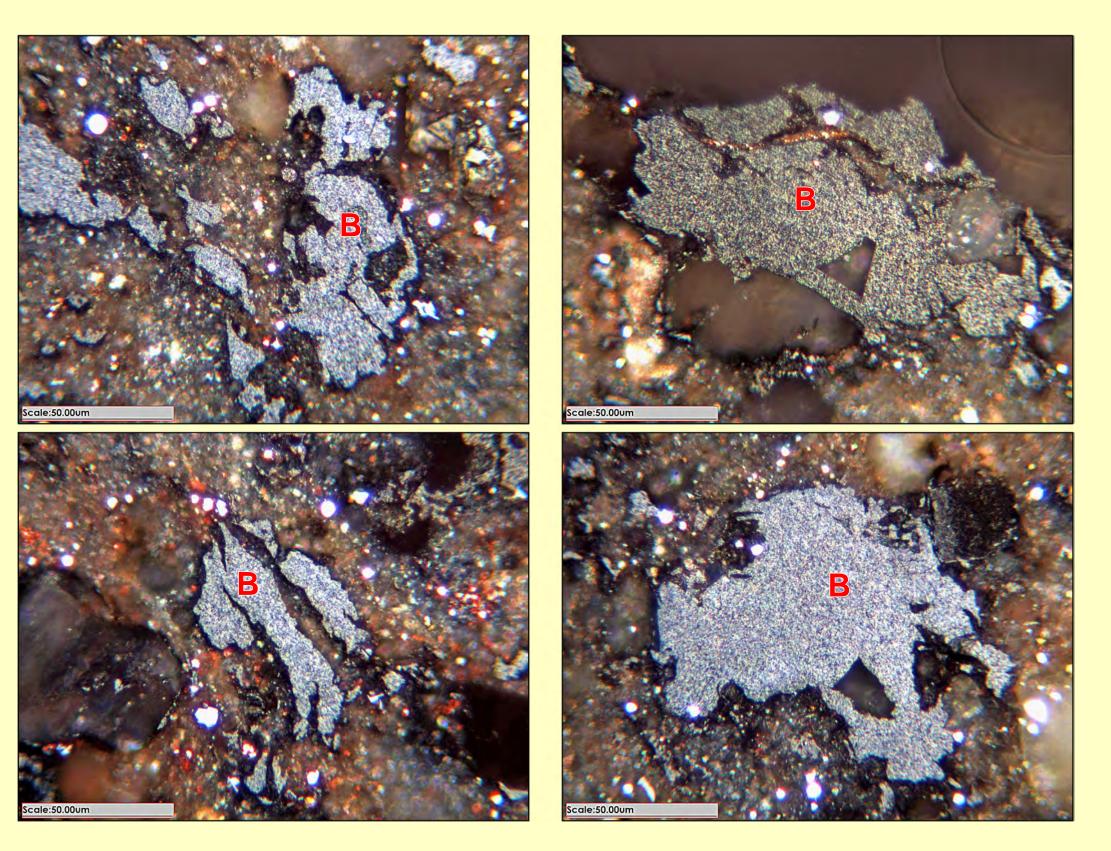


Cambrian Rogersville Shale in the Rome Trough, Kentucky and West Virginia: A Potential Unconventional Oil and Gas Reservoir in the Appalachian Basin

Organic Petrography

Solid bitumen (B) is common in the Rogersville Shale, and reflectance of this material can be measured and used to estimate thermal maturity.



