

Mukul R. Bhatia

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SUMMARY

Senior academic with research experience in Resource Sustainability, Climate Change and Environment, Energy Transition, Carbon Capture and Storage, Subsurface hydrogen assessment and storage, produced water management and seismicity. Proven record of getting funds from the industry and Department of Energy (DOE) and State Agencies.

Senior Subsurface/Geoscience Executive: Goal-oriented and result-driven professional with experience in Upstream Oil and Gas and expertise in Geoscience, Unconventional Resource Plays, Integrated Field Studies, Deepwater Development, Well targeting, and Reserves estimation. Worked on offshore and onshore in Australia, Asia and USA, from appraisal to production and involvement in domestic gas and LNG. Contributed to teams which successfully delivered world class Deepwater projects ranging in CAPEX from \$100 million to \$2 billion. Experience in cross functional integration, generating fit-for-purpose projects and delivering results, especially in unconventional plays and in CCUS. Strong record of navigating complex challenges, inspired high performance teams to work collaboratively for shared goals, and delivered the promised value. Specialties include

- Resource Sustainability and Future of Energy
- Integration of Geoscience and Engineering to solve industry's problems
- Well Performance, Reservoir Management and Phase Behavior
- Sustainable Developments and Societal issues, inclining CCUS
- Carbon Capture and Storage
- Hydrogen storage
- Produced Water Management
- Unconventional Resource Development
- Critical Minerals for future energy supply
- Developing future leaders and mentoring

PROFESSIONAL EXPERIENCE

University of Houston, Houston, Texas

2023 onwards

Research Professor, Department of Earth & Atmospheric Sciences

Interest include Resource Sustainability, Oil and Gas Field Development, Energy Transition, Carbon Capture, Transportation and Storage (CCS/CCUS), Hydrogen Storage, and Geothermal Energy

Texas A&M University, College Station, Texas

2017 to 2022

Executive Professor & Director, Berg-Hughes Center for Petroleum and Sedimentary Systems, Concurrent holder of Dan A. Hughes' 51 and Dudley J. Hughes Chairs

Directing major research and teaching programs in conventional, unconventional resource development, basin analysis, reservoir modeling and integration. Leading 15-company sponsored consortium on Unconventional Resource Development jointly with Late Prof Stephen Holditch/Dr Jeff Spath. Developed integrated geoscience and engineering projects through partnership between Berg-Hughes and Departments of Geology & Geophysics, Petroleum Engineering, Chemistry and Agriculture Economics. Developed five major multi-disciplinary consortia/sponsored projects with the industry support of in excess of \$15 million. Experience of seeking funding as seed money and for full scale mega-projects. Developed projects on CCUS supported by industry which ultimately received \$9 million funding from DOE. Executive Committee member of The Energy Institute of Texas A&M. Participation in Energy-Water-Food nexus projects. Project Director for Industry Sponsored Permian Water Management study. I am co-supervising several graduate students. Have promoted and taught leadership and personal growth strategies to students. More than 90% of the Berg Hughes students get placement in the industry. Developed a team of seven Professor of Practice and 31 graduate students.

<https://berg-hughes.tamu.edu/>

Windsor Oil & Gas Consultants**2016–2017**

- Eagle Ford and Permian Unconventional Resource Development Planning
- Unconventional Resource Development: Industry's Challenges and Progress
- Field Development Plans and Assessments: Conventional Onshore to Deepwater Fields

BHP Billiton Petroleum, Houston**1989 - 2016****Senior Manager Field Studies – Haynesville and Fayetteville****2013 - 2016**

Led integrated team of geoscientists, reservoir and completions engineers and optimized Field Development Plan. High graded acreage for drilling. Other duties included Reservoir Modeling, Resource and Reserves oversight, subsurface studies, capital budgets and forecasting.

