LETTER FROM THE CHAIR

This is an exciting time for Montana Tech and the Geophysical Engineering Department. Recently, the Montana Board of Regents designated Montana Tech as a special-focus institution with emphasis on engineering and related science and health programs. The Board of Regents also gave Montana Tech a new name: “Montana Technological University”. Montana Tech now has one successful PhD program in material science and plans to add several more PhD programs including in “Earth Science and Engineering”. The Geophysical Engineering Department will participate in the Earth Science and Engineering PhD degree.

This year the Department received $20,000 from Montana Tech capital equipment funds for new Unmanned Aircraft Systems (UASs) and associated instrumentation. Our current airborne platforms include a DJI Phantom 2, five Phantom 3s, a DJI Inspire, a DJI Matric 600 Pro, and numerous fixed-wing aircraft. Onboard sensors include a multispectral imager, thermal camera, and other optical cameras. We are building a fluxgate-type gradiometer and an airborne EM system. We are also collaborating with the Montana Bureau of Mines and Geology on the calibration and use of LiDAR from a UAS platform. In addition, we added the professional drone mapping and photogrammetry software Pix4D to our software inventory.

Newmont Mining Corporation generously donated $10,000 in scholarships for geophysical engineering students and provided $20,000 to upgrade our fiber optics Distributed Acoustic Sensing (DAS) Laboratory.

On Friday, October 12, 2018, we will have our annual Industrial Advisory Board (IAB) meeting in Butte, Montana, to coincide with Homecoming weekend. The IAB provides industry input to our program and this is an important part of our assessment process. Please feel free to contact me if you are interested in serving on the IAB. The IAB is an important component of the accreditation process and we take IAB input seriously.

The Montana Tech Foundation Board recently approved a $60,000 capital campaign to increase Montana Tech’s endowment. Montana Tech plans to use these funds to create endowed professorships and enhance the research profile of Montana Tech. The Geophysical Engineering Department plans to become ½ endowed in the next ten years by adding three endowed professorships in applied geophysics. The Department can grow and be strengthened by recruiting outstanding researchers and teachers to fill these endowed chair positions. With declining state support in recent years, we have begun to rely heavily on Montana Tech Foundation funds to support the Department. This is likely to be the funding model for the next several decades. In addition, we have a growing need to replace aging equipment and provide scholarship support. If you would like to help us meet our fundraising goals and help support an endowed professorship, then please contact me and we can discuss how you might help. If you choose to send financial support, then please clearly indicate that your generous donations are for the Geophysical Engineering Department and send you checks to the Department.

Marvin Speece, Professor and Chair
Generous Supporters of the Department: August 2017 - June 2018

Corporate and Foundation Gifts

Chevron Corporation

Newmont Mining Corporation

Shell Oil Company Foundation Educational Matching Gifts

Individual Gifts

Brian Church

Robert Garland

Jim Girard

Fredrick Hoffman

Mark and Catherine McRae and Family

Keith Sjostrom and Mary Ann Moore

Mario and Nancy Vacca
Faculty News

Marvin Speece: Graduate student Megan Valdez is using a 3D seismic data set from West Virginia that was provided by alum Fred Hoffman and Bluescape Resources to compare trace attributes with P-wave anisotropy for fracture detection/orientation in the Marcellus Shale. Brad Rutherford continues to work on his paper for the journal *Tectonics* that discusses the regional tectonics of northwestern Montana. I am working with Jeremy Crowley in the Montana Bureau of Mines and Geology and Geophysical Engineering undergraduate Jacob Clarke on a Montana Tech Summer Undergraduate Research Fellowship (SURF) project to calibrate a LiDAR system for drone use.

Xiaobing Zhou: I continue to teach Gravity and Magnetic Exploration, Elements of Geophysics, Electricity and Magnetism, Field Geophysics, Senior Design, and Remote Sensing for both upper level undergraduates and graduates. For research, I have finished a two-year project “Enhancing Montana’s Energy Resources: Research in Support of the State of Montana Energy Policy Goals” funded by Montana University System research initiative. I am working on the drone project supported by Montana Tech’s capital equipment funds. We now have 12 UASs in our department for education. We developed a fluxgate magnetic gradiometer and integrated it with one of the UASs during a senior design project in Spring 2018. At the same time, I am trying to advise more undergraduate researchers on developing geophysical sensors to be integrated to UAS platforms for geophysical exploration.

