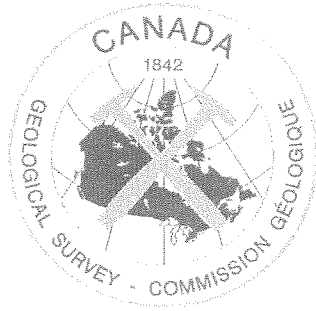


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Vitrinite reflectance (R_o) of dispersed organic matter
from
Mobil et al Linnet E-63

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2002

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Vitrinite reflectance (Ro) of dispersed organic matter from Mobil *et al* Linnet E-63

G.S.C. Locality No.: D215 **Unique Well ID:** 300 E63 48200 50150 **Location:** 48.20822°N, 50.42386°W

R.T. Elevation: 27.3 m **Water Depth:** 160 m **Total Depth:** 4520 m

Sampled Interval: 980 - 4520 m **Interval Studied:** 630-5212 m

Depth Units: Metres referenced to R.T. **Rig Release Date:** November 14, 1982

Vitrinite reflectance has been determined on 20 rotary cuttings samples from Mobil *et al* Linnet E-63, which was classified as an exploratory well and is located on the northern Grand Banks approximately 184 km east northeast of St. John's, Newfoundland. Well status is Plugged and Abandoned.

Sample preparation followed the procedures listed in Appendix I. Data acquisition and manipulation for this report was done with a Zeiss Photometer III system with a custom interface to a microcomputer for data storage and statistical summaries.

Analysis of the well reveals thermal maturity intervals given in Table I. Specific maturity levels, as set out in this report, are based on those of Dow (1977) with modified terminology (Appendix II).

Table I
Inferred Hydrocarbon Thermal Maturity Levels*

Depth in metres**	Vitrinite Reflectance** %Ro	Hydrocarbon generation levels*
160 [Sea floor]	(0.15)	immature
1700	0.3	immature
2340	0.4	immature approaching maturity
2840	0.5	marginally mature
3250	0.6	onset of significant oil generation
3900	0.8	peak of oil generation
4520 [T.D.]	(1.06)	within oil window
(4810)	1.20	peak of dry gas generation

* Actual hydrocarbon products depend on type of organic matter present.

** ()'s indicate Ro's or depths extrapolated from linear regression (0.194 log Ro/km).

Remarks

Sample coverage for vitrinite reflectance analysis (Figure 1, Table II) was very good over the section penetrated at Linnet E-63. The data were plotted on a log Ro vs. linear depth scale and regression lines were calculated and plotted (Figure 1). The 'error bars' displayed on the maturity profile indicate one standard deviation on either side of the mean and may be deceptively small for samples with very few readings. The slope of the maturity line is 0.194 log Ro/km.

The histogram display shows the variability in the reflectance populations, which represent the maturity of the sediments with depth (Figure 2). Plotting reflectance histograms on a log scale may help reveal any trends that may be present in the Ro data. It also can help to demonstrate the effects of cavings, geology, casing points and other influences on the vitrinite reflectance populations.

These vitrinite reflectance data show that the thermal regime of the lower section of Linnet E-63 is suitable to generate and preserve liquid hydrocarbons within the drilled section, between 2840 and 4520 m (T.D.), provided potential source rocks and traps are present.

Discussion

The vitrinite reflectance based maturity profile for this Grand Banks well shows a somewhat regular but slightly stepwise increase in reflectance with depth. It should be noted that, based on formation top information the deepest three samples were taken from Paleozoic metasedimentary basement rocks but there is no marked increase in maturity. Therefore it is quite likely that reflectances below 4175 m were measured on caved cutting samples. This also shows the difficulty in identifying and avoiding caved organic matter. It can also be noted that the histograms (Figure 2) show a marked decrease in quality and quantity of reflectance measurements in these three samples.

References

Dow, W.G., 1977. Kerogen studies and geological interpretations. *Journal of Geochemical Exploration*, no. 7, p.77-99.

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A.E. Jackson, MResG, Dartmouth
MResG Files, Dartmouth

K. Osadetz, GSC (Calgary)
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C. Beaumont, Dalhousie Univ., Halifax

Table II

Summary of kerogen - based vitrinite reflectance

Sample Labels	Depth in metres	Mean Ro (SD) non-rotated	Number of Readings	
			Total	Edited
K0917A	1130-1170	0.22 (± 0.03)	7	7
K0917B	1430-1470	0.25 (± 0.04)	14	14
K0917C	1610-1650	0.27 (± 0.04)	10	10
K0917D	1820-1860	0.35 (± 0.04)	15	15
K0918A	2010-2020	0.38 (± 0.03)	13	13
K0918B	2160-2170	0.37 (± 0.04)	21	21
K0918C	2310-2320	0.41 (± 0.04)	19	19
K0918D	2490-2500	0.45 (± 0.04)	20	20
K0919A	2640-2650	0.50 (± 0.05)	20	20
K0919B	2790-2830	0.56 (± 0.03)	18	18
K0919C	2970-3010	0.49 (± 0.03)	8	8
K0919D	3150-3190	0.52 (± 0.05)	15	15
K0920A	3330-3370	0.61 (± 0.07)	18	18
K0920B	3510-3550	0.74 (± 0.06)	17	17
K0920C	3690-3730	0.76 (± 0.06)	14	14
K0920D	3870-3910	0.76 (± 0.07)	17	17
K0921A	4050-4090	0.92 (± 0.08)	13	13
K0921B	4230-4270	0.99 (± 0.07)	5	5
K0921C	4350-4385	0.87 (± 0.06)	6	6
K0921D	4465-4505	1.04 (± 0.11)	9	9