- Enhanced production 10-15% by modifying plans based on reservoir modeling and integrated geological, flow simulation, geomechanical and Stimplan models
- Characterized storage, deliverability and fracability of the Haynesville and Fayetteville based on field wide regional structural, reservoir properties and fracture parameter mapping
- Built Discrete Fracture Network reservoir model and integrated it with surveillance data. Well performance and history match
- Created well inventory based on geological studies, planned and drilled wells using geosteering, achieving higher than average in-zone wells, making them economically viable at low gas price
- Developed strategy for produced water disposal incorporating the geological, engineering, seismicity, geomechanical and other economic considerations in Fayetteville
- Interaction with Land, D & C, HSE and Surface Engineering for drilling schedule

Senior Manager/Director Production Geoscience Function**2010– 2013**

Conventional and Unconventional Production

Functional head of production geoscience, both conventional and unconventional. Responsible for assurance, standards, reviews (including reservoir models) for CAPEX approval for development, infill and field extension wells in Permian, Eagle Ford, Haynesville, Fayetteville, Gulf of Mexico, North West Shelf and Gippsland Basin of Australia, Algeria, Pakistan and Trinidad & Tobago. Oversight of all subsurface activities in the company, jointly with Senior Manager Reservoir Engineering

- Endorsed inputs for reserves and for sanction case, reserves growth opportunities, including optimized development plans and well proposals.
- Developed staff of 80. Mentored, hired and was responsible for internal transfers, promotions, and career development

Geoscience Manager, Gulf of Mexico Production Unit**2008- 2010**

Infill drilling and field extension for Shenzi and Neptune, BHPB Operated Deepwater GOM Fields

- Delivered optimized Field Development Plan, set budget for coming year and delivered production and reserves by working closely with other stockholders (JV, MMS, drilling, engineering, planning, regulatory and operation teams)
- Enhanced production by 20,000 BOPD by leading a team of geoscientists and working closely with Reservoir Engineers to implement Water Injection and developing Shenzi North
- Enhanced reserves and made an attractive profit at the high oil price time by drilling ten infills wells, at~\$100MM each, on Shenzi and Neptune
- Negotiated cost reduction of \$6MM on RAZ seismic survey in GOM. Total Capex \$68 million

Subsurface Manager**2006- 2008****Neptune Development, Integrated Project Team, Gulf of Mexico**

Member of the Neptune Project Leadership Team. Led all geoscience, reservoir engineering and production technology activities for the first BHPB operated Deepwater project,

- Responsible for optimum reserves recovery, cost effective development and value driven reservoir management plans. Integration with Wells, Surface and Project teams to put together a comprehensive Reserves Growth and Asset Management Plan
- Gained project approval for \$900 million from JV by leading subsurface team during sanction, tollgate and cost finalization process thus fulfilling the corporate KPI. Identified reserves growth opportunities and appropriately categorized them and developed execution plans

Subsurface Team Lead Appraisal, GOM**1999 - 2005**

- Appraisal and field development planning of Deepwater fields: Typhoon, Neptune and Atlantis.
- Production of 60,000 BOPD was added by personally maturing the Atlantis North flank. This improved the Subsurface field development plan and added 25% additional reserves
- Personally, initiated and pursued the Royalty Relief application, valued at more than \$80 millions

Geoscience Team Leader, BHP Petroleum, Melbourne**1995 – 1999****Bayu-Undan Field Development, Integrated Project Team (IPT)**

- Geoscience Leadership of multi-company team, practiced inclusive culture which enabled 7 joint venture partners to approve the field development plan in spite of equity dispute
- Integration of geoscience and engineering to put together an optimized development plan for a gas recycling/condensate recovery, which satisfied the technical, commercial, capital and tollgate criteria. Work included field mapping, volumetrics and in-place resource range for sale gas

Production Coordinator, BHP Petroleum, Melbourne**1992 –1995**

- Enhanced oil production and deliverability rates by 10% by suggesting the new completion (Tubing Conveyed Perforation or TCP guns) in Bass Strait
- Proposed horizontal well in Cossack field which doubled the production rate (30,000 BOPD) and worked on the 4th and 5th Train LNG from NWS Australia