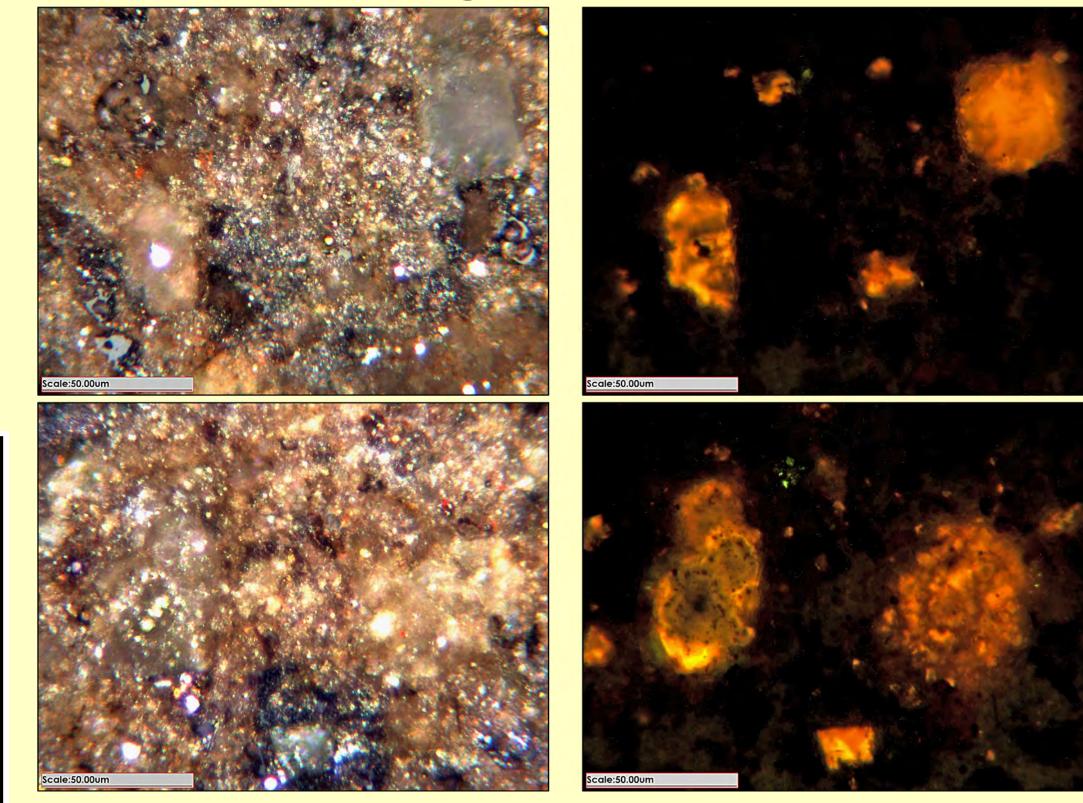
Bitumen reflectance increases (becomes brighter) as thermomaturity increases. In practice, a microscope equipped with a photomultiplier is first calibrated using a glass standard of known reflectance, and monochromatic light (546 nm). Measurements are then collected on multiple grains of bitumen in a given sample. The average of the measurements (usually 50 to 70) is considered to represent the level of thermomaturity.

In the Exxon Smith core, organic matter in the Rogersville Shale consists of amorphous marine algal macerals and solid bitumen. No identifiable *Gloeocapsomorpha prisca* microfossils were observed. Fluorescent liptodetrinite is present, despite the depth and thermal maturity of the shale in the Exxon Smith core.

API# 4709901572	Exxon #1	Smith, J P	Wayne (Wayne Co, WV			
Rogersville core "discovery" well							
Bitumen Reflectance							
Core Depth (ft, md)	11167	11178	11191	11197			
Average R _o random	1.76	1.80	1.80	1.84			
Maximum R _o random	2.11	2.11	2.04	2.10			
Minimum R _o random	1.50	1.47	1.53	1.59			
Standard deviation	0.14	0.16	0.13	0.13			
Observations/sample	50	50	50	50			
Calculated R _o equivalent	1.49	1.51	1.51	1.54			
(R _o random * 0.618) + 0.4							
(Jacobs, 1989)							
Indicated T _{max} from							
calculated R_o equiv.	480	482	482	484			
Spectral Fluorescence							
Core Depth (ft, md)	11167	11178	11191	11197			
Lambda maximum	638	648	648	645			
Indicated R _o	1.35	1.45	1.45	1.45			
Indicated T _{max} from							
Lambda max.	473	479	479	479			