Table III

Formation Tops (McAlpine, pers. comm.)

Formation	Depth in metres
Banquereau (unconformity)	in casing 2542
Dawson Canyon Fm (shale)	2542
(sandstone)	2656
Nautilus shale (shale)	2795
(sandstone)	2905
(shale)	3074
(Mid-Cretaceous unconformity)	3379
(Paleozoic Metasediments)	4175
Total Depth	4520

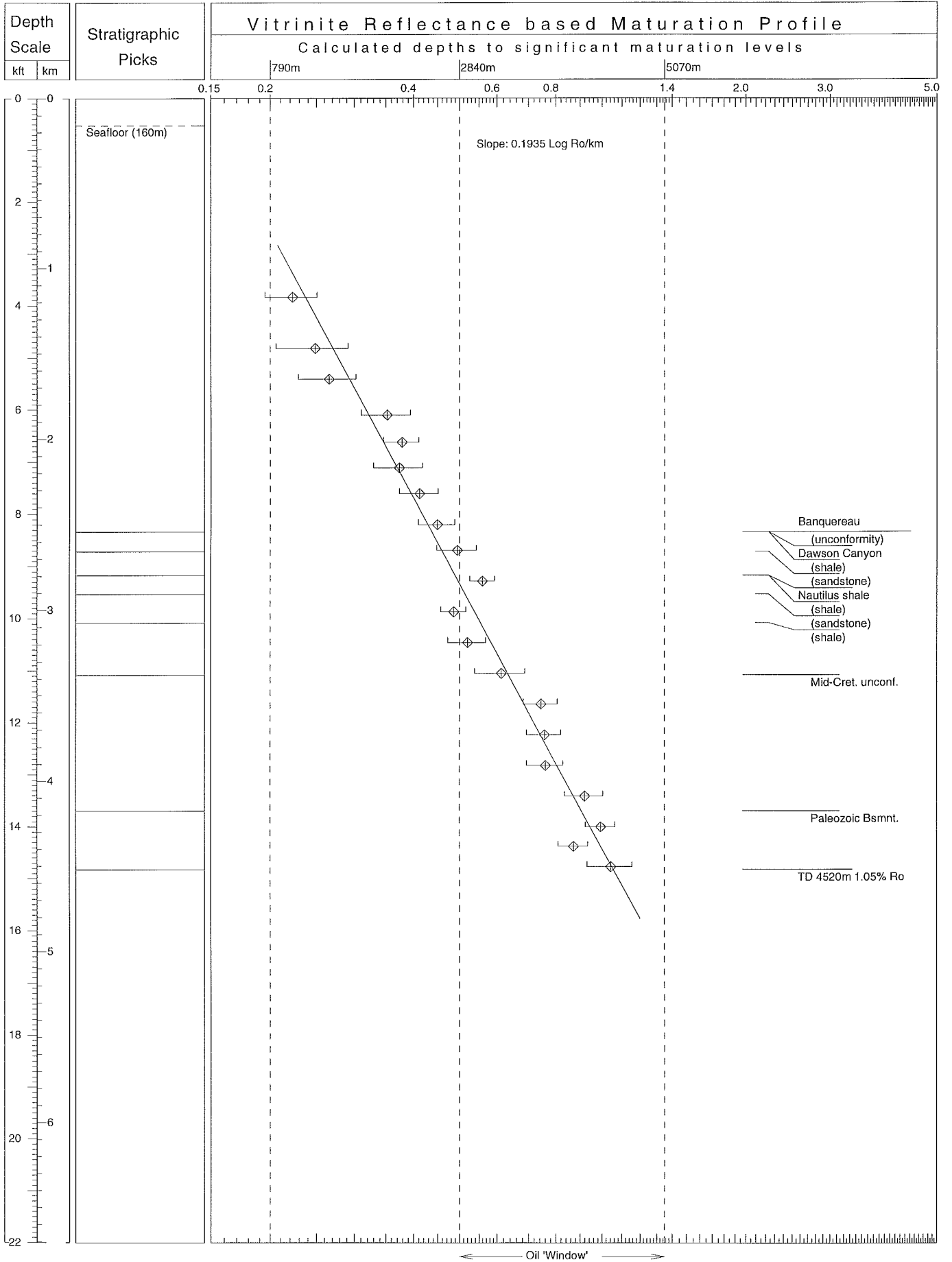


Fig. 1 Linnet E-63

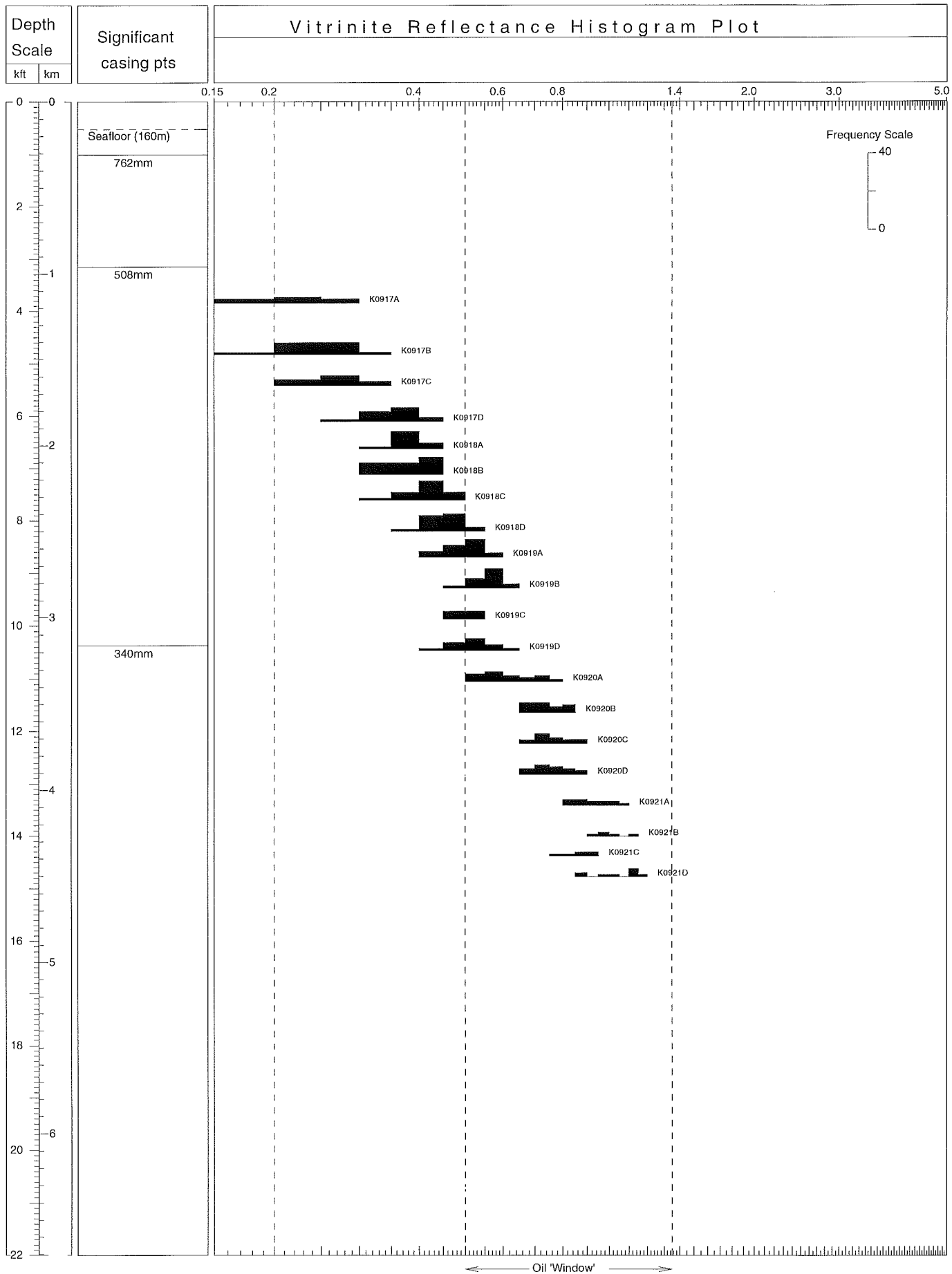


Fig. 2 Linnet E-63 <Histograms>

Appendix I

Sample Preparation Method

Kerogen Concentrate

Preliminary wash (preparation for cuttings)

Dry samples in oven (25°C)

PALYNOLOGY Lab preparation

Place 20-30 grams in 250 ml plastic beaker.

Add 10% HCl till reaction ceases (removes carbonates).

Rinse 3 times.

Immerse in hot concentrated HF overnight (removes silicates).

Rinse 3 times.

Heat (60-65°C) in concentrated HCl (removes fluorides caused by HF).

Rinse 3 times.

Transfer to 15 ml test tube with 4-5 ml 4% Alconox.

Centrifuge at 1500 rpm for 90 sec.

Decant.

Rinse and centrifuge 3 times.

Float off organic fraction using 2.0 S.G. ZnBr solution.

