁶⁶ Laurance, G., 1999, op.cit.⁴⁵ Heward, A. and Al Rawahi, Z., 2008. Qarn Sahmah Salt Dome. GSO Field Guide No. 27, 32p.



Fig. 9) Woodfield Rambler mobile rig A) being assembled on the beach in Duqm, B) rigging-up on the Afar location and C) drilling Afar - 1(Photo credits- G. Laurance). This rig, handed over to Shell/PDO, would go on to discover oil at Yibal (1962), Natih (1963) and Fahud (1964).

In November, very senior geologists from the shareholder companies came to Oman for an extensive field trip of the accessible outcrops, the well at Haima and a seismic crew at A'bluten.⁶⁷ They also examined the Fahud anticline and the Oman Mountains from the air. Feedback from them would have contributed towards their company's 'view' of further investment in Oman, given the lack of success, the limited prospect portfolio, the mounting costs, and the logistical and security issues. PD(O) was overspent and in debt to IPC. The drill-string of HM1- became stuck in early December at 3506 m in a sandstone beneath the salt. Two months of drilling problems followed. On 31st December, CFP (Total) became the first to '*pull the plug*' and seek to withdraw from PD(O). If agreed, others would have to pick up a larger share of the costs.⁶⁸ The market was glutted with cheap oil and there were large discoveries in North Africa due to come on-stream soon.

■ 1960- The end of an era and the start of a new one!

In early January, The New York Times reported that '*Iraq Petroleum Company geologists have very nearly reached the conclusion that there isn't any oil worth having in Oman, or, for that matter, at Buraimi, or anywhere else at the southern end of the Persian Gulf.*'⁶⁹

A shareholder meeting was planned for later in the month and a summary of the status of Exploration activities was prepared. The geological field party was busy working on the Tertiary adjacent to Dhofar, the gravity crew was in the Sahmah sands, one seismic party was running a profile from the Haushi oil seep to the Haima well looking for stratigraphic pinch-outs, and the second crew trying to resolve the complex fault pattern of the Fahud-Natih-Maradi area. A second gravity crew G236 was mobilised from Abu Dhabi to help complete the Sahmah work ahead of the planned summer shutdown (Fig.7C).⁷⁰

⁶⁷ Norman Falcon (BP's Chief Geologist), Henry Hotchkiss (Exxon, previously seconded into IPC as Fields Manager, Qatar), Heybrouk (Shell) and Launais (CFP).

⁶⁸ CFP were probably rationalising their expenditure and resources. As well as IPC, they had sources of oil (and costs) in the Iranian Consortium, Abu Dhabi offshore (ADMA) and more significantly Algeria (Hassi Messaoud and Hassi R'Mel fields discovered in 1956). BP had interests in Iran, Kuwait and Abu Dhabi offshore (ADMA), and NEDC (Exxon, Mobil) in Aramco.

⁶⁹ NYT, International Edition, January 3, 1960.

The reference to Buraimi is likely to be a consequence of the 1952-55 Buraimi dispute.

⁷⁰ Nick Lee was a surveyor with the party. Their fly camp was at Zauliyah (Fig. 7C).

'It was a beautiful and enchanting place, complete with jinn and almost no bedu' and hence a natural refuge for oryx and gazelle. (Notes accompanying colour slides sent to Quentin Morton in April 2008).

Fahud's failure was now attributed to a lack of seals (rather than reservoir), Ghaba's results were wholly disappointing given the porous reservoirs encountered, and Haima was in trouble again with a stuck drill string. It was hoped that it still might encounter oil. Afar was described as an anticline complicated by faulting, but a useful test of a Cretaceous high and the succession of older rocks beneath. With the new Rambler rig and new caravan camp, drilling could start as soon as operations at HM - 1 closed-down.

