Research LAUNCHER Program

About You

First Name: _____Hang_____ _____ Last name: _____ _____Deng_____ __

Company/University: _____ the University of Oklahoma _____

Check which apply to you: ■ Student ☐ Non Student ☐ Independent Researcher ☐ Professor ☐ Corporate Research ☐ Other

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Short Bio: (250 words or less)

Hang Deng is currently a MS student in Geology at the University of Oklahoma. He is working on the stratigraphic analysis and modeling of the Wufeng-Longmaxi shale formation in the Sichuan Basin with Dr. Roger M. Slatt at the Institute of Reservoir Characterization.

Hang also worked as an intern geologist in Shell China Exploration & Production Company. He completed the analog study of shale reservoirs while at Shell.

Before starting his MS, Hang completed BS degrees from China University of Petroleum (Beijing) and Missouri University of Science and Technology (MS&T). His senior thesis was the geochemical analysis on the black coatings on the Jefferson City Dolomite with implications to the paleoclimate while he was advised by Dr. David J. Wronkiewicz at MS&T.

After completing his MS degree, Hang plans to continue his education and pursue a PhD degree with emphasis on sedimentology and stratigraphy.

Project Description

1. Name of project _____Multiscale stratigraphic characterization and modeling of the Wufeng-Longmaxi shale formation in the Sichuan Basin, China _____

2. Brief synopsis/areas of geosciences or engineering (50-75 words)

This research emphasize on sedimentology, stratigraphy, sedimentary petrology, as well as organic and inorganic geochemistry with applications to mudrock studies. This research attempts to investigate the outcrop analogue of the Wufeng-Longmaxi formation and employ current analytical methods for sample analysis to understand the stratigraphic variations of the formation, allowing for a better prediction of the subsurface features.

3. Bullet list of 5-7 main outcomes/goals.

The objectives of this research are:

- Document and interpret the outcrop-based stratigraphic variations of the Wufeng-Longmaxi shale formation in the Sichuan Basin with comparison to the subsurface data, allowing for better understanding the subsurface.

- Interpret the depositional environment, depositional processes and controls that form the sedimentary facies, identify high-frequency stratigraphic cycles, and define the stratigraphic architecture of the formation.
- Generate a depositional model with sequence stratigraphic analysis to illustrate the stratigraphic evolution of the Wufeng-Longmaxi formation, allowing for better understanding the formation and predicting the stratigraphic variations in the areas with limited data control.
- Generate a Petrel (TMSchlumberger) model with input from the collected data for better understanding the local property variations of the formation, provide a petrophysical model that may help with statistically modeling the regional variations of the formation characteristics.
- Provide an analogue for exploration and production of other unconventional reservoirs in the United States and other countries.

4. In two or three sentences, describe why your research is important. Please mention who will benefit from your work.

Most shales have a number of fundamental properties in common, but there are big differences in these properties which may affect the reservoir performances while studying them in detail. The Wufeng-Longmaxi shale formation was buried deeper and is more structurally complex than most shales in the United States, which increase the difficulty for research as well as exploration and production of hydrocarbon resources. This research will benefit geologists who are working on the Wufeng-Longmaxi formation and/or shales in the United States and other countries by providing a detailed analogue and methods of research.

5. Timeline with milestones (12 month/18 month)

Timeline	Milestones (Events)
First 12 months	- Dec 2014; Additional data collection - Dec 2014 – Feb 2015: Data analysis and Interpretation - April 2015 Present the research work in the International Shale Plays Geoscience Technology Workshop - May/June 2015: Complete thesis for MS degree
First 18 months	- Dec 2015 – May 2016: double-check the data set, and may collect more data, start writing for publication.

6. Funding amount needed to achieve first basic goals within 12 months. Please provide a brief summary overview of your budget. List costs of 5-10 main items.

