MINERAL INDUSTRY RESEARCH LABORATORY

BRIEF STATEMENT OF CAPABILITIES

The Mineral Industry Research Laboratory (MIRL) was established at the University of Alaska Fairbanks by the 1963 Alaska Legislature for the purpose of conducting basic and applied research to aid in the development of Alaska's mineral and energy resources.

Facilities & Expertise Relevant to Mineral Processing

Faculty expertise and facilities in mineral processing span a variety of mineral processes including comminution, gravity, magnetic separation, flotation, leaching and solvent extraction. Faculty expertise and facilities are also available on various aspects of economic geology and geosciences including remote sensing and geology. Specialized instruments include microprobes, scanning electron microscope, inductively coupled plasma mass spectrometer, atomic absorption spectrometer, zeta potential meter and universal testing machine.

Facilities & Expertise Relevant to Mine Engineering

Faculty expertise and facilities in mine engineering includes mine safety and health, ventilation (underground tunnels and open pit), systems engineering, and artificial intelligence. Laboratory and software capabilities include ventilation instruments, VentSim, Vulcan, computational fluid dynamics packages, and a suite of programming languages.

Facilities & Expertise Relevant to Geotechnical Engineering

The Rock Mechanics Laboratory is a well-equipped rock testing facility and includes digitally controlled load frame with a loading capacity of 330,000 pounds, the largest in the state. It is a modern laboratory and is continuously upgraded. Over the years, in addition to its use as a teaching/research facility, the laboratory has served the mining, oil and construction industries for various rock mechanics test needs. The laboratory currently can perform the following rock mechanics tests:

- Uniaxial compressive strength test
- Uniaxial tensile strength test
- Triaxial compressive strength test
- Deformability test (for Poisson's ratio and Young's modulus)
- If needed, creeping test and test under high temperature (up to 1000F) or low temperature (down to -50F)

Facilities & Expertise Relevant to Environmental Engineering

The Water and Environmental Research Center (WERC) laboratory is well equipped with instrumentation capable of handling a wide range of water quality tests using varied instrumental analyses. Instrumentation is available for the quantitative analysis of anions, cations, volatile and semi-volatile organics, and total carbon, both organic and inorganic. A UV/Vis spectrometer is also available for various molecular and colorimetric absorbance techniques.

The table below summarizes the instrumental techniques available at the WERC laboratory.

Instrument	Technique	Analytes	Examples
Agilent 4200 MP_AES	Atomic Emissions	Cations	Ca, Mg, Na, K, Fe, Mn (flame) Cd, Cr, As, Se, Pb (graphite furnace)
OI Analytical Aurora 1030	Carbon via CO_2	Total Carbon	Inorganic/Organic Carbon Total and/or Dissolved
Agilent 6890	GC/MS	Volatile and Semi-volatile Organics	Petroleum Hydrocarbons Sulfolane, PCE Pesticides/herbicides (derivatives)
HACH DR6000	Molecular Absorbance		Colorimetric – Nitrate/Nitrite etc. COD, Chlorophyll
Dionex Aquion	Ion chromatography HPLC UV/Vis Detector	Anions Chromophores	Nitrate, Nitrite, Chloride, Sulfate, etc. Iodide, Sugars, Chlorophyll

Other Facilities & Expertise Available to MIRL

A benefit of being part of a larger university system is that expertise and facilities available within any unit of the university are accessible to other units. This includes a variety of geophysical and remote sensing instrumentation, drones (unmanned aerial vehicles) and satellite data.

Contact MIRL

Rajive Ganguli, PhD, PE
Director, Mineral Industry Research Laboratory
Phone: (907)474-7212
Website: MIRL.UAF.EDU

RAJIVE GANGULI, PHD, PE

GROUP LEADER: MINE ENGINEERING

Dr. Rajive Ganguli is a professor of mining engineering at the University of Alaska Fairbanks. He has a doctorate in mining engineering from the University of Kentucky (1999). Besides UAF, he has worked for copper (Hindustan Copper Limited, India) and coal (Jim Walter Resources, USA) mines as mine engineer. He also consults with the mining industry through his company Opti-mine.