The shareholder meeting duly took place to discuss funding the existing obligations and a reduced 1960 work-programme. CFP were determined to withdraw, as were BP if their costs were to increase and the American partners wanted to leave too (Exxon and Mobil). Shell sought more information about the costs of staying or leaving. A concern of management was *'what to say to The Sultan when the time comes.'* The decision to abandon HM-ST1 was made in February, after fishing pipe, running logs over the sidetrack hole and setting plugs. HM - 1 was concluded 'dry', with water-bearing reservoirs in Tertiary-Permian carbonates, Palaeozoic sandstones, and bitumen and heavy oil stained Cambrian? carbonates. A letter to The Sultan in Salalah informed him of the abandonment of the well and the closure of the camp at Azaiba, under the guise of the new mobile rig requiring less supplies. Afar - 1 was spudded on 16 February 1960, two days before HM - 1 was finally abandoned. Not only was there a new mobile rig, but a whole new mobile camp to facilitate rig moves (Figs 6F and 9).

The decision to suspend operations and pull out was made in early March. Shell and Partex would remain in Oman on a strictly limited basis (in terms of expenditure). Shell (85%) was the only major shareholder without a significant source of Middle East oil outside of IPC. Partex (15%)⁷¹ stayed on the advice of two former IPC geologists, Eric Tiratsoo and Ziad Beydoun.⁷²

A handover of assets, reports and samples began in March and continued through the year. Heavy oil shows were encountered in the Shuaiba of Afar - 1, but a DST

⁷¹ CFP (Total) re-entered PDO in June 1967, after the discovery of commercial oil in Oman, when they purchased 2/3 of Partex's 15% interest.

⁷² Eric Tiratsoo was a distant relative of Calouste Gulbenkian, lectured at The Royal School of Mines (Imperial College) and was a scientific consultant to the Gulbenkian Foundation. Ziad (Don) Beydoun was finishing his D.Phil. as a mature student at Oxford on the 'Geology of The East Aden Protectorate (Yemen)'. For the latter, his subsequent employment as Partex' representative for Oman was a blessing (Obituary ENT- J. Petroleum Geol., 2001, 24 (2), 235-7; Walmsley, P.J. email 27 June 2020; ZRB- William Smith medal reply, Geoscientist, 1994, 4 (5), 22-3.

produced only sweet gas and an influx of mud and salt water. Gas from the test was being flared on 14 March when representatives of IPC and Shell arrived as part of the planned handover of assets. AF - 1 was abandoned in mid-April, without logging, when it lost circulation 20 m into the Khuff (at 1448 m). Most of the shareholders had no appetite for further expenditure in Oman. All equipment was packed for storage at Afar, including that of the field geologists who had just completed a survey of the Jabal Qusaybah dome near Natih.

Brigadier Stephen Longrigg, the former General Manager of Petroleum Concession Ltd. and an authority on Middle East oil affairs (but not a geologist) wrote – *‘These so far wholly negative results (of oil exploration in Oman) were the more disappointing in view of the successful conquest of the exceptional difficulties of the enterprise, and the general high promise of the region.’*⁷³

In May, commercial 40° API oil was discovered by IPC in the Thamama reservoirs at Murban (-3), onshore Abu Dhabi.⁷⁴ Later in the year, a stratigraphic well drilled by Aramco close to the ‘yet-to-be-agreed’ border with Oman (ST18) encountered porous carbonates in the Thamama. The prospect for the western parts of Oman were looking up, but by then decisions had already been made and most of the shareholders in PD(O) were set to withdraw in October.

In hindsight, the withdrawal was probably best for Oman. IPC was becoming an unworkable ‘joint venture’ with five major oil companies, and Partex, with increasingly diverging views, requirements for oil, priorities for expenditure and needs to satisfy host governments. Oil was selling for ~\$2 per barrel (~\$18 per barrel in 2020 money). Had IPC discovered oil in Oman, other than in Fahud, the shareholders have struggled to prioritise its development compared to other more profitable opportunities for themselves collectively or individually in other countries. Only wells in Fahud and Natih could produce at rates of 5,000-10,000 bopd initially and it took a step change in oil price for most of Oman’s typically smaller, more complex and difficult fields to become commercial. It also helped to have fewer and more-aligned partners, and a change of operator and staff to re-assess the exploration results to date and decide an appropriate way forward.

