

# Bei Liu

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## EDUCATION

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**Ph.D.** in Geological Sciences, Indiana University, Bloomington, IN 08/2015–07/2020  
Dissertation: Organic matter accumulation, thermal maturation, and organic pores development in the Upper Devonian New Albany Shale, Illinois Basin  
Advisory Committee: Juergen Schieber (Chair), Maria Mastalerz, Simon Brassell, Abhijit Basu

**M.Eng.** in Mineral Resources Prospecting and Exploration, China University of Geosciences, Beijing, China  
Thesis: Geochemical characteristics of trace elements and rare earth elements in the Upper Paleozoic coals from the Qinshui Basin 09/2012–07/2015  
Advisor: Wenhui Huang

**B.Sc.** in Materials Chemistry, China University of Geosciences (Beijing), Beijing, China 09/2008–07/2012

## PROFESSIONAL APPOINTMENTS

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Indiana University Bloomington Postdoctoral Fellow 08/2020–present  
Supervisors: Juergen Schieber, Maria Mastalerz

## RESEARCH INTERESTS

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- Sedimentology and Stratigraphy, Diagenesis
- Petroleum Geology, Coal Geology, Organic Petrology and Geochemistry
- Shale Oil/Gas, Tight Reservoir Characterization

## RESEARCH EXPERIENCES

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08/2020–present, **Postdoctoral Fellow**, Indiana University Bloomington

**Project 1:** Shale Gas: Geochemical and Physical Constraints on Genesis, Storage, and Producibility, funded by U.S. Department of Energy, Basic Energy Sciences

- Long-term heating experiments to study methane generation in shales at low temperatures
- Catalytic effects of clay minerals on methane generation in shales at low temperatures
- Compositional control on shale pore structure at different stages of thermal maturation
- Porosity and permeability of shales through MICP analysis

**Project 2:** Marine Shale Sedimentation in Sichuan Basin, funded by China National Petroleum Corporation

- Lithofacies assignment of the Upper Ordovician Wufeng Formation and the Lower Silurian Longmaxi Formation shales
- Stratigraphic and lateral distribution patterns of different lithofacies
- Petrographic characteristics of shales of different lithofacies under an optical microscope and SEM
- Identify the distinct characteristics of well logs (e.g., gamma ray, bulk density) of different lithofacies and conduct subsurface correlation
- Establish a depositional model for the Wufeng-Longmaxi black shale succession

08/2015–07/2020, Indiana University Bloomington

**Ph.D. Dissertation:** Study on the Upper Devonian New Albany Shale in the Illinois Basin

- Organic matter distribution within a sequence stratigraphic framework
- Variation of rock mechanical properties within a sequence stratigraphic framework
- Black shale diagenesis and its control on shale reservoir properties
- Organic matter transformation during thermal maturation
- SEM petrography of dispersed organic matter in black shales

09/2012-07/2015, **Research Assistant**, China University of Geosciences (Beijing)

**Project 1:** Distribution characteristics and modes of occurrence of hazardous trace elements in coals from major coal-producing areas in North China., funded by the National Basic Research Program of China

- Organic petrographic (thermal maturity and maceral composition) characteristics of coals from the Qinshui Basin, North China
- Mineralogical composition and content, sulfur content and its forms, and hazardous trace elements (e.g., Hg, and As) content and modes of occurrence in coals from the Qinshui Basin, North China

**Project 2:** Geological controls on the reservoir properties of No. 3 and No. 15 coal seams of the Qinshui Basin, funded by the National Science and Technology Major Project of China

- Coal rank, quality, petrographic and geochemical compositions of coals from the No. 3 and No. 15 coal seams of the Qinshui Basin
- Reservoir properties such as porosity and permeability of coals and geological controls
- Methane adsorption capacity of coals and its influencing factors

## TEACHING EXPERIENCES

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- **TA** for “Journey to Mars” at Indiana University Fall 2020

## FIELD EXPERIENCES

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- Devonian Shale Field Trip in the eastern US 05/23/2019–06/01/2019
- Field study of the Cretaceous Tununk Shale Member of the Mancos Shale Formation in the Henry Mountains Region, Utah 08/13/2016–08/26/2016, 10/13/2016–10/22/2016
- Several short field trips to study the sedimentology and sequence stratigraphy of the Devonian New Albany Shale and Ohio Shale in KY 2016–2019

## SHORT COURSES

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- Organic Petrography and Biomarker and Isotope Geochemistry of Unconventional Systems, TSOP 2019 Annual Meeting Short Course at Bloomington, IN. 09/08/2019
- Southern California Deepwater Reservoir Modeling, ExxonMobil Short Course at Madison, WI. 10/25/2019–10/27/2019

## TECHNICAL SKILLS

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- **Software:** BasinMod, Stereonet, Surfer, Neuralog, Adobe Illustrator, and Microsoft Office products.
- **Lab Work:** Experienced in using reflected-light and transmitted-light microscopes and SEM.