I continue collaboration with researchers in universities in China by applying remote sensing techniques to snow/ice monitoring and inversion for ice thickness and subglacial sediment thickness from IceBridge aerogravity and lidar/radar DEM data. We have one visiting scholar from China here in the Department. He is developing remote sensing image segmentation/classification algorithms.
Shamim Akhtar: I served as a Visiting Assistant Professor of Physics at Colorado State University-Pueblo, Colorado for the last two years. In the last two semesters, I taught advanced-level electricity and magnetism and other algebra and calculus-based courses including labs. Last Spring, I was involved in designing an advanced electricity and magnetism lab for the senior undergraduate physics students. I also mentored a senior undergraduate student last year who worked on energy loss calculations and determining the efficiency of a neutron detector. He presented his work in June 2018. I attended a “Workshop for New Physics and Astronomy Faculty” organized by AAPT in College Park, Maryland in June 2017. I gave seminar talks at Colorado State University-Pueblo on the topics of “Introduction to particle accelerators” and “Study of the $^{12}$C($\alpha$, $\gamma$)$^{16}$O reaction via the $\alpha$-transfer reactions: $^{12}$C($6$Li, d)$^{16}$O and $^{12}$C($7$Li, t)$^{16}$O” in 2017. This summer, I am working on designing an online introductory physics course. Apart from that, I am also working on my research paper about helium burning in stars under the guidance of my Ph.D. advisor Dr. Carl Brune. I am excited about the new position at Montana Tech and I am working on preparing material for the courses that I will be teaching in the Fall of 2018. I am looking forward to moving to Montana.

Khalid Miah: I taught Seismic Prospecting, Inverse Theory, Numerical Computing, and general physics course in Electricity and Magnetism.

This summer, I am working with my graduate student (Ngoc Ha) to build a prototype fiber-optic DAS (Distributed Acoustic Sensing) system. I am also collaborating with Professor Xiaobing Zhou on UAS & related research and a UAS certification program. I am looking forward to mentoring two undergraduate students: Rachel Hadley has been awarded a grant from the Montana Academy of Sciences (MAS) to conduct research on the seismic interferometry, and Marihelen Held has applied for a URP award to work on piezo-electric energy harvesting.

Mohamed Khalil: I continue teaching resistivity and electromagnetic, petro-physics, general physics and field geophysics for both graduate and undergraduate students.

Former graduate student Akpofure Orubu received his MS degree. His research paper was accepted for publication in the Journal of Applied Geophysics. His work dealt with dewatering of Lolo Creek, south of Missoula. Kristen Prudhomme is studying recent unexplained land subsidence in Butte, Montana by using 2D and 3D resistivity, Self-Potential (SP) and Frequency Domain Electromagnetics (FDEM). This summer, I collected Time Domain Electromagnetic (TDEM) and resistivity data near Sydney, Montana for a joint project with Montana Bureau of Mines and Geology.
Jim Girard: Jim continues to teach physics and manage the physics lab.

Theresa Froehlich: Administrative Associate II.

Emeritus Professors: Curtis Link, Bill Sill and Chuck Wideman

Recent Publications


Recent Publications, continued


Recent MSc Theses:


Akpofture Orubu, 2017, Geophysical Investigation of Dewatering in Lolo Creek, Montana, USA.

Mo Li, M. S., 2017, Aeromagnetic and Spectral Expressions of Rare Earth Element Deposits in Gallinas Mountains Area, Central New Mexico, USA.

2018 Senior Design Project:

Sierra Luoma & Joseph Natale, 2018, Construction of a Small Unmanned Aircraft System Based Magnetic Gradiometer.

Shane Namie & Jonathan Rice, 2018, Montana Tunnels Mine Investigating the Unstable Slope above the Northwest Wall.

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