Senior Petroleum Geologist, BHP Petroleum, Melbourne**1989 – 1992**

- Near field exploration/exploitation around Jabiru and Challis

AGL Petroleum, Brisbane, Australia**1986 - 1989****Senior Development Geologist/Planner**

- Reservoir mapping, development drilling, volumetric and reserves assessment of the Nido, Matiloc, Bonita fields in offshore Philippines. Work resulted in drilling of additional successful wells.
- Economic evaluation of oil/gas fields. Work resulted in the successful acquisition of TMOC and CSR Petroleum by AGL

Elf Aquitaine Petroleum, Sydney, Australia**1982 - 1986****Senior Geologist**

- Well planning, geological mapping, volumetrics and reserves estimation (Bonaparte/Otway/Bass)
- Participated in LNG discussions with Japanese, Korean and Taiwanese companies

EDUCATION

Ph. D, Geology, The Australian National University, Canberra, Australia
 Master of Science, Honors, Geology, Punjab University, Chandigarh, India
 Bachelor of Science, Honors, Geology, Punjab University, Chandigarh India

FELLOWSHIPS AND SCHOLARESHIPS

ANU Research Scholar, Australian National University,
 Junior/Senior Research Fellow, CSIR, Centre of Himalayan Geology, PU
 National Merit Scholar, Punjab University

AFFILIATIONS

Texas Board of Professional Geoscientists, License #6589
Society of Petroleum Engineers, Member
American Association of Petroleum Geologists, Member

HONORS

- Member of the Advisory Council of The Energy Institute, Texas A&M University
- Member of the Selection Committee for the Director of the The Energy Institute, Texas A&M University
- Member of the Selection Committee for the Head of the Department of the Geology & Geophysics, Texas A&M University
- Member of the Selection Committee for the Head of the Department of the Petroleum Engineering, Texas A&M University
- Member of the Executive Committee of the Crisman Institute of the Department of Petroleum Engineering Department, Texas A&M University
- Member of the Advisory Committee of ADVANCE program of Texas A&M University
- Member of the Inclusion and Diversity Council, BHP Billiton Petroleum:
Vice Presidents' Highest Kudo's award for writing booklet on *Unconscious Bias: Discovering our Blind Spots and seeing past them*
- Kudos for integration of various disciplines and creating an inclusive and positive environment for *Discrete Fracture Network Modeling Project*
- Special Recognition for initiating and seeking approval for *Royalty Relief* for Typhoon Deepwater Development
- President Exploration's Recognition for writing the best practice document on *Reservoir Modeling, Uncertainty Analysis and Scenario Building*, which saved several months of time during the tollgate process
- Contributed to internal *Appraisal Planning* best practice guidelines

VOLUNTEERING & KEY NOTE ADDRESSES

- Organized the 10th Anniversary Symposium of the Berg Hughes Center "**The Role of Geoscience and Petroleum Engineering in the Energy Transition**". Speakers included President ExxonMobil Exploration, Vice President Shell, Vice President Marathon and AAPG 2018 President and SPE2021 President, Founder Enverus
- Keynote Address at Unconventional Resources Conference organized by European Association of Geoscientist and Engineers (EAGE), Mexico City 2019
- Keynote Address at Reserves Estimation Unconventional Conference, Houston 2018
- Effective Leadership Strategies, Berg Hughes Center, 2017,2018, 2019
- The Permian Basin of Texas & New Mexico: The Jewel in the Crown of North American Oil & Gas. Invited talk at The Energy Institute of Texas A&M
- Invited by Bureau of Economic Geology, UT Austin to give a special talk on *Unconventional Resource Development: Industry's Challenges and Progress*, August 2016
- Organizer for SPE Workshop on Field Development in Bali
- Referee for technical papers for Elsevier Geoscience Journals: Sedimentary Geology, Chemical Geology, Paleocology and Precambrian Geology
- Lead Recruiter for Graduates and Interns to University of Oklahoma
- Organizer of Unconventional Geoscience Forum Series in BHPB