⁷³ Longrigg, S.H., 1968, op.cit. 2, p. 318.

⁷⁴ Wellings, F.E., 1965, in Owen E.W., 1975, The Trek of the Oil Finders. AAPG Memoir 6, p. 1345.
 Heard, D., 2011, op.cit. 4, pp. 413-414.

OPEC (The Organisation of Petroleum Exporting Countries) was formed in September 1960 when representatives of five major oil-exporting countries (Venezuela, Saudi Arabia, Iran, Iraq and Kuwait) met in Baghdad to wrest-back some control of the market and price of oil from the major oil companies (many of whom were shareholders in IPC).

■ What might have been?

It was a missed opportunity that G.M. Lees was not involved more in an advisory role in exploration activities in Oman. He had his field notebooks typed-up in 1949 to aid the IPC geologists,⁵ but his understanding and experience were not actively sought before his health failed in 1953. He correctly ‘surmised’ that Fahud and its neighbouring folds *‘have an uneasy appearance suggestive of some complication not present in normal foreland anticlines.’*⁷⁵

Had commercial oil been discovered in the Thamama in Murban-1 in 1954,⁷⁶ then more attention would have been paid to the Cretaceous oil shows in F - 1. IPC staff might have suspended the drilling and sourced 15” packers to test the well. Test results might have provided the encouragement to evaluate the structure further and the neighbouring anticline at Natih. As it was, they were overly ‘focused’ on the Arab Zone which they should have realised from outcrops in Dhofar, Jabal Hagab and Haushi, and Dauka - 1, did not extend into Oman. Being open to Lees’ interpretation of an allochthonous origin for the Jurassic grainstones at Bat might have helped.

It was shortsighted, in hindsight, not to extend the seismic line through F - 1 over the northern flank of the jabal in the spring of 1956. Indeed, it was a line shot in that orientation in February 1962, that revealed the Fahud fault down-throwing the Cretaceous carbonates more than 1000 m to the southwest, pre-Aruma (Fiqa) and having no trace at surface. IPC had missed discovering the Fahud field by a few hundred meters only (page 1, top and base). Paxton described F - 1 as the unluckiest and most ill-fated wildcat in the history of Middle East oil.⁷⁷

⁷⁵ Note by Lees, G.M., 16 Mar1949. Arabia–Technical & General Nov 1937-July 1949. BP Archive.

⁷⁶ Walmsley, P.J., 2012, op. cit.¹⁹, records that in Murban - 1 the casing was set too shallow and an inexperienced geologist logged the Thamama interval as shale, cavings from the overlying, un-cased, Nahr Umr. Only with the wireline logs could the base of the Nahr Umr be picked and a later evaluation, screening out the larger shale fragments, showed the smaller, oil-bearing, limestone cuttings from the Thamama.

⁷⁷ Paxton, J., 2002. Frustrations and failures in the early search for oil in Oman. J. of the Sultan’s Armed Forces Assoc., March 2002, 53-56 and March 2003, 51-55.

He quoted Rudi Jäckli (a former MD of PDO and a geologist) *'that had IPC geologists had the opportunity to study the Oman Mountains more closely... in Wadi Mu'aydin... they might not have abandoned Fahud after only drilling a single well.'* Given Welling's conclusion that F - 1 lacked porous reservoir, it is doubtful whether observing a fuller sequence of 'tight' Natih and Thamama in Wadi Mu'aydin would have prompted IPC to re-evaluate Fahud in the absence of a positive DST result and/or seismic over the northern flank of the structure.