Reflected white light

UV fluoresence



% Ro	Level of Petroleum Generation
<0.6	Thermally immature
0.6 – 1.1	Oil window
1.1 - 1.4	Wet gas window
1.4 - 2.0	Dry gas window
>2.0	Catagenic gas generation
>2.0	Catagenic gas generation

John Hickman (jhickman@uky.edu), Dave Harris, and Cortland Eble, Kentucky Geological Survey

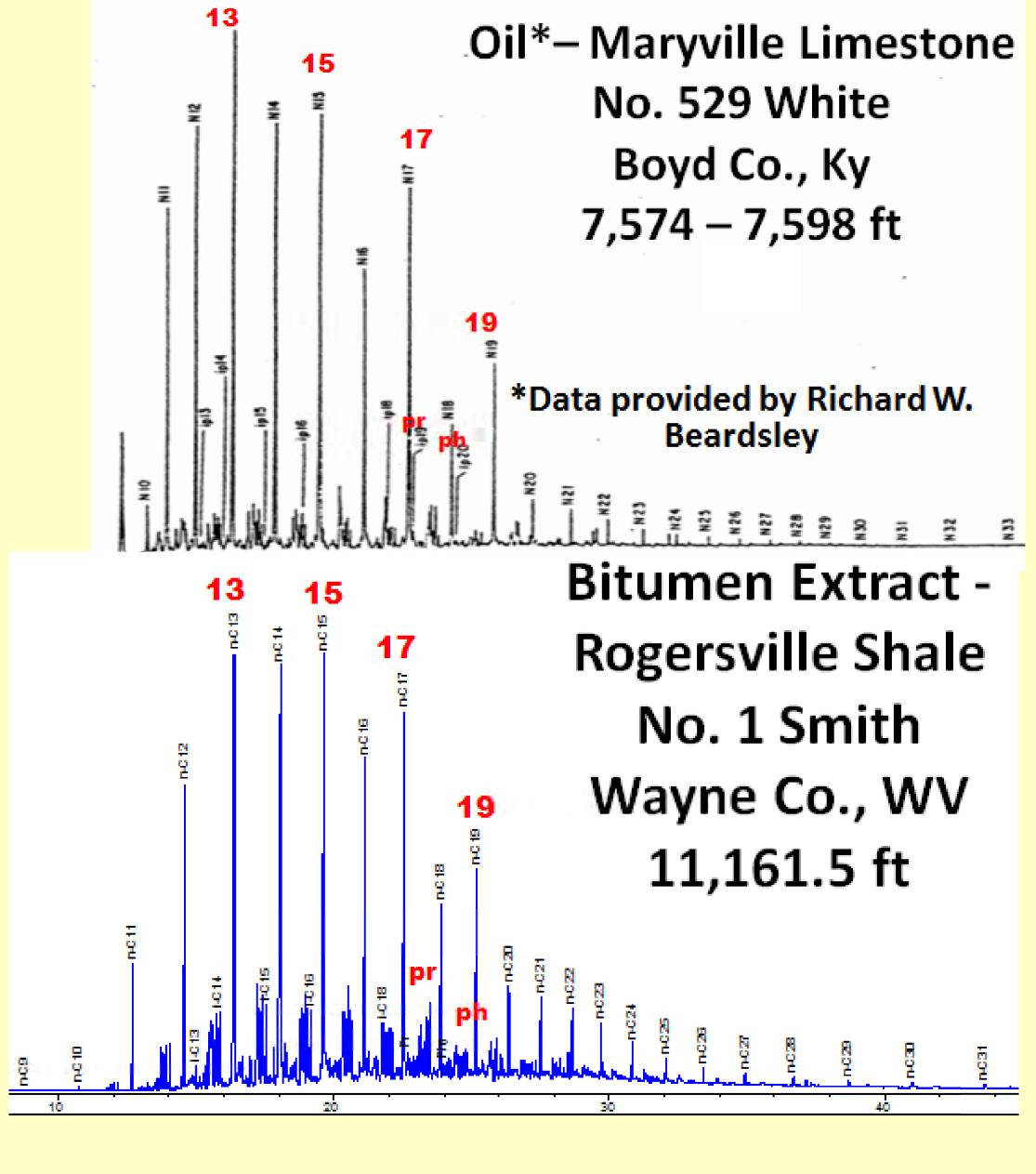
Geochemical analysis and source rock potential of the Rogersville Shale.