Centrifuge at 1000 rpm for 8 min.

Float fraction into second test tube.

Wash and centrifuge 3 times.

Make kerogen smear slide.

Remaining kerogen material is made available to Organic Petrology Lab.

VITRINITE REFLECTANCE Lab preparation

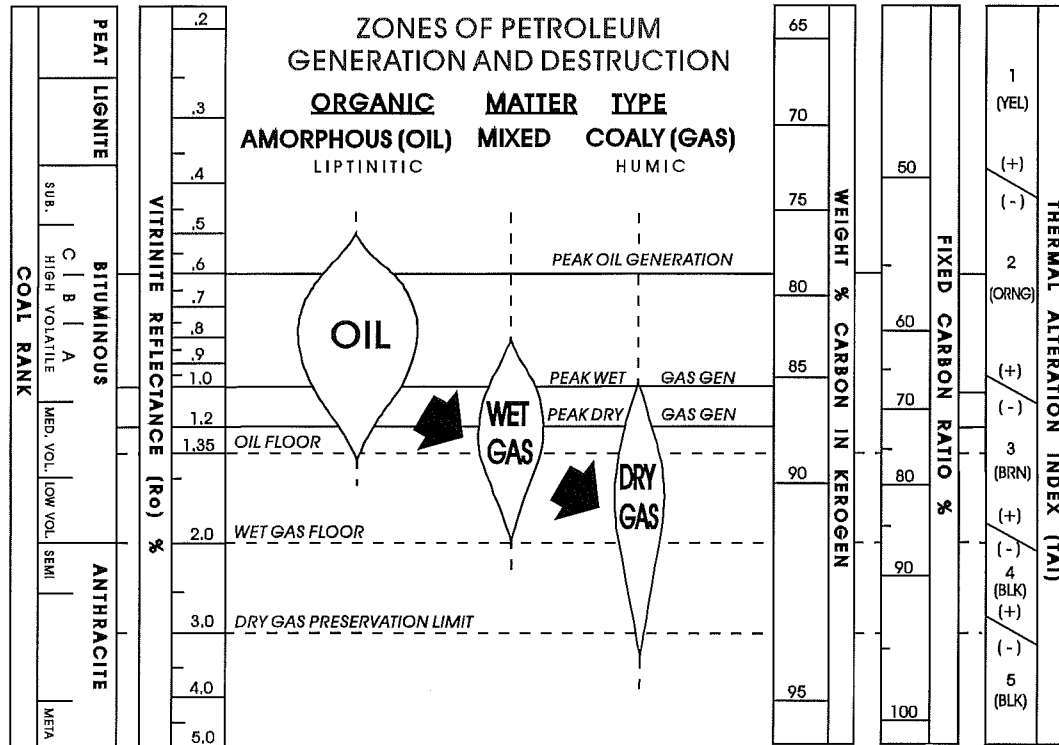
Pipette off excess water and prepare as 2.5 cm (1") diameter plastic stubs to fit polisher.

Freeze dry and fix material for polishing with epoxy resin.

Polish with diamond-based suspension to obtain low relief, scratch-free surface.

Examine under oil lens, incident light at approximately 1000x magnification.

Appendix II (Dow, 1977)



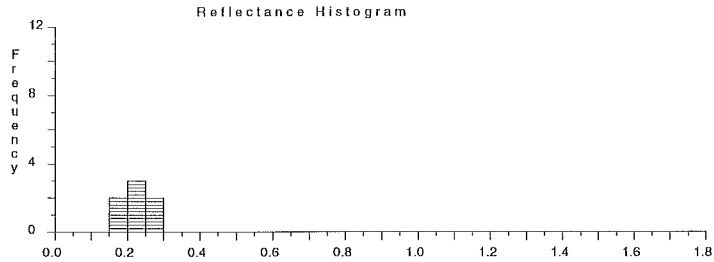
Note: In this report, the terminology used to describe the various maturity levels has been modified. The 'peak' designation, as used in this figure, has been changed to 'onset of significant' and 0.8 %Ro is herein used as the 'peak of oil generation' (Table I, Figure 1).

Appendix III
Reflectance Histograms

K0917A, 1130-1170m

Col >	1	2	3	4	5	6	7
Row	(0.22)	(0.25)	(0.26)	(0.24)	(0.21)	(0.19)	(0.19)

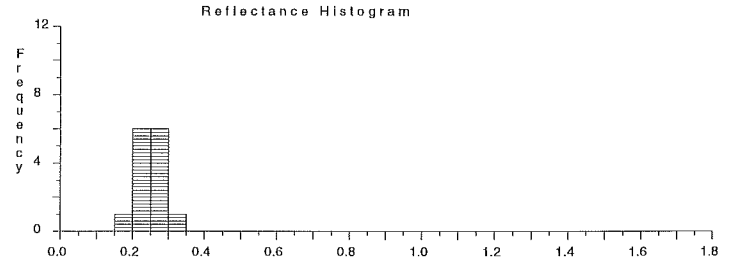
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	0.22	0.03	7	0.19	0.26	1.56
(Edit)	0.22	0.03	7	0.19	0.26	1.56