Dr. Ganguli works in the area of mine and systems engineering. He has led projects on blasthole sampling, blast movement, mine-mill data mining, mineral processing, coal combustion, production optimization and software product development. He has led over $11M in domestic and international research projects. He is currently leading a mining industry research consortium involved in water remediation and mineral processing.

Dr. Ganguli was inducted into the Alaska Innovators Hall of Fame in 2017. He was the lead author of two chapters in the SME Mining Engineering Handbook, “Systems Engineering” and “Mine Monitoring, Control and Communication.”

Selected Projects

- Water remediation and flotation optimization at Red Dog mine, Alaska
- Fundamental Sampling Error Estimation for Blasthole Sampling, Erdenet Copper Mine, Mongolia
- Measurement of Movement of Material Due to Blast, Erdenet Copper Mine, Mongolia
- Data Mining of Mine and Mill Data, Erdenet Copper Mine, Mongolia
- Mineral Processing Strategy for Rare Earths, Bokan Dotson Ridge, Alaska
- Mine Design and Reserve Estimation of Underground Coal Deposit, Wishbone Hill, Alaska
- Monitoring Software for Coal Preparation Plant, Peabody Coal, Colorado
- Dynamic mill simulator for processing plants, A US DOL grant
- Production simulation for underground coal mine, Walter Energy
- Underground Frozen Placer Mine Design, PDNG Mining

Selected Publications

- Srivastava, V.K., Ghosh, T.G., Akdogan, G.A. and Ganguli, R., 2018, "Dynamic Modeling & Simulation of a SAG Mill for Characterization of Mill Charge," Minerals and Metallurgical Processing, Vol.35, No. 2, pp. 61-68.
- Ganguli, R., Chieregati, A.C and Purvee, A., 2017, "Fundamental Error Estimation And Accounting In The Blasthole Sampling Protocol At A Copper Mine," Mining Engineering, SME Publications, November, 49-54.
- Ganguli, R., Purvee, A., Sarantsatsral, N. and Bat, N., 2017,"Investigating Particle Size Distribution of Blasthole Samples in an

Open Pit Copper Mine and its Relationship with Grade," Mining Engineering, February, pp 29-33.

- Arku, Daniel and Ganguli, Rajive, 2014, "Investigating Utilization Of Aggregated Data: Does It Compromise Information Gleaning?" Mining Engineering, 2014, Vol. 66, No. 6, pp. 60-65.
- Agarwal, S. and Ganguli, R., 2011, “Refining Automated Modeling of Operational Data by Identifying the Most Important Input Factors,” Mining Engineering, Vol 63, No.12, pp-52-54.
- Yu, S., Ganguli, R., Walsh, D.E., Bandopadhyay, S. and Patil, S.L., 2004, "Calibration of On-line Analyzers Using Neural Networks,” Mining Engineering, Vol. 56, No. 9 (Sept), pp. 99-102.

GANG CHEN, PHD, PE
GROUP LEADER: GEOTECHNICAL

Dr. Gang Chen is currently a professor of mining engineering at University of Alaska Fairbanks. He has been conducting teaching and research in mining engineering and related fields for over 30 years. Dr. Chen's research interests are mainly in the areas of rock mechanics in mining, petroleum and civil engineering, as well as rock blasting for surface and underground mining and rock excavations. Dr. Chen has conducted in-situ monitoring, laboratory testing and numerical modeling of rock, rock mass and rock excavations as well as in-situ monitoring, measurement and analysis of rock blasting and fragmentation. Examples of his research projects include laboratory testing of rock mechanics properties, in-situ testing and monitoring of rock mass behaviors, monitoring and analysis of mine excavation deformation and stability, in-situ testing of rock bolt strength, rock slope stability analysis, computer modeling studies of rock excavation stability, wellbore stability simulation and analysis, rock blasting monitoring, rock fragmentation measurement and analysis, and other mine ground control and mine blasting related topics. Over the years, Dr. Chen has published approximately 100 technical papers in various national/international journals and conferences.