Imperior <td

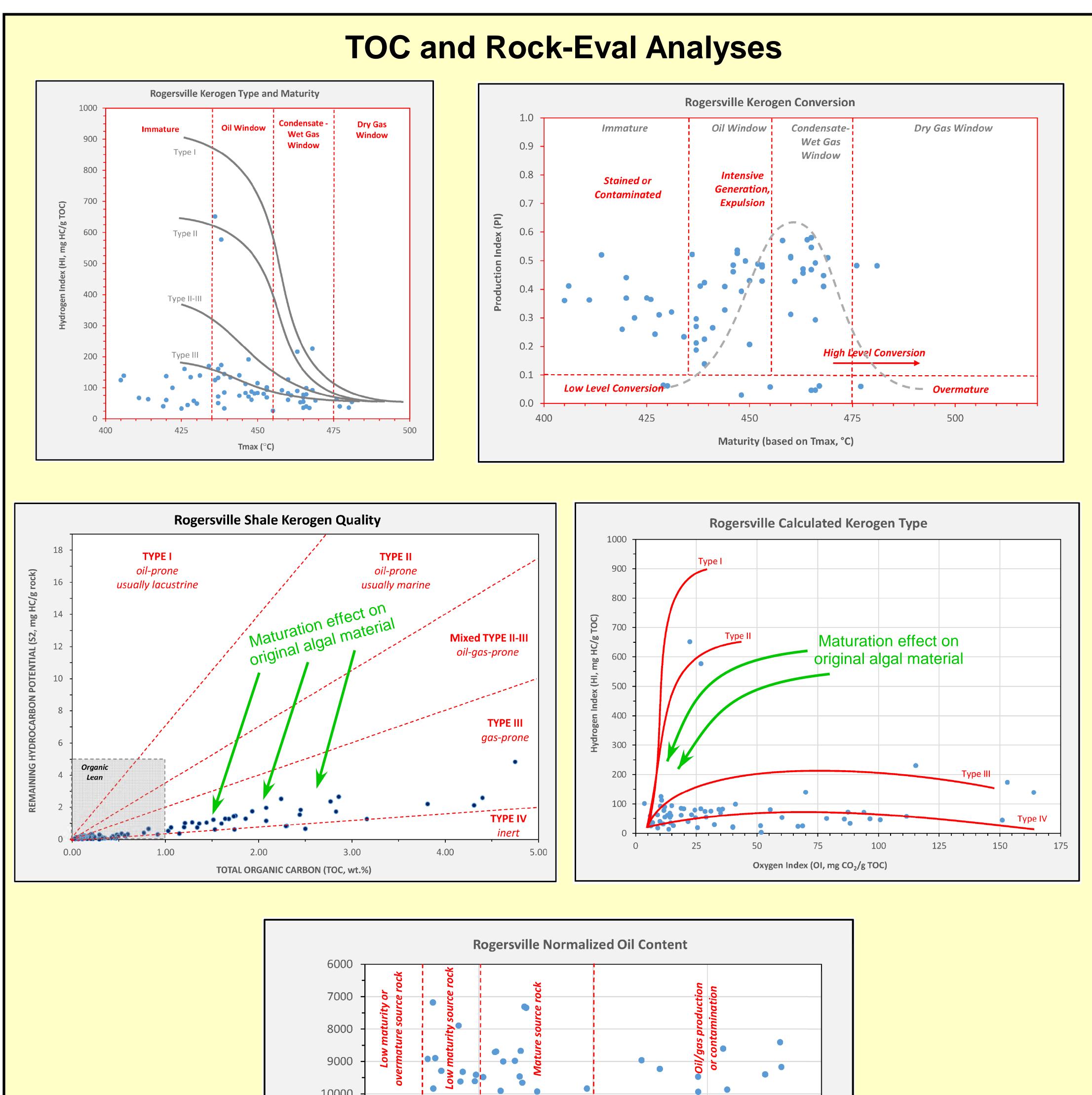
Hydrocarbons and Source Rock

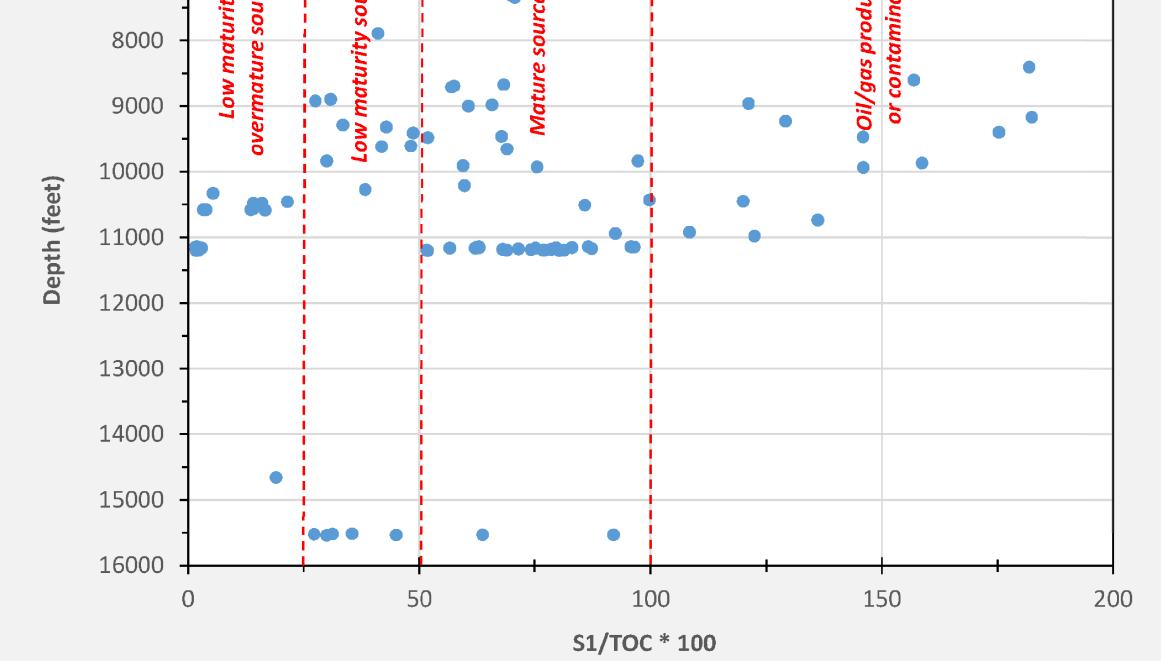
The key core was found in the Exxon #1 Smith well in Wayne County, WV, where the Rogersville Shale was cored from 11,135 to 11,201 ft. This dark gray fissile shale has up to 4.8% total organic carbon. The mud log from this well recorded shows of gas in the Rogersville interval.





Oil and condensate from Cambrian reservoirs in Ky. have a unique composition characteristic of Ordovician (and older?) source rocks containing the alga *G. prisca*. Gas chromatographs show odd-carbon normal alkanes (C13-C19) are more abundant than even alkanes. This oddcarbon predominance was also seen in bitumen extracted from the Rogersville in the Exxon Smith core. This strong similarity allows correlation of the Rogersville with produced hydrocarbons, and defines a Cambrian petroleum system in the Rome Trough.