## HONORS & AWARDS

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E.R. Cumings Award, Department of Earth and Atmospheric Sciences, IU

2020

AAPG Foundation Grants-in-Aid Award	2019
GSA Graduate Student Research Grant	2018
Research Grant-in-Aid Award, Department of Geological Sciences, IU	2018
GSA Graduate Student Research Grant	2017
John Barrett Patton Award, Indiana Geological and Water Survey	2017
Research Grant-in-Aid Award, Department of Geological Sciences, IU	2016
Distinguished Master Thesis, China University of Geosciences (Beijing)	2015
Distinguished Master Graduate, China University of Geosciences (Beijing)	2015
National Scholarship for Graduate Students, Ministry of Education of China	2014
National Scholarship for Graduate Students, Ministry of Education of China	2013

### **PEER-REVIEWED JOURNAL ARTICLES**

12. Teng, J., Deng, H., **Liu, B.**, Chen, W., Fu, M., Xia, Y., Yu, H., 2021. Insights of the pore system of lacustrine shales from immature to late mature with the aid of petrology, mineralogy and porosimetry: A case study of the Triassic Yanchang Formation of the Ordos Basin, North China. *Journal of Petroleum Science and Engineering* 196, 107631, doi: 10.1016/j.petrol.2020.107631.
11. **Liu, B.**, Teng, J., Mastalerz, M., Schieber, J., 2020. Assessing the thermal maturity of black shales using vitrinite reflectance: Insights from Devonian black shales in the eastern United States. *International Journal of Coal Geology* 220, 103426, doi: 10.1016/j.coal.2020.103426.
10. **Liu, B.**, Schieber, J., Mastalerz, M., Teng, J., 2020. Variability of rock mechanical properties in the sequence stratigraphic context of the Upper Devonian New Albany Shale, Illinois Basin. *Marine and Petroleum Geology*, 112, 104068, doi: 10.1016/j.marpetgeo.2019.104068.
9. **Liu, B.**, Mastalerz, M., Schieber, J., Teng, J., 2020. Association of uranium with macerals in marine black shales: Insights from the Upper Devonian New Albany Shale, Illinois Basin. *International Journal of Coal Geology*, 217, 103351, doi: 10.1016/j.coal.2019.103351.
8. Qiu, Z., **Liu, B.\***, Dong, D.\*, Lu, B., Yawar, Z., Chen, Z., Schieber, J., 2020. Silica diagenesis in the Lower Paleozoic Wufeng and Longmaxi Formations of the Sichuan Basin, South China: Implications for reservoir properties and paleoproductivity. *Marine and Petroleum Geology*, 121, 104594, doi: 10.1016/j.marpetgeo.2020.104594.
7. Teng, J., Mastalerz, M., **Liu, B.\***, Gognat, T., Hauser, E., McLaughlin, P., 2020. Variations of organic matter transformation in response to hydrothermal fluids: Example from the Indiana part of the Illinois Basin. *International Journal of Coal Geology*, 219, 103410, doi: 10.1016/j.coal.2020.103410.
6. **Liu, B.**, Schieber, J., Mastalerz, M., Teng, J., 2019. Organic matter content and type variation in the sequence stratigraphic context of the Upper Devonian New Albany Shale, Illinois Basin. *Sedimentary Geology*, 383, 101–120, doi: 10.1016/j.sedgeo.2019.02.004.
5. Schieber, J., Miclăuş, C., Seserman, A., **Liu, B.**, Teng, J., 2019. When a mudstone was actually a “sand”: Results of a sedimentological investigation of the bituminous marl formation (Oligocene), Eastern Carpathians of Romania. *Sedimentary Geology*, 384, 12–28, doi: 10.1016/j.sedgeo.2019.02.009.

4. **Liu, B.**, Schieber, J., Mastalerz, M., 2017. Combined SEM and reflected light petrography of organic matter in the New Albany Shale (Devonian-Mississippian) in the Illinois Basin: A perspective on organic pore development with thermal maturation. *International Journal of Coal Geology*, 184, 57–72, doi: 10.1016/j.coal.2017.11.002.
3. **Liu, B.**, Huang, W., Ao, W., Yan, D., Xu, Q., Teng, J., 2016. Geochemistry characteristics of sulfur and its effect on hazardous elements in the Late Paleozoic coal from the Qinshui Basin. *Earth Science Frontiers*, 23(3): 59–67. (in Chinese with English abstract).
2. **Liu, B.**, Huang, W., Ao, W., Yan, D., Xu, Q., Teng, J., 2015. Geochemistry characteristics of rare earth elements in the late Paleozoic coal from Qinshui Basin. *Journal of China Coal Society*, 40(12): 2916–2926. (in Chinese with English abstract).
1. **Liu, B.**, Huang, W., Ao, W., Zhang, S., Wu, J., Xu, Q., Teng, J., 2014. Occurrence characteristics of minerals and their influences on physical properties of coal reservoirs in southern Qinshui Basin. *Geoscience*. 28(3), 645–652. (in Chinese with English abstract).