Expertise

- Underground opening design and stability analysis;
- Slope stability monitoring and analysis;
- Rock blasting monitoring, analysis and optimization;

- Monitoring and analysis of ground vibration due to rock blasting;
- Laboratory testing of rock mechanical properties; and
- Computer modeling and analysis of rock excavations

Selected Projects

- Measurement of Movement of Material Due to Blast, Erdenet Copper Mine, Mongolia
- Yield Pillar Monitoring and Design in Appalachian Coal Field
- Feasibility Study of Applying Yield Pillars in Illinois Longwall Coal Mines
- Laboratory Rock Mech Tests — Coal Gasification Project
- Laboratory Rock Mech Tests — Pogo Mine Portal Stability
- Coal Mine Surface Subsidence Monitoring in Appalachian Coal Field
- Effect of Drilling Mud on Rock Pore Pressure and Wellbore Stability
- Photogrammetry Software Development for Soil Volume Measurements during Triaxial Testing
- Monitoring and Analysis of Ground Vibrations Caused by Production Blasts in Fort Knox Gold Mine

Selected Recent Publications

- Li, L., X. Zhang, G. Chen, and R. Lytton, “Measuring Unsaturated Soil Deformations during Triaxial Testing Using A Photogrammetry-Based Method," Canadian Geotechnical Journal, 53(3): 472-489, 2016.
- b. Rui, Z., C. Li, F. Peng, K. Ling, G. Chen, X. Zhou, and H. Chang, “Development of Industry Performance Metrics for Offshore Oil and Gas Project,” J. of Natural Gas Sci and Eng., 39 44-53, 2017.
- Chen, L. B., G. Sheng and G. Chen, “Investigation of impact dynamics of roof bolting with passive friction control,” International Journal of Rock Mechanics and Mining Sciences, July, 2014.
- Yoon, S., H. K. Lin, G. Chen, and G. Hwang, “The investigation of arsenic and heavy metal concentrations in soil, water and crops around abandoned metal mines,” Int. J. of Mining and Mineral Eng, Vol. 5, No. 2, pg. 117-137, 2014.
- Chen, G., “Probabilistic Key Block Analysis of a Mine Ventilation Shaft Stability – A Case Study,” Geomech. & Geoeng: An International Journal, Vol. 7, Issue 4, 2012.
- Obermiller, K., M. Darrow, S. Huang and G. Chen, “Site Investigation and Slope Stability Analysis of the Chitina Dump Slide (CDS), Alaska,” Environmental and Engineering Geoscience, 2012.
- Chugh, P., Chen, G., Yu, Z. “Effects of the Immediate Roof- Coal Pillar-Immediate Weak Floor Interaction on Coal Mine Ground Control: Laboratory and Field Characterization Studies,” XV Colombian Geotechnical Congress & II International Specialized Conference of Soft Rocks, 2016
- Song, X., G. Chen, and L. Wang, “Application of Borehole Imaging for Detection of Rock Fracture Zone and Improvement of Roadway Stability,” Proceedings of SME Annual Meeting, 2016.

- Bhowmick, T., Gupta, T., Chen, G., Bandopadhyay, S. and Ghosh, T., 2015, “Evaluation of Various Mining Methods to Design an Underground Coal Mine Using Flac 2D,” Proceedings of the 37th International Symposium, APCOM 2015, ISBN 978-0-87335-417-2, pp. 420-429.
- Chen, G., “Probabilistic Approach for the Analysis of Rock Excavation Stability,” Proceedings, the 4th International Conference on New Development in Rock Mechanics and Engineering, Shenyang, China, Sept. 2012.
- Chen, G., “The Influence of Drilling Direction on RQD Values of Rock Mass with Multiple Sets of Discontinuities and RQD Data Acquisition for In-depth Analysis,” Proceedings of the 46th U S Rock Mechanics Symposium, Chicago, Illinois, June 2012

DR. TATHAGATA GHOSH GROUP LEADER: MINERAL PROCESSING

Dr. Ghosh received his Ph.D. in Mining Engineering from University of Kentucky. He has more than 14 years of teaching, work and research experience in the areas of mining technology, mine safety, mineral processing, computer modeling, computational fluid dynamics, scale modeling, pilot-scale studies, numerical analysis applications in Mining and Mineral Engineering. He has extensive experience in Computer Modeling applications and recently been involved in a comprehensive CFD study of an air-based density separator. Dr. Ghosh's expertise also includes advanced physical processing, comminution, population balance modeling, process simulation and control, coal preparation, fine particle processing, gravity separation techniques, flotation, agglomeration, hydrometallurgy, leaching and rare earth research.