Current wells with Rogersville Shale data

	API #	Well Name	County	State	Formation @ TD	Lat	Lon	KB Elev	TVD	Rogersville (md)	Rogersville (sstvd)	RGRV Isopach
	16025007450000	United Fuel Gas 8613T Williams, S.	Breathitt	KY	Precambrian Basement	37.536584	-83.290302	762	11118	8212	-7450	368
	16043000700000	Inland Gas 546G McDavid, E.	Carter	КҮ	Rome Formation	38.173835	-82.946759	808	9963	8000	-7192	646
	16063000030000	Monitor Petroleum 1 Ison, Cecil	Elliott	КҮ	Pumpkin Valley Shale, Conasauga Gp	38.135464	-82.960767	686	9655	8529	-7843	744
	16063000050000	Monitor Petroleum 2 Ison, I.T.	Elliott	КҮ	Rogersville Shale, Conasauga Gp	38.120610	-82.955832	794	9473	8934	-8140	(base below TD)
	16063005970000	Blue Ridge Group 1 Greene, J.	Elliott	КҮ	Rogersville Shale, Conasauga Gp	38.135643	-82.927085	696	9032	8806	-8110	(base below TD)
	16063006460000	Ashland Exploration 1 Kazee	Elliott	КҮ	Precambrian Basement	38.144773	-82.955921	727	11079	7804	-7077	568
ale	16063009750000	Hay Expl #9A WWP	Elliott	КY	Rogersville Shale, Conasauga Gp	38.090196	-83.013361	810	8469	8468	-7658	(base below TD)
Shale	16063010410000	Hay Expl 41E Simpson, M.&M.	Elliott	КҮ	Rogersville Shale, Conasauga Gp	38.103305	-82.996560	920	8842	8508	-7588	(base below TD)
ville	16065007910000	Texaco 1 Tipton, Glyn	Estill	КҮ	Rome Formation	37.672517	-84.005799	647	6809	5550	-4903	219
irsv.	16071017190000	Signal Oil & Gas 1 Hall, M.	Floyd	КҮ	Precambrian Basement	37.493262	-82.758014	701	13000	9307	-8606	405
oge	16115002450000	Ashland Exploration 1 Williams, E.	Johnson	КҮ	Rogersville Shale, Conasauga Gp	37.861278	-83.002591	809	10595	9580	-8771	917
e B	16115012660000	Columbia Gas Transmission 9784T Evans	Johnson	КҮ	Rogersville Shale, Conasauga Gp	37.972797	-82.919606	939	9975	9821	-8882	(base below TD)
the	16115012680000	ARCO Exploration 1 KY/WV Gas	Johnson	КҮ	Precambrian Basement	37.743943	-82.672058	687	10950	8853	-8166	316
ate	16115012700000	U S Signal 1 Elkhorn Coal	Johnson	КҮ	Precambrian Basement	37.802567	-82.722084	737	14542	10154	-9417	692
leti	16127018520000	Inland Gas 542 Young, W.	Lawrence	КҮ	Precambrian Basement	38.226621	-82.744489	884	12693	9203	-8319	724
Per	16129013030000	Ashland Exploration 1 Cable, M.	Lee	КҮ	Precambrian Basement	37.689761	-83.744076	1028	9644	7127	-6099	401
the	16159010420000	United Fuel Gas 8610T Jasper, James	Martin	КҮ	Rome Formation	37.856796	-82.521908	659	13160	10676	-10017	703
ells t	16175001960000	Monitor Petroleum 1 Ison, F.&E.	Morgan	КҮ	Rutledge Limestone, Conasauga Gp	37.987580	-83.039884	821	10002	8951	-8130	736
We	16193008720000	ARCO Exploration 1 Duff, J.	Perry	КҮ	Precambrian Basement	37.365798	-83.324204	1209	9659	8100	-6891	245
sting	16195037180000	Signal Oil & Gas 1 Stratton, H.	Pike	КҮ	Precambrian Basement	37.482115	-82.462953	1199	12428	10292	-9093	131