SUPERVISED THE FOLLOWING STAFF AT TEXAS A&M

Dr Art Donovan - Professor of Practice
Dr Mauro Becker - Professor of Practice
Dr Alan YU - Professor of Practice
Dr Mamdouh Siebl - Professor of Practice
Dr Lin Hu - Professor of Practice
Dr Cameron Manche – Post Doc Fellow/ Research Scientist
Ms Dawn Spencer – Program Co-Ordinator

GRADUATE ADVISOR/COMMITTEE MEMBER AT TEXAS A&M

Emmanuel . Duran -	MS in PETE	May 23, 2022	Committee
Udita Pradeep . Deota -	MS in PETE	Apr 25, 2022	Committee
Kassem . Alokla -	PHD in PETE	Apr 18, 2022	Committee
Fabian A. Jimenez -	MS in PETE	Aug 13, 2021	Committee
Omar . Abdelwahab -	PHD in PETE	Jul 17, 2021	Committee
Matthew . Kelly -	MS in PETE	Jan 29, 2021	Committee
John . Brien -	MS in GEOL	Dec 17, 2020	Committee
John A. Scherer -	MS in GEOL	Nov 18, 2020	Committee
Sara . Edwards -	MEN in PETE	Nov 11, 2020	Committee
Fatemah Bukhamsin -	MS in GEOL	Aug 28, 2020	Committee
Aditya . Raizada -	MS in PETE	Jul 30, 2020	Committee
Daniel R. Acevedo	MS in GEOL	Jul 03, 2020	Committee
Jeffy . Ho	MEN in PETE	Jun 09, 2020	Committee
Peace C. Eze -	MS in GEOL	May 21, 2020	Committee
Himanshu S. Jha -	PHD in PETE	May 07, 2020	Committee
Elsie B. Ladan -	MS in PETE	Jan 13, 2020	Committee
Sebastian F. Smith -	MS in GEOL	May 17, 2018	Committee
Carlos E. Varady Mago	PHD in PETE	Nov 08, 2017	Committee
Guangjian Xu -	Ph.D. in GEOL	Mar 22, 2019	Committee

RESEARCH INTERESTS

- Energy Transition
- Sustainable developments and Carbon Capture, Utilization and Storage and societal issues
- Hydrogen economy and subsurface storage
- Address contemporary challenges in unconventional resource development in association with engineering colleagues and industry partners
- Completion Optimization and Simulated Rock Volume enhancement to increase production and recovery
- Produced water management, environmental impact and seismicity in unconventional plays
- Risking, resource characterization and probabilistic and deterministic methods of resource evaluation
- Petroleum systems, sedimentary basins and resource development
- Integration of geoscience, petrophysics, geomechanics and engineering (flow simulation & production history) to develop predictive models for reserves assessment and production forecasting
- Reservoir modeling, uncertainties analysis and scenarios building
- Resource Evaluation and Recovery of Unconventional Reservoirs
- Optimum Field Development and Well Layout in Unconventional reservoirs
- Appraisal and Conventional Field Development Planning
- Deepwater Developments – fast track developments and uncertainties in subsalt field plays

FUNDING HISTORY

I have been able to raise \$15 million dollars of funding at a short time at the Berg Hughes Center of Texas A&M. This funding is to carry out multi-disciplinary industry focused projects. In addition, I tend to build a long-term relationship with industry, agencies and national labs and help them solve the contemporary problems and also identify the life-cycle problems. During my time as the Geoscience and Subsurface Manager in the industry, I have seen what is required from Joint Industry Projects and am well aware of delivering the high-quality results on time and within budget. It is a hallmark of my professional career.