More recently, he has been involved in quantifying and characterizing critical rare earth minerals in Alaskan coal and ash, which is a critical national need. He also led the development of the world’s first training dynamic mill simulator. This project has resulted in the design of the very first operator certification program to train Alaskan workers and maximize the mining and minerals industry’s high quality labor force. The dynamic mill process simulator will help the mining industry monitor plant performance and increase training efficiency by simulating various scenarios in real time.

He serves on the editorial board of the International Journal of Coal Preparation and Utilization, the International Journal of Mineral Processing and Extractive Metallurgy (IJMPEM) and on the Executive Committee of the Coal and Energy Division of the Society of Mining, Metallurgy and Exploration. He has regularly served as a peer-reviewer for several international mining and mineral processing journals. Dr. Ghosh was the recipient of the "Invent Alaska" award for the year 2016.

Expertise

- Advanced Mineral Processing
- Fine Particle Processing
- Computational Fluid Dynamics
- Hydrometallurgy

Selected Projects

- Investigating Impact of Pulp Rheology on Flotation Performance (Teck Alaska - Red Dog Mine)
- Mill Operator Training (MPO) Program (part of US DOL TAACCCT grant), ongoing
- Dynamic Mill Simulator Module (part of US DOL TAACCCT grant), ongoing
- Identification of REE in some Alaskan Coal and Ash Samples, Leonardo Technologies, Inc. contractor to the U.S. Department of Energy, National Energy Technology Lab (NETL)

Selected Peer Reviewed Publications:

- Srivastava, V.K., Ghosh, T.G., Akdogan, G.A. and Ganguli, R., 2018, "Dynamic Modeling & Simulation of a SAG Mill for Characterization of Mill Charge," Minerals and Metallurgical Processing, Vol.35, No. 2, pp. 61-68.
- Characterizing REEs in Alaskan Coal and Ash, 2017, T. Gupta, T. Ghosh, G. Akdogan and V.K. Srivastava, Minerals and Metallurgical Processing Journal, Vol. 34, No. 3, pp. 138-145.
- Mining-related Selenium contamination in Alaska: State of knowledge, 2017, A. Khamkhas, V. Srivastava, T. Ghosh, G. Akdogan, R. Ganguli and S. Aggarwal, Minerals 7(3), 46; DOI:10.3390/min7030046.
- Numerical modeling of an air-based density separator, 2017, T. Ghosh, A. Salazar and R. Honaker, Int. Journal of Coal Preparation and Utilization, Vol. 37, No. 5, pp. 252-278.
- Investigation and Quantification of Water Track Networks in Boreal Regions of Alaska, 2016, U. Mendbayer, D. Misra, T. Gupta and T. Ghosh, Geosciences Research, Vol. 1, No. 1, November 2016, pp. 7-23; https://dx.doi.org/10.22606/gr.2016.11002.
- Three-dimensional CFD modeling approach to approximate air pollution conditions in high latitude open-pit mines, 2015, T. Bhowmick, S. Bandopadhyay and T. Ghosh; WIT Transactions on the Built Environment, Vol. 168, Sustainable Development, Vol. 2, ISSN 1743-3509 (on-line), ISBN: 978-1-78466-157-1, doi:10.2495/SD150652, pp. 741-753.
- Scale and Numerical Modeling of an air-based density separator, 2015, T. Ghosh, M. Rezaee, R. Q. Honaker and K. Saito; Progress in Scale Modeling Vol. 2, ISBN: 978-3-319-10308-2, pp. 225-238, Springer.