K0917B, 1430-1470m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.25)	(0.24)	(0.24)	(0.29)	(0.33)	(0.23)	(0.27)	(0.20)	(0.28)	(0.23)
1	(0.27)	(0.23)	(0.15)	(0.27)						

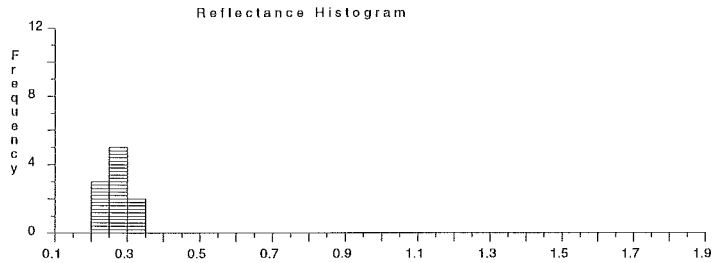
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	0.25	0.04	14	0.15	0.33	3.48
(Edit)	0.25	0.04	14	0.15	0.33	3.48



K0917C, 1610-1650m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.21)	(0.28)	(0.26)	(0.29)	(0.30)	(0.23)	(0.33)	(0.23)	(0.28)	(0.25)

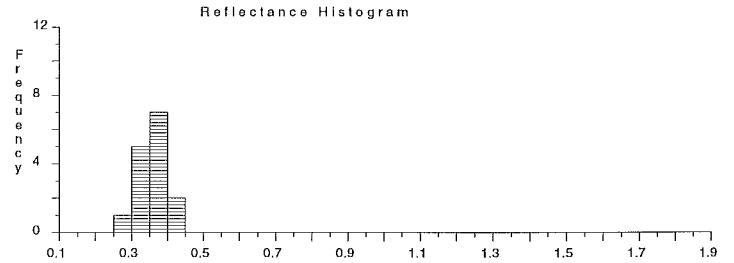
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	0.27	0.04	10	0.21	0.33	2.66
(Edit)	0.27	0.04	10	0.21	0.33	2.66



K0917D, 1820-1860m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.40)	(0.34)	(0.43)	(0.31)	(0.28)	(0.36)	(0.37)	(0.39)	(0.36)	(0.37)
1	(0.30)	(0.34)	(0.35)	(0.39)	(0.30)					

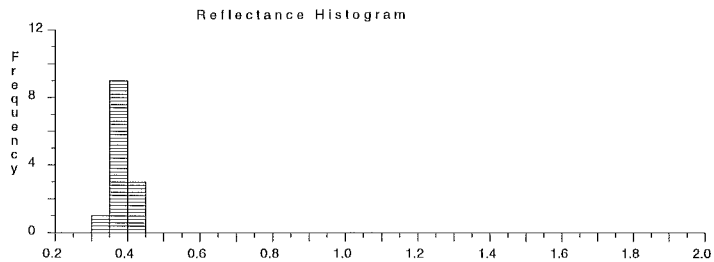
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	0.35	0.04	15	0.28	0.43	5.29
(Edit)	0.35	0.04	15	0.28	0.43	5.29



K0918A, 2010-2020m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.36)	(0.31)	(0.41)	(0.44)	(0.40)	(0.39)	(0.35)	(0.38)	(0.39)	(0.39)
1	(0.37)	(0.35)	(0.38)							

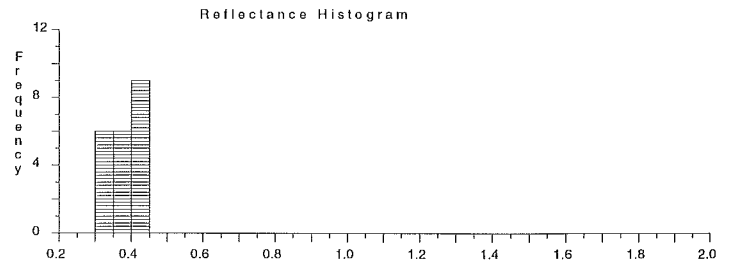
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	0.38	0.03	13	0.31	0.44	4.92
(Edit)	0.38	0.03	13	0.31	0.44	4.92



K0918B, 2160-2170m

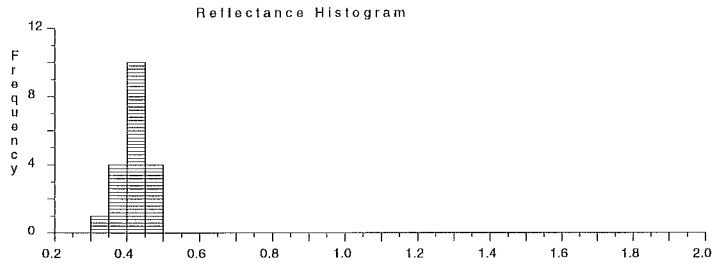
Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.32)	(0.35)	(0.38)	(0.37)	(0.40)	(0.36)	(0.32)	(0.32)	(0.43)	(0.33)
1	(0.44)	(0.37)	(0.41)	(0.37)	(0.41)	(0.42)	(0.40)	(0.30)	(0.41)	(0.31)
2	(0.43)									

