



# AAPG

## Research LAUNCHER Program

### About You

First Name: Wan Last name: Yang

Company/University: Missouri University of Science and Technology

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

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Short Bio: (250 words or less)

#### **Education and Employment History:**

2010-present, associate professor, graduate coordinator, Geology & Geophysics Program, Missouri S&T, Rolla, Missouri

1999-2010, assistant and associate professor, graduate coordinator, department chair (2007-2010), Geology Department, Wichita State University, Wichita, Kansas.

1997-1999, research associate, Bureau of Economic Geology, University of Texas at Austin, Austin, Texas.

1995-1997, explorationist, International E&P, Phillips Petroleum Company, Bartlesville, Oklahoma.

1990-1995, Ph.D. student, Dept. of Geological Sciences, University of Texas at Austin. Degree awarded in 1995.

1988-1990, MS student, Geology Dept., California State University, Fresno, California. Degree awarded in 1991.

#### **Courses taught in Missouri S&T and Wichita State University:**

Advanced Stratigraphy and Basin Analysis, Petroleum Geology, Sedimentology and Stratigraphy, Clastic Depositional Systems, Sandstone Petrography, Carbonate Sedimentology, Physical Geology, Advanced Physical Geology, Environmental Geology, Paleoclimatology, Chinese Summer Field Course.

**Research interests:** Sedimentology, stratigraphy, petroleum geology, paleoclimatology.

**Current and past graduate students conducting independent researches under my supervision in Missouri S&T since 2010:** 8 undergraduate students, 10 MS students, 5 Ph.D. students.

#### **Professional Affiliations:**

Membership of AAPG, SEPM (permanent), GSA (also limnology and sedimentary), AGU, Kansas Geological Society, Association of Missouri Geologists.

Representative of Midcontinent Section in House of Delegates of AAPG, member of Nomination and Election Committee of House of Delegates of AAPG (2013 to present).

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

- Siliciclastic and carbonate petrography, sedimentology, depositional systems, sequence stratigraphy, using outcrop, well, and seismic data.
- Petroleum systems analysis on characterization of source and reservoir rocks, and primary and secondary migration pathways.
- Basin analysis involving provenance analysis, stratigraphic architecture, and basin-filling history.
- Paleoclimatic conditions and their control on sedimentation, stratigraphy, and quality and distribution of source and reservoir rocks.

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

- Sedimentological and stratigraphic characteristics of lithofacies and depositional systems in the Permian-Lower Triassic fluvial-lacustrine sediment fill in a half graben in the greater Turpan-Junggar basin, NW China.
- Construction of a cyclo- and sequence stratigraphic framework of the fluvial-lacustrine fill to delineate the stratigraphic architecture of potential source, reservoir, and seal rocks.
- Experiment and establish effective time-stratigraphic correlation strategies in nonmarine intracontinental rift basins.
- Reconstruct basin-filling history to assess the types and mechanisms of major controlling processes on sediment infilling in a half graben.
- Petrographic and geochemical characterization of organic-rich shale and oil shale in Lower Permian Lucaogou Formation.
- Assess the source-reservoir-seal elements and maturation, primary and secondary migration, trapping, and accumulation processes of the Permian-Lower Triassic petroleum system in the adjacent Tu-Ha and Junggar petroliferous basins.

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

Fluvial-lacustrine rocks in continental rift basins contain abundant hydrocarbon source, reservoir, and seal rocks and proven reserves. This research will: 1) provide outcrop analogs of the occurrence, pattern, and distribution of potential source, reservoir, and seal rocks through reconstructing the stratigraphic architecture of fluvial-lacustrine fills; 2) establish a predictive depositional model with improved understanding of the processes controlling the deposition of such rocks; and 3) develop effective methodologies in stratigraphic correlation of such rocks. Oil companies exploring conventional and unconventional resources in nonmarine rift basins in this and other similar basins will benefit.

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

- Summer of 2014: Fieldwork, measuring two Permian-Lower Triassic sections, ~1000 m thick each section. One inside the Tarlong-Taodongou half graben, the other in Zhaobishan, ~150 km east to the east of the graben.
- Fall, 2014-May 2015: Petrographic study of sandstone, limestone, and shale samples. Interpretations of depositional systems and cyclo- and sequence stratigraphy of the two sections. Tentative time-stratigraphic correlation among 5 sections, 3 of which were measured in previous fieldwork.
- Summer of 2015: Fieldwork, measuring supplemental sections, collection of supplemental samples.

- Fall, 2015 – May 2016: Biomarker analysis of organic-rich shale and oil shale. Sequence stratigraphic interpretation of 36 2-D seismic sections in the adjacent Tu-Ha Basin, which were acquired from Tu-Ha Bureau of Exploration, PetroChina Corp. Correlation among outcrop sections and seismic sections. Interpretation of stratigraphic architecture and basin filling history, and assessment of petroleum systems.