- Application of spatial statistical techniques for predicting sulfur in the Pittsburg no. 8 coal seam, 2014, W. Collingwood, D. Misra, S. Bandopadhyay and T. Ghosh; Transactions of the Society for Mining, Metallurgy, and Exploration, Vol. 336, No. 1, pp. 491-499.
- Upgrading low-rank coal using a dry, density-based separator technology, 2014, T. Ghosh, R. Q. Honaker, D. Patil and B.K. Parekh; Int. Journal of Coal Preparation and Utilization; Vol. 34, No. 3-4, pp. 198-209.
- Performance Evaluation and Optimization of A Fullscale Reflux Classifier, 2012, T. Ghosh, D. Patil, R.Q. Honaker, M. Damous, F. Boaten, V.L. Davies and F. Stanley; CPSA (Coal Preparation Society of America) Journal; Vol. 11, No. 2, pp. 24-33.
- Application of air table technology for cleaning Indian coals, 2012, N. Gupta, R. Bratton, G. Luttrell, T. Ghosh and R. Q. Honaker; Separation Technologies for Minerals, Coal and Earth Resources, Editors: C. A. Young and G. Luttrell; ISBN - 10: 0873353390 | ISBN - 13: 9780873353397, pp. 199-209.

PAUL METZ, PHD, PG

GROUP LEADER: MINERALS EXPLORATION

Dr. Paul Metz is a Professor of Geological Engineering at the University of Alaska Fairbanks. He has a doctorate in mining geology and mineral exploration from the Royal School of Mines, Imperial College, University of London and an MBA from the University of Alaska Anchorage. He served as a Regular Officer in the United States Air Force in Alaska (21st Civil Engineering Squadron and Kulis AFB) for six years and has conducted mineral exploration and evaluation in Alaska, Canada, and elsewhere for base and precious metals, ferro-alloys, rare earth elements, and industrial minerals.

Dr. Metz for the past decade has examined the impact that bulk transportation systems (marine and railroads) and low cost energy will have on the development of critical and strategic minerals in Alaska and northwestern Canada. During his tenure with the University if Alaska Fairbanks, he has been the Principal Investigator on approximately $25M (in constant dollars) of research funding.

Expertise

- Minerals valuation
- Transportation systems
- Site characterization

Selected Projects

- Alaska Canada Rail Link Phases I & II
- Alberta to Alaska Rail Development
- Alaska Marine Highway Systems Analysis
- Surface access to the Tanana Flats and Donnelly Military Training Areas, Fort Wainwright, Alaska
- Discovery and Development of the Large Tonnage/High Purity Limestone Resources in the Tolovana Mining District, Alaska
- Evaluation of the Porphyry Cu-Mo-Au-Co-W resources in the Tolovana Mining District, Alaska
- Evaluation of the Golden Summit Project (3M troy ounces), Fairbanks Mining District, Alaska
- Evaluation of the REE in the Banded Iron Formations of the Lake Superior Region.

Selected Final Contract Reports

- Mineral freight forecast in support of the Alberta to Alaska Rail Link - Province of Alberta, 2015.
- Geological and geotechnical site characterization for the design of a carbon dioxide rich flue gas direct injection and storage facility: U.S. Department of Energy, June 2013.
- Utilization of the MOREV Tool to evaluate the mineral occurrence gross metal value and freight volumes for the Klondike Highway Corridor: Alaska Department of Transportation and Public Facilities, June 2012.

- Eielson, AFB Coal-to-Liquids Plant Carbon Capture and Storage Options – Permanent Storage as Carbonate Minerals In Mafic and Ultramafic Rocks: U.S. Department of Defense, USAF, July 2012.
- Economic and systems analysis of the synergistic effects of a multi-modal transportation corridor on the development of Alaska North Slope natural gas: U.S. Department of Transportation, Phase I & II.
- Alaska Marine Highway Systems Analysis, Phase IV: Alaska Department of Transportation and public Facilities.
- Liquid Fuels Systems Analysis: Alaska Department of Transportation and Public Facilities.
- Alaska Marine Highways Systems Analysis Phases II and III: Alaska Department of Transportation and Public Facilities and Alaska University Transportation Center.
- Alaska Marine Highways Systems Analysis Phase I: Alaska Department of Transportation and Public Facilities and Alaska University Transportation Center.
- Market analysis of in-state processing of natural gas liquids from the North Slope of Alaska – Alaska State Legislature.
- Petrographic Analysis of Aggregates from Interior Alaska Phase II – U. S Army Corp of Engineers.
- Alaska Railroad re-alignment and extension from Fairbanks to Delta Junction – Environmental Assessment and Environmental Impact Statement preparation: Alaska Railroad Corporation.
- Preliminary design and engineering economic analysis of alternative modes of access to the Tanana Flats Training Area, Fort Wainwright, Alaska: U.S. Department of Defense, USARAK June 2005.