isti	16237008060000	Exxon 1 Banks, Orville	Wolfe	КҮ	Precambrian Basement	37.708602	-83.367779	1057	12259	8594	-7537	601
Exi		Gulf Oil 1 Price, W.	Russell	VA	Precambrian Basement	36.872586	-82.237169	2238	16832	14658	-12420	67
	47013025030000	Exxon 1 Gainer-Lee	Calhoun	WV	Precambrian Basement	38.880717	-81.101780	1238	20222	17408	-16170	635
	47035013660000	Exxon 1 McCoy (Stalnacker)	Jackson	WV	Precambrian Basement	38.727937	-81.572350	943	17675	14608	-13665	940
		Exxon 1 McCormick, D.E.	Lincoln	WV	Precambrian Basement	38.215185	-81.940129	767	19124	13938	-13171	1047
	47059008050000	Columbia Gas 9674T Mineral Tract 10	Mingo	WV	Precambrian Basement	37.903251	-82.170970	958	19537	13891	-12933	1096
	47079015380000	Cabot 50 Amhurst Industries	Putnam	WV	Rogersville Shale, Conasauga Gp	38.534115	-81.836249	1005	14000	13855	-12850	(base below TD)
	47099015720000	Exxon 1 Smith, J.P.	Wayne	WV	Precambrian Basement	38.219893	-82.534599	622	14625	10696	-10074	738
	16127031000000	Bruin Exploration 1 Young, Silva	Lawrence	κγ	Unreported	38.087888	-82.824320	669	PTD=15000	No da	ata released as of 6/1,	/15
ted ths		Cabot Oil & Gas 50 Amherst Industries	Putnam	wv	Unreported	38.534115	-81.836249	1004	PTD=14000		ata released as of $6/1$	
<mark>o lit</mark>		Confidential - Strat Test	Lawrence	кү	Unreported	?	?	?	?		ata released as of $6/1$	
oeri 8 n		Confidential - Strat Test	Lawrence	КҮ	Unreported	?	?	?	?		ata released as of $6/1$	
<mark>lls </mark> st 1		Confidential - Strat Test	Lawrence	КҮ	Unreported	?	?	?	?		ata released as of $6/1$	
<mark>We</mark> n la		Bruin Exploration 1 Walbridge Holdings, LLC	Lawrence	КҮ	Unreported	38.013012	-82.616128	620	PTD=15000		ata released as of $6/1$,	
ew Ithi		Horizontal Technology 572360 EQT Production Co.	Johnson	КҮ	Unreported	37.911750	-82.803907	929	PTD=15000		ata released as of $6/1$	
ŽŠ		Confidential - Strat Test	Lawrence	кү	Unreported	?	?	?	?		ata released as of 6/1,	

Conclusions

- A viable Cambrian petroleum system exists in the Southern Appalachian Basin. The Rogersville Shale (Conasauga Group) is the primary source interval.
- The Rogersville Shale is 5,000 to 10,000 ft deep in Kentucky, and up to 1,100 ft thick
- It contains up to 4.8% total organic carbon, and has generated gas and condensate
- Source rock quality in the Rogersville is variable. Controls on TOC distribution are not well understood.
- Shallower, less mature areas likely to be more liquids-prone than deeper areas in WV
- A Rogersville unconventional gas or liquids play should be possible in higher TOC areas, but economics will be a challenge due to depth and low prices.
- Eight new wells have been permitted to test the Rogersville Shale to date; all results remain confidential.

All of the data presented in this poster is available on request from the Kentucky Geological Survey in Lexington, Ky. http://www.uky.edu/KGS