#### **MANUSCRIPTS UNDER REVIEW AND IN PREPARATION**

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Teng, J., Mastalerz, M., **Liu, B.** Petrographic and chemical structure characteristics of amorphous organic matter in marine black shales: Insights from Pennsylvanian and Upper Devonian black shales in the Illinois Basin. (in preparation).

**Liu, B.**, Teng, J., Mastalerz, M., Schieber, J., Schimmelmann, A., Bish, D. Compositional control on shale pore structure across a maturation gradient: Insights from the Devonian New Albany Shale and Marcellus Shale. (in preparation).

**Liu, B.**, Schieber, J., Mastalerz, M., Teng, J. Black shale diagenesis in the Upper Devonian New Albany Shale, Illinois Basin: Implications for source-rock reservoir properties. (in preparation).

#### **BOOK CHAPTER**

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**Liu, B.**, Schieber, J., Mastalerz, M., 2019. Petrographic and micro-FTIR study of organic matter in the Upper Devonian New Albany Shale during thermal maturation: Implications for kerogen transformation. In: Camp, W., Milliken, K., Taylor, K., Fishman, N., Hackley, P., and Macquaker J. (Eds.), *Mudstone Diagenesis: Research Perspectives for Shale Hydrocarbon Reservoirs, Seals, and Source Rocks*. AAPG Memoir 120, 165–188, doi: 10.1306/13672216M1213380.

#### **INVITED TALK**

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Organic matter in black shales: From basin scale to nanometer scale. Southern Unconventional Resources Collaboratory of Excellence Distinguished Lectures Series. University of Louisiana at Lafayette, Lafayette, LA. April 1, 2019.

#### **CONFERENCE PRESENTATIONS**

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8. **Liu, B.**, Mastalerz, M., Schieber, J., 2019. Organic matter in the Upper Devonian New Albany Shale of the Illinois Basin: From basin scale to nanometer scale. The 36th Annual Meeting of The Society for Organic Petrology, Bloomington, IN. (**Oral presentation**)

7. **Liu, B.**, Teng, J., Schieber, J., Mastalerz, M., Lazar, R., 2018. Organic matter content and type variation in the sequence stratigraphic context of the Upper Devonian New Albany Shale, Illinois Basin. GSA Annual Meeting, Indianapolis, IN. (**Oral presentation**)
6. **Liu, B.**, Schieber, J., Mastalerz, M., Lazar, R., Teng, J., 2018. Rock mechanical properties variation in the sequence stratigraphic context of the Upper Devonian New Albany Shale, Illinois Basin. GSA Annual Meeting, Indianapolis, IN. (**Poster presentation**)
5. **Liu, B.**, Mastalerz, M., Schieber, J., 2018. Petrographic and micro-FTIR study of organic matter in the Devonian-Mississippian New Albany Shale during thermal maturation: Implications for oil-prone kerogen transformation. AAPG Annual Convention and Exhibition, Salt Lake City, UT. (**Oral presentation**)
4. **Liu, B.**, Schieber, J., Mastalerz, M., 2018. SEM petrography of organic matter in the New Albany Shale and its implication for organic pore development with thermal maturation. AAPG Annual Convention and Exhibition, Salt Lake City, UT. (**Poster presentation**)
3. **Liu, B.**, Schieber, J., Mastalerz, M., 2017. Combined SEM and reflected light petrography of organic matter in the New Albany Shale (Devonian-Mississippian) in the Illinois Basin: A perspective on organic porosity development with thermal maturation. GSA Annual Meeting, Seattle, WA. (**Oral presentation**)
2. **Liu, B.**, Mastalerz, M., Schieber, J., 2017. Petrographic study of organic matter in the New Albany Shale (Devonian-Mississippian) with thermal maturation: Implications for oil-prone kerogen transformation and primary migration. GSA Annual Meeting, Seattle, WA. (**Poster presentation**)
1. **Liu, B.**, Schieber, J., Mastalerz, M., 2017. Authigenic minerals formation and detrital minerals accumulation associated with *Tasmanites* cysts, and initial depositional porosity in the New Albany Shale, Illinois Basin. AAPG Annual Convention and Exhibition, Houston, TX. (**Poster presentation**)

## **MEMBERSHIPS**

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American Association of Petroleum Geologists (AAPG)  
Geological Society of America (GSA)  
Society for Sedimentary Geology (SEPM)  
The Society for Organic Petrology (TSOP)  
Professional Geologists of Indiana (PGI)