	Mean	Stand Dev	Pts	Min	Max	Sum
Total	0.37	0.04	21	0.30	0.44	7.85
(Edit)	0.37	0.04	21	0.30	0.44	7.85



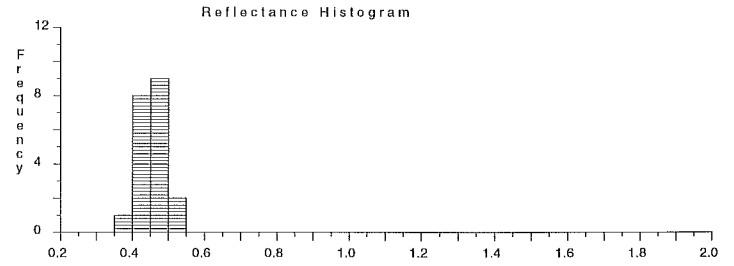
K0918C, 2310-2320m

Col >	1	2	3	4	5	6	7	8	9	0
Row 1	(0.47)	(0.41)	(0.47)	(0.35)	(0.43)	(0.42)	(0.34)	(0.42)	(0.35)	(0.38)
	(0.39)	(0.47)	(0.42)	(0.41)	(0.41)	(0.42)	(0.40)	(0.42)	(0.45)	
	Mean	Stand Dev	Pts	Min	Max	Sum				
Total	0.41	0.04	19	0.34	0.47	7.83				
(Edit)	0.41	0.04	19	0.34	0.47	7.83				



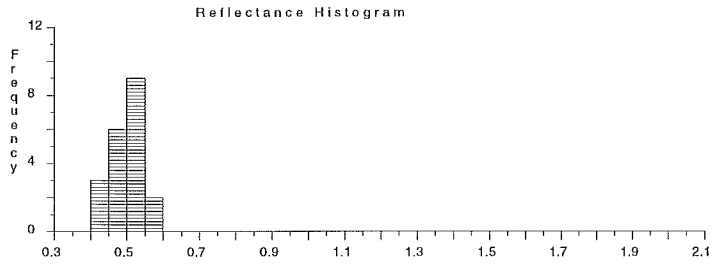
K0918D, 2490-2500m

Col >	1	2	3	4	5	6	7	8	9	0
Row 1	(0.48)	(0.51)	(0.45)	(0.38)	(0.43)	(0.40)	(0.42)	(0.47)	(0.46)	(0.48)
	(0.46)	(0.41)	(0.48)	(0.44)	(0.54)	(0.47)	(0.45)	(0.44)	(0.40)	(0.41)
	Mean	Stand Dev	Pts	Min	Max	Sum				
Total	0.45	0.04	20	0.38	0.54	8.98				
(Edit)	0.45	0.04	20	0.38	0.54	8.98				



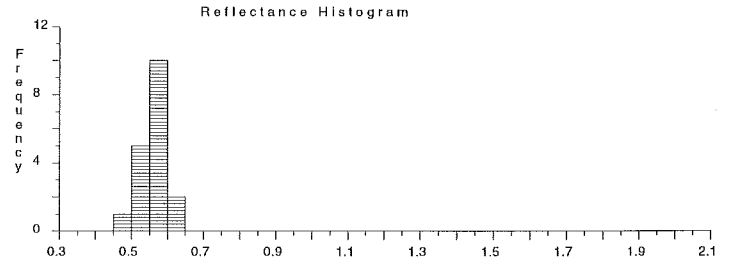
K0919A, 2640-2650m

Col >	1	2	3	4	5	6	7	8	9	0
Row 1	(0.47)	(0.43)	(0.51)	(0.52)	(0.54)	(0.45)	(0.49)	(0.40)	(0.51)	(0.52)
	(0.54)	(0.48)	(0.52)	(0.49)	(0.41)	(0.57)	(0.55)	(0.54)	(0.45)	(0.51)
	Mean	Stand Dev	Pts	Min	Max	Sum				
Total	0.50	0.05	20	0.40	0.57	9.90				
(Edit)	0.50	0.05	20	0.40	0.57	9.90				