SRIJAN AGGARWAL, PHD
GROUP LEADER: REMEDIATION

Dr. Srijan Aggarwal obtained his Ph.D. degree in Environmental Engineering from University of Minnesota, Twin Cities and has been working in the field of water/air quality for over a decade. His PhD research at Minnesota won the best doctoral dissertation award in Civil Engineering.

Dr. Aggarwal has wide-ranging expertise in the field of environmental engineering and has worked on several projects related to water and wastewater treatment, aquatic chemistry, removal and degradation of contaminants, and the fate of oil spill response chemicals in the Arctic environment. His research has been funded by local, state, industry and federal sources. He has presented his work at numerous national and international conferences, and his research has been published in reputed journals such as *Environmental Science & Technology*, *Langmuir,* and *Biotechnology & Bioengineering*.

A winner of the prestigious NSF CAREER grant (2018), Dr. Aggarwal has frequently been invited to serve as an expert reviewer for reputed federal agencies such as the National Science Foundation (NSF) and state agencies such as the Kentucky Science & Engineering Foundation. He was recognized with an excellent reviewer award by the ASCE Journal of Environmental Engineering in 2014 and selected as an ASCE ExCEEd (Excellence in Civil Engineering Education) Fellow in 2016. For his research accomplishments, Pacific Northwest International Section of the Air & Waste

Management Association (AWMA), felicitated Dr. Aggarwal with the 2016 Lab-Coat Award.

Expertise

- Water Chemistry
- Biofilm Processes
- Air Pollution
- Fate and Transport of Contaminants

Selected Projects

- Water remediation at Red Dog mine, Alaska
- Use of Silica Gel Encapsulated Graphene Oxide Nanoparticles for water treatment. USGS grant.
- Investigation of environmental impacts of application of chemical herders in oil spills. State of Alaska funded.
- Investigating Food-energy-water systems in remote Alaskan communities. NSF grant.
- Applications of chemical herders for enhanced in-situ burning of crude oil in Alaska. Joint Industry Program funded by a consortium of oil companies.
- Water Purification Using a Graphene Bead Filter. EPA funded.
- Use of satellite data to predict near-ground air quality in interior Alaska. NASA grant.
- Near-Roadway Air Pollution: Evaluation of Fine Particulate Matter (PM2.5) and Ultrafine Particulate Matter (PM0.1) in Interior Alaska. DoT grant.