Had oil been discovered at Fahud in 1956 it might have hardened the resolve of the rebels and their sponsors to seize the interior of Oman and its oil for themselves. Maps recovered from an arms shipment in 1955 (and printed by Aramco!), showed *'the Sultanate of Muscat as a minute coastal strip and the rest of Oman from the coastal foothills to the Saudi frontier - as Independent Oman.'* ⁷⁸

Had commercial oil been discovered by IPC in Oman it might have caused problems for its American partners. Their stake in Aramco in Saudi Arabia was the most important thing in the world to them. A geologist who had just returned from Oman told the executive committee of Exxon *'I am sure there is a 10 billion-barrel oil field there.'* Well then said Howard Page (Exxon's Middle East Director) *'I am absolutely sure we don't want to go into it. I might put some money in if I was sure we weren't going to get oil, but not if we are going to get oil because we are liable to lose the Aramco concession.'* ⁷⁹

■ IPC's legacy

IPC's shareholders had invested about £12 MM in Oman (around £232 MM in today's money) for three deep and one shallow well, >75 party-months of field geology, and >185 party-months of geophysics, and six years of security costs for the MOFF. ⁸⁰ What IPC achieved in Oman was an understanding of the geology of the Interior, where virtually nothing had been known before. The stratigraphy they established was underpinned by determinations on macro- and micro-fossils. R.G.S. Hudson and F.R.S. Henson were influential in the rigour of scientific work carried out by IPC and enjoyed good contacts with academics and museums when specialist

⁷⁸ Innes, N. McL., 1987, op.cit. ⁵², p. 114.

⁷⁹ Yergin, D., 1991. The Prize- The Epic Quest for Oil Money and Power, Simon and Schuster, London, pp. 533-535. (Was the geologist Henry Hotchkiss, in November 1959?)

⁸⁰ Skeet, I., 1974. Muscat and Oman- the end of an era. Faber and Faber, London, p. 190. Dhofar Cities Service' costs were comparable to 1.1. 1961 (\$30-40 MM Wendell Phillips, 1966, op. cit. ⁸, p. 246) for more wells (6 deep and 17 shallow), less field geology logistical and security costs.

opinion was required on fossils and rocks from the Middle East.⁸¹ They correlated formations down the Gulf from Iraq, Qatar and Abu Dhabi into Oman. Thus, type sections for the Nahr Umr and Shuaiba are in southern Iraq, the Kharai and Simsim in Qatar and the Habshan and Fiqa in Abu Dhabi. They were the first to interpret the Permo-Carboniferous boulder beds of the Huqf as Gondwanan glacial deposits.⁸² Ultimately they were wrong about the mountains, but it was peripheral to their activities and they never had the opportunity to study the geology properly on the ground because of the troubled political situation.

IPC's surveyors and those working for the geophysical parties established the first grid and datum system for Oman using astrofixes, barometric measurements, surveying and levelling from Duqm and Azaiba, and tying into the Trucial Coast grid.⁸³ The first series of topographical maps of the interior were compiled in 1957. They passed on to Shell/PDO in 1960 hundreds of interim reports, notes, reports, publications, maps, samples, cores, wireline logs, volumes of geophysical data (gravity, magnetic, aeromagnetic and seismic), equipment for field geology, and a new mobile drilling rig and camp. Hermy van der Plaats estimated that equipment worth £10 MM in 1960 was handed over (£88 MM in today's money).⁸⁴

The narrow, single-track roads they created were some of the first in Oman, improving communications to the interior, Haima and Duqm (Fig. 7B). Dirt airstrips had been created at Duqm, Azaiba and at drilling locations and geophysical camps. The Azaiba camp, closed by IPC in 1960, was used temporarily by The Sultan's Armed Forces, and then as PDO's bachelor camp until facilities were constructed at Ras Al Hamra. Fresh water wells drilled at Al Ajaiz, Awaifi, and Haima would allow some tribesmen to settle and water their animals, rather than following the rains for grazing.

⁸¹ Elliott, G.F., 1983. The contribution of British oil interests in the Middle East to palaeontology. *Annals of Science* 40, 3, 273-9.