Item/Analysis	Rate	Total Amount
Thin Sections (~9 thin sections)	$75/section for large format thin section (2*3 inches, Prograding Rock Services rate)	$675
LECO Total Organic Carbon (TOC)	$35/sample (GeoMark rate) * 35 samples	$1225
XRD analysis	$50/sample for bulk mineralogy * 35 samples	$1750
Travel for field work	$0.56/mile (standard rate) * 3200 miles (approximation)	$1792
		Total: $ 5442
		Total Requested: $ 5442

Justifications: Most analysis of the samples has been completed before with the support from Dr. Roger M. Slatt. This research results provide a good outcrop analogue to the subsurface, allowing for better understanding the subsurface. However, analysis of the rest samples are necessary to reduce the uncertainty of the intervals without sample analysis. The rates for these additional analyses are listed above, which will need external fund. The funds from Dr. Slatt and the institute of Reservoir Characterization are not listed in case of confusion. The analyses of more samples will help in better understanding the Wufeng-Longmaxi shale formation. Besides, the detailed documentation with an adequate amount of data from sample analyses will provide a better analog while using for exploration and production of unconventional shale resources in the United States and other countries.

7. In the process of gaining background knowledge in the field of your proposed research, who did you find to be the top two or three researchers? What are the main concepts that are being explored? Please briefly describe.

Top researchers on mudrock reservoir studies	Affiliations
Roger M. Slatt, Younane N. Abousleiman, Kurt J. Marfurt	the University of Oklahoma (OU)
Bob G. Loucks, Kitty L. Milliken, Stephen Ruppel, Harry Rowe and more	Mudrock Systems Research Laboratory, Bureau of Economic Geology (BEG)
Paul E. Potter	University of Cincinati
Juergen Schieber	Shale Research Lab, Indiana University (IU)

Main concepts that are being explored are listed below:

Applying sequence stratigraphic analysis to the mudrock studies (OU, BEG)

Geomechanics as well as predicting the behaviors and influences of natural and induced fractures while hydraulic fracturing (OU)

Seismic attributes with applications to predict mudrock properties (OU)

Mudrock reservoir quality and the controls that affect the reservoir quality (BEG)

Applying chemostratigraphic methods to the mudrock studies and the various implications from elemental centration and associations (BEG)

Delineating shale depositional processes through experiments (IU)

8. Please provide a photo of yourself and a photo related to your proposed project. It will be very helpful in publicizing your project and potentially securing funding.

Please see attachments.

9. Who will benefit? This research will benefit geologists who anticipate to employ analogue studies to compare to their current research/projects on geology of unconventional shale reservoirs for a better understanding of their research/projects. This research will benefit geologists from academia and/or industry who study the Wufeng-Longmaxi formation for scientific research and/or exploration and production for unconventional hydrocarbon resources as well.

AAPG Research LAUNCHER supporters receive

The opportunity to work directly with you and receive reports, information, and findings, depending on the level of support.

The Deal

The researcher agrees to:

- ❖ Develop a brief public presentation on the research to be made available to AAPG
- ❖ Share an annotated bibliography and review of relevant published articles
- ❖ Present research findings on project at an AAPG Forum, GTW, or Research Symposium
- ❖ Write a detailed report on the results of your research to be made available to LAUNCHER supporters

❖ Write a extended abstract on the results of your research to be made available to AAPG

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Thank you for submitting your research proposal to the AAPG Research LAUNCHER Program. Your proposal will be reviewed and upon acceptance you will be contacted by AAPG Education/Research. If your proposal is accepted, we will publicize your proposal and encourage funders to contact you directly. AAPG does not guarantee funds nor have any connection with the success or failure of the endeavor. The goal is to support scientific research in the petroleum geosciences and engineering and launch the next generation of geological advances.

Hang Deng   12/12/2014

_____   _____   _____   _____
Research Candidate (print)   Date   AAPG Education/Research (print)   Date

                                             12/12/2014

_____   _____   _____   _____
Research Candidate (sign)   Date   AAPG Education/Research (sign)   Date

AAPG Education/Research

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Photo. 1 concretions in the Wufeng-Longmaxi formation (ruler scale = 1 foot)

Photo. 2 calcite-mineralized shear fractures in the Wufeng-Longmaxi formation

0.5 m