PALAEOZOIC SEQUENCES AS POTENTIAL SOURCE ROCKS FOR PETROLEUM IN NORTHWESTERN PAKISTAN, WITH PARTICULAR REFERENCE TO THE SILURIAN SYSTEM, A MAJOR PETROLEUM SOURCE IN THE MIDDLE EAST AND NORTH AFRICA

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Silurian sequences in the Middle East and North Africa have been demonstrated to be major petroleum source rocks. The principal sources were black shales mostly of Early Silurian (Llandovery) age representing major events of anoxia. It is estimated that 9% of the world's petroleum reserves have been derived from Silurian source rocks. Devonian sequences that have also contributed importantly as source rocks and also as host rocks for petroleum production in North Africa and Canada.

The Palaeozoic sequences of Pakistan and stratigraphic alignments between them are not well known, but a significant Silurian dark shale sequence with high organic content, the Lun Shale (Llandovery, identified by graptolites), is known from Chitral. It is, admittedly, much disturbed structurally, having been involved in the Himalayan Orogeny, but what happened (or may have happened) farther south during Silurian times is poorly known. Silurian sediments are nevertheless known from the Nowshera- Misri Banda area where the base of the Nowshera Limestone and underlying Kandar Formation (senior synonym of Panjpir Formation of Pogue et al., 1992) and, underlying that again, the Misri Banda Quartzite, are, despite poor exposures, potentially sources of much information about events during Silurian times in northern Pakistan. There is a modicum of information on the Devonian sequences around the Peshawar Basin and into the tribal areas. Farther westwards in southern Afghanistan (such as the Dasht-i-Narwar) and Iran, Silurian sequences are associated with Devonian sequences. Colour Alteration Indices of conodonts from SOI]le of the latter sequences, such as in the vicinity of Tabas, fall within the oil and gas windows. Conceivably, the same situation may occur with mid-Palaeozoic (including Silurian) sequences concealed beneath the Mesozoic-Cainozoic sedimentary blanket of northwestern Pakistan.

During Silurian and Devonian times the Arabian and Indian plates (then conjoined) were located in the southern hemisphere between the Equator and 30° south, with the Indian plate lying closer to the Tropic of Capricorn and therefore in slightly less warm waters. What this may have meant for organic productivity at that time is uncertain, but highest productivity at the present time is in cool waters, notably in the Southern Ocean. However that may be, Palaeozoic reef occurrences, as in Canada, have proved to be prime loci for oil accumulation. Why not something similar in Pakistan for concealed occurrences in carbonate complexes (cf. the Nowshera Limestone)?

This paper will discuss the potential for Palaeozoic oil and gas occurrences in northwestern Pakistan, having in mind the highly significant Silurian source rocks of the Middle East and North Africa.