Hudson, W., 2008. HUD, The Life and work of Robert George Spencer Hudson, F.R.S. Privately Published in San Antonio, USA, 117p.

⁸² Hudson, R.G.S., March 1957, in discussion of King, L.C., 1958. Basic palaeogeography of Gondwanaland during the Late Palaeozoic and Mesozoic eras. *Q. J. Geol. Society*, 114, 47-77.

⁸³ Mugnier, C.F. 2007. Grids and datums: Sultanate of Oman. *Photogrammetric Engineering and Remote Sensing*, 73, 229-230.

⁸⁴ Paxton, J.F.E., 1996. PDO history. Draft text received in material from George Laurance's daughter. An abbreviated version of this text was published in Paxton, J., 2002 and 2003, op. cit. ⁷⁷

These were adventurous times for those involved who were often highly moved by Oman, the people they worked with, what they witnessed and were part of. Several took photographs or recorded cine-films capturing a different era, kept diaries, a few wrote books, private memoirs and later wrote articles for the IPC Society Newsletter.⁸⁵ For some, like George Laurance, his five years in Oman was *'the most interesting period of his life.'*

Perhaps the most enduring legacy, and one easily overlooked, is the name Petroleum Development Oman. Decided at a Board Meeting in March 1951,⁸⁶ since 1974 majority-owned by the Government of Oman and now with only two of the original shareholders remaining. The company, through perseverance in geology and oil exploration discovered the Fahud field and, a decade later, was able to commercialise the Marmul discovery. PDO's activities have fueled the development of the nation, become the largest private sector employer of Omani staff, and educated and trained many senior Omanis who work in the company, private business or government institutions.

⁸⁵ Henderson, E., 1988, op. cit. ¹³, 1999, Arabian Destiny, Motivate, Dubai, 272p. Codrai, R., 1994. Travels to Oman: an Arabian Album, 183p (Ronald Codrai was an IPC 'political' representative based in Dubai, who took wonderful photographs in the Middle East, and especially the UAE in the 1950s).

Sheridan, D., 2000, op.cit.²⁹ Don's book was written in the late 1950s but was not published because its content was deemed detrimental to his then employers. The manuscript lay in a bottom drawer for 30 years. In the mid 1990s, he was assured that the book should be published (by someone who knew the region well, Robert Fisk of the Independent?), as it *'records events that will never be repeated, and in Oman, a way of life that has gone forever.'*

Morton, M.Q. 2006, op.cit.¹⁴ Mike Morton's diaries and photos were written up by his son, Quentin.

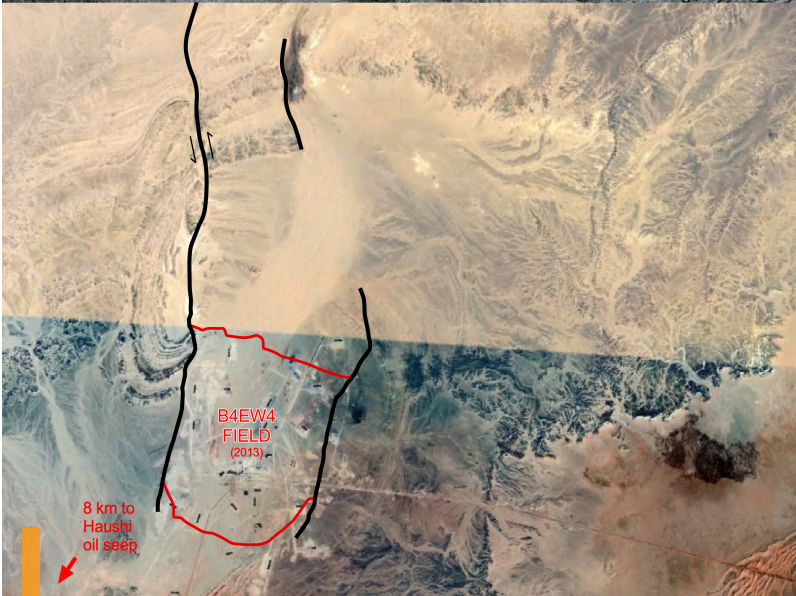
The IPC Society Newsletter ceased to be published in 2014 when funding from ADPC dried up.