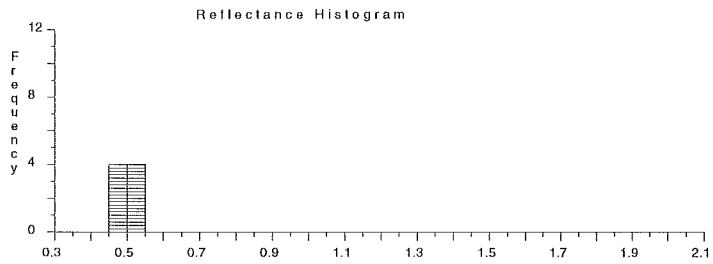
K0919B, 2790-2830m

Col >	1	2	3	4	5	6	7	8	9	0
Row 1	(0.58)	(0.59)	(0.60)	(0.57)	(0.53)	(0.54)	(0.52)	(0.58)	(0.57)	(0.59)
	(0.56)	(0.51)	(0.58)	(0.60)	(0.52)	(0.49)	(0.55)	(0.59)		
	Mean	Stand Dev	Pts	Min	Max	Sum				
Total	0.56	0.03	18	0.49	0.60	10.07				
(Edit)	0.56	0.03	18	0.49	0.60	10.07				



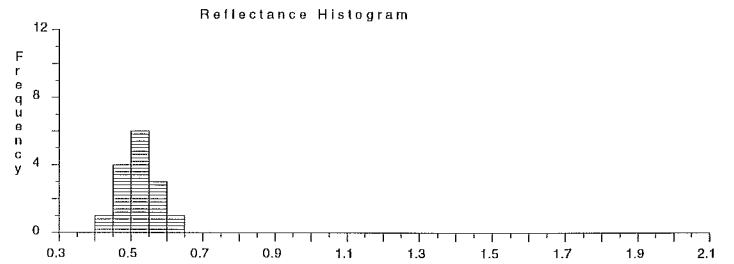
K0919C, 2970-3010m

Col >	1	2	3	4	5	6	7	8
Row 1	(0.52)	(0.46)	(0.51)	(0.51)	(0.45)	(0.51)	(0.45)	(0.48)
	Mean	Stand Dev	Pts	Min	Max	Sum		
Total	0.49	0.03	8	0.45	0.52	3.89		
(Edit)	0.49	0.03	8	0.45	0.52	3.89		



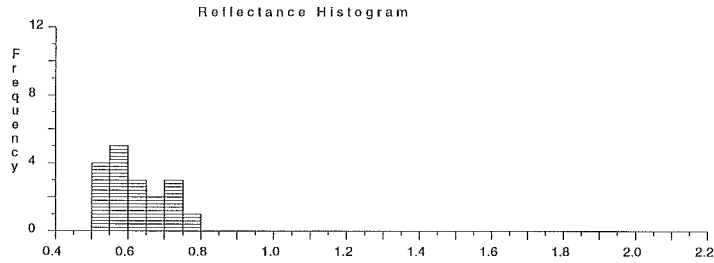
K0919D, 3150-3190m

Col >	1	2	3	4	5	6	7	8	9	0
Row 1	(0.51)	(0.48)	(0.52)	(0.49)	(0.51)	(0.57)	(0.62)	(0.51)	(0.49)	(0.57)
	(0.49)	(0.42)	(0.53)	(0.57)	(0.52)					
	Mean	Stand Dev	Pts	Min	Max	Sum				
Total	0.52	0.05	15	0.42	0.62	7.80				
(Edit)	0.52	0.05	15	0.42	0.62	7.80				



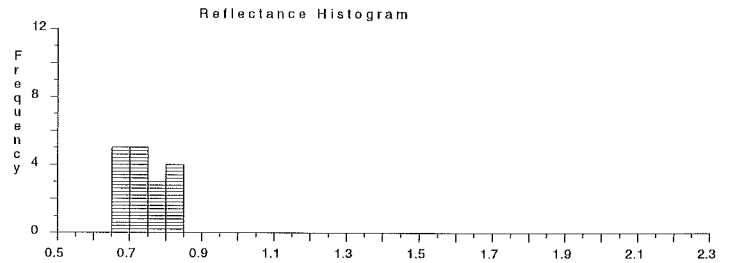
K0920A, 3330-3370m

Col >	1	2	3	4	5	6	7	8	9	0
Row 1	(0.55)	(0.70)	(0.60)	(0.61)	(0.52)	(0.67)	(0.62)	(0.54)	(0.67)	(0.58)
Total	Mean	Stand Dev	Pts	Min	Max	Sum				
(Edit)	0.61	0.07	18	0.52	0.77	11.03				
	0.61	0.07	18	0.52	0.77	11.03				



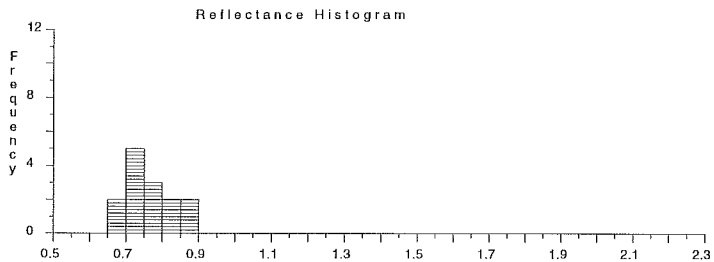
K0920B, 3510-3550m

Col >	1	2	3	4	5	6	7	8	9	0
Row 1	(0.67)	(0.84)	(0.69)	(0.73)	(0.82)	(0.66)	(0.79)	(0.82)	(0.67)	(0.76)
Total	Mean	Stand Dev	Pts	Min	Max	Sum				
(Edit)	0.74	0.06	17	0.66	0.84	12.65				
	0.74	0.06	17	0.66	0.84	12.65				