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.

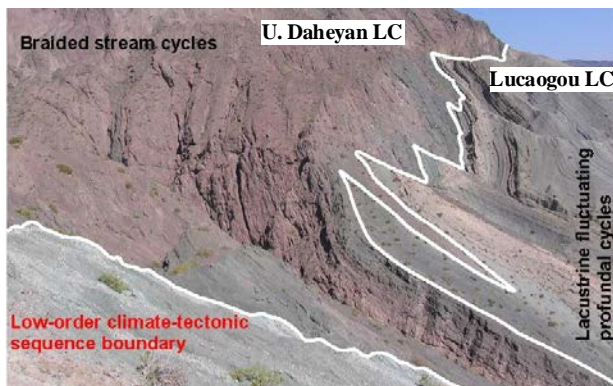
1. Round-trip international airfare for PI, 3 students (1 Ph.D., 2 MS):  $\$2200 \times 4 = \$8,800$ . For 2014 fieldwork in NW China.
  2. Field vehicle rental and gasoline:  $\$100/\text{day} \times 60 \text{ days} = \$6,000$ . Students and I will camp out during fieldwork.
  3. Stipend for PI and students in summer of 2014:  $\$7000/\text{month} \times 2 \text{ months (PI)} + \$1500/\text{month}/\text{student} \times 3 \text{ students} \times 2 \text{ months} = \$23,000$ .
  4. Thin section making:  $\$25/\text{section} \times 100 \text{ thin sections} = \$2,500$ .
  5. Biomarker analysis in Organic Geochemical Lab, Chinese Academy of Sciences:  $\$20/\text{sample} \times 50 \text{ samples} = \$1,000$ .
  6. XRD analysis of shale samples in Missouri S&T:  $\$20/\text{sample} \times 50 \text{ samples} = \$1,000$ .
  7. Zircon U/PB age dating of bentonites using ID-TIMS method at Boise State University:  $\$2000/\text{sample} \times 3 \text{ samples} = \$6,000$ .
- Total: \$48,000.**

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.

Alan Carroll and Kevin Bohac's stratigraphic classification of ancient lakes (Carroll, A.R. and Bohacs, K.M., 1999; Carroll, A.R. and Bohacs, K.M., 2001) established a model that serves as both a guide and a testable model in studying ancient stratigraphic records of lakes and associated environments.

Fluvial-lacustrine fills in rift basins contain abundant hydrocarbon source and reservoir rocks. However, stratigraphic complexities intrinsic to nonmarine environments challenge reconstruction of the architecture and history of fluvial-lacustrine fills and hamper petroleum exploration. The reconstruction can be most effectively done in a sequence-stratigraphic context. This study focuses on one half-graben, the basic catchment and accommodation unit of all rift basins, to understand processes controlling fluvial-lacustrine sedimentation and develop effective methodologies in nonmarine sequence stratigraphy to resolve inherent difficulties in intermontane settings. The working hypotheses include: (1) fluvial-lacustrine sedimentary cycles are hierarchical time-stratigraphic entities corresponding to cycles of sedimentation controlled by autogenic and allogenic processes; and (2) spatial cycle correlation can be done accurately using a process-response approach. Local autogenic cycles can be differentiated from allogenic cycles to establish a regional time-stratigraphic framework. Accurate cycle delineation and interpretation of controlling processes are key to understanding the temporal and spatial evolution of continental paleoenvironments. Detailed field and petrographic data from superbly-exposed Permo-Triassic outcrops in the Bogda Mountains, NW China, will be used to identify and correlate multi-order cycles over 0.1-100-km distances. Depositional systems analysis within a sequence-stratigraphic framework will establish process-response depositional models under variable tectonic and climatic conditions, which will guide such analyses in other rift basins.

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.



9. Who will benefit?

Four to five undergraduate, master, and Ph.D. students in this team will benefit directly by conducting micro- to macro-scale, outcrop, laboratory, and seismic observations and analyses of stratigraphic records. The relevance of their research methods and results to conventional and unconventional hydrocarbon exploration and production will enable to become solid professional geologists in the future. Samples collected and results of study will be used in several classes and labs that PI and graduate students teach to enhance the learning by other undergraduate and graduates in Missouri S&T. In this aspect, the petroleum industry and our society in general are the ultimate beneficiary of this research. This research will also benefit the PI and the Geology and Geophysics Program of Missouri S&T in developing active research programs that attract future undergraduate and graduate students interested in sedimentology, stratigraphy, and petroleum geology.

**AAPG Research LAUNCH 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
- ❖ Create 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.

Wan Yang

March 28, 2014

Research Candidate (print)

Date



March 28, 2014

Research Candidate (sign)

Date

AAPG Education/Research (print)

Date

AAPG Education/Research (sign)

Date

**AAPG Education/Research**

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