⁸⁶ Minutes of Extraordinary General Meeting held at 214 Oxford Street, London, on 8th March 1951. On the proposal of Monsieur R. de Montaigu, seconded by Mr H.W. Page, it was resolved as a Special Resolution – *"That the name of the Company be changed to Petroleum Development (Oman) Limited."* IPC Archive, Warwick Univ., U.K. (IPC 27). Reproduced with permission of the BP Archive.

Anticlines like this, rising out of the desert, give clues to....

Oil Structures of Oman

Morton (1959). September 28, *Oil and Gas Journal*.



Top- Aerial photograph displayed on its side used to illustrate an article by Mike Morton in the *Oil & Gas Journal*. The caption was prophetic; 54 years later CCED would discover commercial oil in the Buah Fm of the Haushi anticline partially in the photo. Bottom- Google Earth image in its correct orientation (top to north) showing folds associated with the Maradi Fault Zone and the B4EW4 oil field. The most obvious fold is a syncline.

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Any errors, mistakes or misrepresentations are the responsibility of the author who has attempted to reconstruct the geological thinking and events based on the material available to him. I appreciate there are different views of the struggle for power and influence in Arabia and the exploration activities of the oil companies and their western governments, forced some of these issues. In due course, oil would provide the means for the region's rulers to improve the well-being, prospects and prosperity of their peoples.

⁸⁷ Hudson, W., 2008. HUD: The Life and Work of Robert George Spencer Hudson, F.R.S. Privately published by William Hudson, 117p.

⁸⁸ Heard, D., 2011. From Pearls to Oil: How the oil industry came to the United Arab Emirates. Motivate, Dubai, 623p.

Heard, D., 2019. Oil Men Territorial Ambitions and Political Agents: From Pearls to Oil in the Trucial States of the Gulf. Gerlach Press, Berlin, 778p.

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الجمعية الجيولوجية العمانية
Geological Society of Oman



■ Geological Society of Oman

Oman is well known as the “paradise of geology”. The diverse and fascinating geology displayed on mountains, deserts, caves and wadis allows studying the details of both the continental and oceanic plates. The geology of Oman represents a history of more than 800 million years and resembles almost all the chapters of tectonic events and climatic conditions throughout the Earth’s history. In Oman, you can touch the Moho, the boundary between the Crust and the Mantle, and you can as well see the initiation and development of life in this wonderful planet.

The geology of Oman has encouraged the existence and growth of a geologic community. Hence, the Geological Society of Oman (GSO) was established in April 2001 as a vocational non-profitable society. The society aims at advancing the geological sciences in Oman and the development of its members through seminars, workshops and fieldtrips, students courses and kids events.

The Legacy of the Iraq Petroleum Company in Oman

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The Legacy of the Iraq Petroleum Company in Oman

The Iraq Petroleum Company (IPC) was active in Oman from June 1937 to September 1960 and, despite an outward lack of success, laid many of the foundations for the discovery of oil and the peace and prosperity that has followed. This book recounts the story of some of those involved, the difficulties they encountered and the adventurous times they had piecing together the geology of interior Oman from its surface outcrops, the first exploration wells and the first geophysics. The backdrop, in Oman, was a way of life which was already beginning to change due to the discovery of oil elsewhere in Arabia.



Alan Heward studied geology at King's College, London, and sedimentology at Oxford, supervised by Harold Reading. He worked for Durham University, Shell, PDO, Lasmo and Petrogas and also as a consultant. His interest in the early exploration history of Oman was spurred by geological fieldwork and travel in the early 1980s and reading Don Sheridan's book 'Fahud the Leopard Mountain' in 2000.