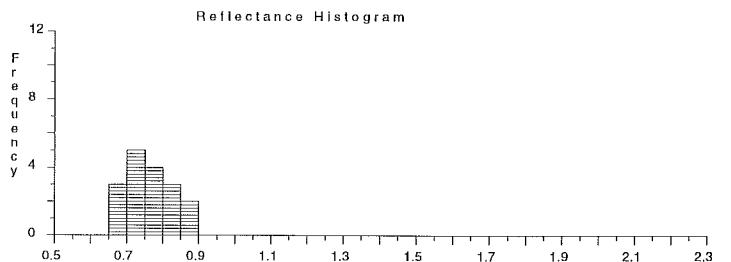
K0920C, 3690-3730m

Col >	1	2	3	4	5	6	7	8	9	0
Row 1	(0.73)	(0.86)	(0.71)	(0.83)	(0.78)	(0.65)	(0.80)	(0.73)	(0.86)	(0.76)
Total	Mean	Stand Dev	Pts	Min	Max	Sum				
(Edit)	0.76	0.06	14	0.65	0.86	10.60				
	0.76	0.06	14	0.65	0.86	10.60				



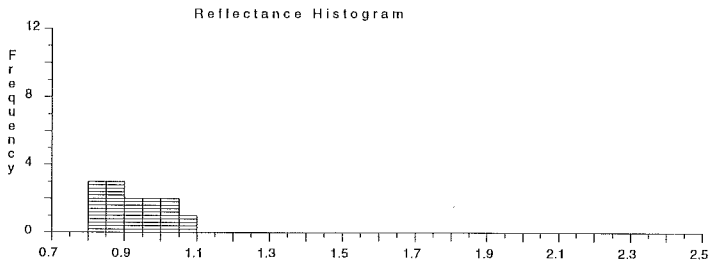
K0920D, 3870-3910m

Col >	1	2	3	4	5	6	7	8	9	0
Row 1	(0.73)	(0.88)	(0.68)	(0.75)	(0.80)	(0.83)	(0.72)	(0.72)	(0.67)	(0.84)
Total	Mean	Stand Dev	Pts	Min	Max	Sum				
(Edit)	0.76	0.07	17	0.67	0.88	12.94				
	0.76	0.07	17	0.67	0.88	12.94				



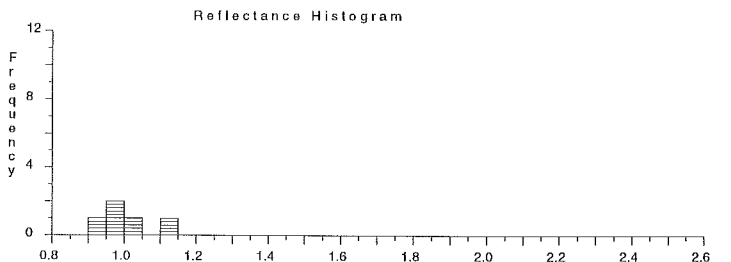
K0921A, 4050-4090m

Col >	1	2	3	4	5	6	7	8	9	0
Row 1	(0.84)	(0.89)	(1.09)	(0.90)	(0.99)	(1.02)	(0.80)	(0.83)	(0.95)	(0.87)
Total	Mean	Stand Dev	Pts	Min	Max	Sum				
(Edit)	0.92	0.08	13	0.80	1.09	11.96				
	0.92	0.08	13	0.80	1.09	11.96				



K0921B, 4230-4270m

Col >	1	2	3	4	5	
Row 1	(0.93)	(0.96)	(1.11)	(0.96)	(1.01)	
Total	Mean	Stand Dev	Pts	Min	Max	Sum
(Edit)	0.99	0.07	5	0.93	1.11	4.97
	0.99	0.07	5	0.93	1.11	4.97



K0921C, 4350-4385m

Col >	1	2	3	4	5	6
Row	(0.78)	(0.88)	(0.94)	(0.86)	(0.94)	(0.83)
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	0.87	0.06	6	0.78	0.94	5.23
(Edit)	0.87	0.06	6	0.78	0.94	5.23

K0921D, 4465-4505m

Col >	1	2	3	4	5	6	7	8	9
Row	(1.01)	(1.13)	(0.87)	(1.14)	(1.17)	(1.10)	(0.89)	(0.97)	(1.11)
	Mean	Stand Dev	Pts	Min	Max	Sum			
Total	1.04	0.11	9	0.87	1.17	9.39			
(Edit)	1.04	0.11	9	0.87	1.17	9.39			