I was the PI of the following projects which were funded by the industry and agencies

- 1) Petroleum System and Basin Modeling of Permian unconventional resources of Texas \$500,000/year. Supported by Chevron
- 2) Production Forecasting and Basin Modeling – Permian of Texas and Vaca Muerte. \$300,000/year. Supported by Shell, YPF and Vista Oil & Gas
- 3) Soaking in Unconventional Reservoirs. \$30,000. Supported by Core Lab
- 4) Permian Water Management and Value Creation. Three years project with a total funding of \$755,000. Supported by University Lands
- 5) Carbon Capture Project. Funded by AirtoEarth \$100,000
- 6) Coastal Bend Carbon Storage Project. \$1,000,000 for 1 year. Supported by Talos Energy
- 7) Carbon Safe Proposal- Coastal Bend Carbon Storage Project. \$9,000,000 for 3 year. Supported DOE

LIST OF PUBLICATIONS

1. JA Brien, GE Obkirchner, PSK Knappett, GR Miller, D Burnett, **M Bhatia**: Impacts of Groundwater Pumping for Hydraulic Fracturing on Aquifers Overlying the Eagle Ford Shale. Groundwater 2023.
2. J Foster, S Misra, Y Falola, **M Bhatia**: Preemptive detection of high water-cut wells in Delaware basin using a joint unsupervised and supervised learning approach Gas Science and Engineering 112, 204944, 2, 2023
3. NI Cool, R James, P Schofield, JV Handy, **M Bhatia**, S Banerjee: Tunnel-Structured ζ -V2O5 as a Redox-Active Insertion Host for Hybrid Capacitive Deionization. Handy ACS Applied Materials & Interfaces 15 (1), 1554-1562, 2022
4. N Rivera-Gonzalez, A Bajpayee, J Nielsen, U Zakira, W Zaheer, J **M Bhatia**, S Banerjee: Textured ceramic membranes for desilting and deoiling of produced water in the Permian Basin. Iscience 25 (10), 1, 2022
5. J Nielsen, N Rivera-Gonzalez, A Baypaee, U Zakira, W Zaheer, J Handy **M Bhatia**, S Banerjee: Textured Ceramic Membranes for Desilting and Deoiling of Produced Water in the Permian Basin. Bulletin of the American Physical Society, 2022
6. Y Falola, S Misra, J Foster, **M Bhatia**: Data-driven workflow for the preemptive detection of excess water producing wells drilled in unconventional shales .Journal of Natural Gas Science and Engineering 103, 104609, 3, 2022
7. O Abdelwahab, T Almubarak, D Schechter, **M Bhatia**: An Organic Gel System for Water Production Issues Post Hydraulic Fracturing. International Petroleum Technology Conference, D012S120R004, 1, 2022
8. J Brien, G Obkirchner, PSK Knappett, G Miller, D Burnett, **M Bhatia**: Impacts of Groundwater Pumping for Hydraulic Fracturing on Other Sector Wells in Aquifers Overlying the Eagle Ford Shale, Texas, Texas, 1, 2021
9. J Foster, S Misra, O Osogba, **M Bhatia** Machine learning assisted detection of excess water-producing wells in unconventional shale plays. Journal of Natural Gas Science and Engineering 92, 104025, 6, 2021
10. G Obkirchner, PSK Knappett, **M Bhatia**, D Burnett Evaluating the Impacts of Pumping for Hydraulic Fracturing on Local Aquifer Drawdown and Optimizing the Water Resource Management in the Eagle Ford Shale, Texas. AGU Fall Meeting Abstracts 2018, H21I-1748. 2018
11. G Obkirchner, P Knappett, D Burnett, **M Bhatia**, R Mohtar. Assessment of Water Resource Sustainability in Energy Production for Hydraulic Fracturing in the Eagle Ford Shale Play, Texas AGU Fall Meeting Abstracts 2017, H23J-1808, 2017
12. Evaluating the Impacts of Pumping for Hydraulic Fracturing on Local Aquifer Drawdown Shale, Texas: Optimizing Water Resource Management in the Eagle Ford Shale, Texas. AGU Abstract ID 1748, 2018 (with G. Obkirchner, P. Knappett and D. Burnett)
13. John Lee, Tom Blasingame and **Mukul Bhatia**. Delaware Basin Production Forecasting and GOR. AAPG Annual Convention, 2019 ID875
14. WS Bayer*, M Wunderle, E Araujo, R Alcalde, C Yao, F Suhy, T Jo, ...**M. Bhatia**: Geological and Geomechanical Modeling of the Haynesville Shale: A Full Loop for Unconventional Fractured Reservoirs/ Unconventional Resources Technology Conference, San Antonio, Texas, 1-3, 10, 2016
15. DE Reese, JC Currie, YS Chow, **MR Bhatia** Bayu-Undan field: Appraisal and development planning. SPE Asia Pacific Oil and Gas Conference and Exhibition 3, 1997
16. **M. Bhatia**: Bayu-Undan Field: Appraisal and Development Planning: SPE Proceedings, 401, 1997