Selected Publications

- Khamkhash A, Srivastava V, Ghosh T, Akdogan G, Ganguli R, Aggarwal S. 2017. "Mining-related Selenium Contamination in Alaska, and the State of Current Knowledge." Minerals. 7 (3) 46. doi: 10.3390/min7030046
- Aggarwal S, Schnabel WE, Buist I, Garron J, Bullock RJ, Perkins RA, Potter S, Cooper D. 2017. "Aerial Application of Herding Agents to Advance In-Situ Burning for Oil Spill Response in the Arctic." Cold Regions Science and Technology 135 (2017) 97–104. DOI: 10.1016/j.coldregions.2016.12.010
- Bullock RJ, Aggarwal S, Perkins RA, Schnabel WE. 2017."Scale-Up Considerations for Herder Assisted In-situ Burn Crude Oil Spill Response Experiments in the Arctic: Laboratory to Field-Scale Investigations." Journal of Environmental Management 190 (2017) 266-273. http://dx.doi.org/10.1016/j.jenvman.2016.12.044
- Jeon Y, Aggarwal S, Hozalski RM. 2016. Effect of Sodium Triphosphate, EDTA, Urea and Citrate on Disruption of Single-Species and Multi-Species Biofilms. In review.
- Aggarwal S, Stewart PS, Hozalski RM. 2016.“Biofilm Cohesive Strength as a Basis for Biofilm Recalcitrance: Are Bacterial Biofilms Overdesigned?" Microbiology Insights, 8(S2): pp 29-32. DOI: 10.4137/MBI.S31444
- Aggarwal S, Jeon Y, Hozalski RM. 2015.“Feasibility of Using Particle Counting Technologies for Assimilable Organic Carbon (AOC) analysis in drinking water.” Biodegradation, 26(5): pp 387-397. DOI: 10.1007/s10532-015-9741-6
- Aggarwal S, Hozalski RM. 2012. “Effect of Strain Rate on Mechanical Properties of S epidermidis Bacterial Biofilms.” Langmuir, 28(5): pages 2812–2816. DOI: 10.1021/la204342q
- Aggarwal S, Jain R, Marshall JD. 2012. “Real-Time Prediction of Size-Resolved Ultrafine PM on Freeways.” Environmental Science and

Technology, 46(4): pages 2234−2241. https://doi.org/10.1021/es203290p

- Aggarwal S, Poppele EH, Hozalski RM. 2010. “Development and Testing of a Novel Micro-cantilever Technique for Measuring the Cohesive Strength of Intact Biofilms.” Biotechnology and Bioengineering. 105(5): pages 924–934. DOI:10.1002/bit.22605 (Selected as issue’s “spotlight article”)
- Aggarwal S, Hozalski RM. 2010. “Determination of Biofilm Mechanical Properties from Tensile Tests Performed Using a Micro-Cantilever Method.” Biofouling: Journal of Bioadhesion and Biofilm Research. 26 (4): pages 479 – 486. DOI:10.1080/08927011003793080

SHISHAY KIDANU, PHD
GROUP LEADER: GEOPHYSICS

Dr. Shishay Kidanu is an assistant professor of Geological Engineering at the University of Alaska Fairbanks (UAF). He received his Ph.D. degree in geological engineering from the Missouri University of Science and Technology, M.Sc degree in Engineering geology from the Graz University of Technology in Austria and a B.S. degree in applied geology from Mekelle University in Ethiopia. He has more than five years of experience working as a faculty in Mekelle University in Ethiopia. Dr. Kidanu's research focuses on: Application of near surface geophysics for mining engineering, mineral resource exploration and development, geotechnics and environmental purposes; and GIS-based multivariate geospatial analysis for geohazard assessment and prediction, environmental studies, and natural resource management.

Dr. Kidanu has been working in several research and consultancy projects on the application of near surface geophysics for engineering and environmental purposes. Some of his recent projects include integrated geophysical investigations (ERT and MASW) for coal plant landfill site selection, and 2D and 3D karst Sinkhole subsurface imaging. He has been also working in the application of GIS-based multivariate geospatial analysis for the study of landslides, karst sinkholes, geotechnical microzonation and other related geohazard mapping and prediction modeling.

Expertise

- Application of geophysics in exploration and development of mineral deposits.
- Application of geophysical techniques for rippability assessment, determination of stratigraphy, and slope stability studies.

- Application of geophysics for engineering and environmental purposes.
- Application of GIS as planning and decision making tool.
- Engineering geological site characterization

Selected Projects

- Coal plant landfill site selection in karst terrain in Southwestern Missouri using 2D and 3D-ERT and MASW geophysical techniques.
- Imaging the 3D subsurface structure of karst sinkhole/subsidence in Southwestern Missouri using 2D and 3D-ERT and MASW geophysical techniques
- GIS-Based multivariate spatial analysis to determine factors controlling the development of karst sinkholes.
- GIS-Based Analytical Hierarchy Processes for landslide susceptibility mapping in Northern Ethiopia
- GIS-Based Multivariate analysis for geotechnical microzonation in Northern Ethiopia
- Geological and Engineering geological investigation of Tailings Dam Site for Meli Gold mine project in North Western Tigray, Ethiopia.

Selected Publications

- Shishay T. Kidanu, Neil L. Anderson, J. David Rogers (2018). Using GIS-based Spatial Analysis to Determine Factors Influencing Sinkhole Formation in Greene County, Missouri; Environmental & Engineering Geoscience, Vol. XXIV, No. 2, February 2018, pp. 1–11

- Shishay T. Kidanu, Evgeniy V. Torgashov, Aleksandra V. Varnavina, Neil L. Anderson (2016). ERT-based Investigation of a Sinkhole in Greene County, Missouri. AIMS Geosciences, 2016, 2(2): 99-115. doi: 10.3934/geosci.2016.2.99.

- Shishay Tadios (2013). GIS-based Geotechnical Microzonation Mapping using Analytic Hierarchy Process: a case study in Shire-Endasilasie City, Tigray,

Northern Ethiopia; Momona Ethiopian Journal of Science (MEJS), V5(2):101-116, 2013.

- Nata Tadesse, Shishay T. Kidanu, Mekdes Tesfaye (2010). The water balance of May Nugus catchment, Tigray, Northern Ethiopia, International Journal of Earth Sciences and Engineering, ISSN 0974-5904, Vol. 03, No. 05, October 2010, pp. 609-625.

SAMPURNA ARYA, PHD
GROUP LEADER: MINE HEALTH AND SAFETY

Dr. Sampurna Arya is an assistant professor of Mining Engineering at the University of Alaska Fairbanks (UAF). He received his Ph.D. and M.S. degrees in mining engineering from the University of Kentucky (UK). Prior to joining UAF, he was a postdoctoral associate at UK and was actively involved in mine health and safety related research projects. Dr. Arya has over seven years of research and teaching experience and more than three years of experience working in an iron ore mine (Steel Authority of India Limited) as a junior manager.

Dr. Arya's research focuses on mine health and safety, mine ventilation, CFD modeling of mine environment, scale modeling, and computer applications in mining. He has been involved in the development of a scrubber to combat dangers of dust generation in underground coal mines. Some of his recent projects include testing of a wing regulator to enhance the flow of fresh air at a room and pillar mine section, numerical modeling a novel Vortecone wet scrubber for dust capture in underground coal mines, and development of computer-based training modules for miners to teach problem-solving and decision-making skills.

Dr. Arya is the recipient of "Outstanding Graduate Student" award at the University of Kentucky and won prizes in three poster contests at the Society for Mining, Metallurgy & Exploration (SME) Conference and Expo.

Expertise

- Mine Health and Safety
- Mine Ventilation
- Computational Fluid Dynamics (CFD) Modeling
- Scale Modeling
- Computer Applications in Mining

Selected Projects

- Improved Face Ventilation for Extended-cut Continuous Mining Using a Wing Regulator and Scrubber Control System, Alpha Foundation Grant
- CFD Modeling of Application of a Flooded-bed Scrubber to a Longwall Shearer, Alpha Foundation Grant
- The Application of Flooded-bed Dust Scrubbers to Longwall Mining Systems, Alpha Foundation Grant
- CFD Modeling of a Novel Vortecone wet scrubber, National Institute for Occupational Safety and Health (NIOSH) Grant
- Computer-based Training Exercises for Mining Personnel, National Institute for Occupational Safety and Health (NIOSH)

Selected Publications

- Arya, S., Sottile, J., Rider, J.P., Colinet, J.F., Novak, T., and Wedding, W.C., (2018), Design and experimental evaluation of a flooded-bed dust scrubber integrated into a longwall shearer, Powder Technology, Vol. 339, pp. 487-496.
- Arya, S., Sottile, J., Novak, T., and Wedding, W.C., (2018), Development of a flooded-bed scrubber for removing coal dust at a longwall mining section, Safety Science, Vol. 110, Part A, pp. 204-213.
- Arya, S., Wedding, W.C., Saito, K., Novak, T., and Levy, A., (2017), Scale modeling of dust capture through a flooded-bed dust scrubber integrated

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