17. **MR Bhatia**, KAW Crook: Trace element characteristics of graywackes and tectonic setting discrimination of sedimentary basins. Contributions to mineralogy and petrology 92 (2), 181-193, 3462, 1986
18. **MR Bhatia** Rare earth element geochemistry of Australian Paleozoic graywackes and mudrocks: provenance and tectonic control. Sedimentary geology 45 (1-2), 97-113, 962, 1985
19. **MR Bhatia** Plate tectonics and geochemical composition of sandstones: a reply The Journal of Geology 93 (1), 85-87, 49, 1985
20. M. Thomas, J.M. Borrie and **M.R. Bhatia**. Depositional framework and diagenesis of the Late Permian gas reservoirs of the Bonaparte Basin, Australian Petroleum Exploration Association Journal, v 24, p 299-313, 1984.
21. **MR Bhatia** Composition and classification of Paleozoic flysch mudrocks of eastern Australia: implications in provenance and tectonic setting interpretation. Sedimentary Geology 41 (2-4), 249-268, 151. 1984
22. AK Prasad, **MR Bhatia**: Petrography and geochemistry of Blaini carbonates of Simla Hills, their genetic and paleoenvironmental implications. India Geol. Assoc. Mem 1, 137-154, 2, 1984
23. **MR Bhatia**: Plate tectonics and geochemical composition of sandstones. The Journal of geology 91 (6), 611-627, 2764, 1983
24. **MR Bhatia**, AK Prasad. Evolution of Late Paleozoic glacial marine sedimentation in the Simla hills, Lesser Himalaya, India. Neues Jahrbuch für Geologie und Paläontologie-Monatshefte, 267-288, 9. 1981
25. **MR Bhatia**: Petrology, geochemistry and tectonic setting of some flysch deposits
26. PQDT-Global 19 1981
27. **MR Bhatia**, SR Taylor: Trace-element geochemistry and sedimentary provinces: a study from the Tasman Geosyncline, Australia. Chemical geology 33 (1-4), 115-125, 269, 1981
28. **MR Bhatia**. Late Paleozoic diamictites of the Simla Hills, Lesser Himalayas, India: age and geochemistry. In: W.B. Harland (Editor), Earth's Pre-Pleistocene Glacial Record, Cambridge University Press, p 293, 1981
29. **MR Bhatia**: A contribution to the petrology and geochemistry of the Blaini formation Simla Hills Himachal Pradesh India Chandigarh 1977
30. AK Prasad and **MR. Bhatia**. Pre-Carboniferous granitic clast in the Blaini diamictites of Simla Hills and its significance. Recent Researches in Geology, v 3, p 391-398, 1977
31. **MR Bhatia** and AK Prasad. The Blaini Formation – a marker horizon in Lesser Himalayas, its age and classification. Science and Culture, v 42, p 579 – 580, 1976 (with A.K. Prasad)
32. AK Prasad, **MR Bhatia**: Fossil tracheids and other micro-fossils from the Blaini Tillite horizon, Simla Hills, India. Bull. Indian Geol. Assoc 8, 191-195, 18 1975
33. **MR Bhatia**, AK Prasad Some sedimentological, lithostratigraphic and genetic aspects of the Blaini Formation of parts of Simla Hills, Himachal Pradesh, India. Bulletin 8, 162-185, 14, 1975
34. **MR Bhatia**, SP Jain. Smaller foraminifera from the Dalmiapuram Formation (Lower Cretaceous), South India. Bull. Ind. Geol. Assoc 5 (1-2), 45-46 9 1972