It is a pleasure to write this introduction together as outgoing department head and incoming department head. The department has gone through a tumultuous season of change, as we had a huge turnover of faculty members. Fortunately, the CSM administration has allowed the department to make 6 new hires in the last two years, and the department did well in attracting top-candidates. The new hires of the last year are described on page 4. Going through this hire process was labor-intensive, and the rate of change in the department was an emotional drain at times. But this process was all carried out in a great spirit of collaboration and comradery. We especially want to thank Michelle Szobody and Joana Perez for their support in this time of change. It is a pleasure to work with the wonderful faculty and staff in our department.

But the department went beyond replacing its ranks. The ability to make new hires was an opportunity to strike out in new directions. Such new directions are also needed to make the department, and its students, less dependent on fluctuating energy prices. We have started the Reimagine Geophysics project, which is described on more detail on page 11. We expect to roll out a new geophysics curriculum in the 2018-2019 academic year.

At the beginning of the fall semester Roel Snieder moved out of the department to be Professor of Professional Development Education, while John Bradford joined CSM in his role of Department Head of Geophysics. To make the transition as smooth as possible we collaborated intensively during the spring and summer, and continue to do so in the fall semester. It is pleasure for both of us to serve the geophysics department and to work together in such a collegial way.
Welcome to the Department... 

The department has seen a 50% turnover in the last few years. We are thrilled that the Mines administration allowed us to hire new colleagues, which provide us with an opportunity to move in new directions.

We welcome our new colleagues and are excited to work with them.

EBRU BOZDAG

is Assistant Professor in global computational seismology. Ebru received a PhD from Utrecht University, did a postdoc at Princeton University, and most recently worked at the University of Côte d’Azur in France, as Assistant Professor and held a Chaire d’Excellence position. Ebru’s work will help the department to broaden out in whole-earth geophysics, and in numerical global wave simulations.

JOHN H. BRADFORD

joined us in August as the new Department Head. He came from the Department of Geosciences at Boise State University. As past President of the Society of Exploration Geophysicists, John is well connected in the geophysics community. John runs an active research program in near-surface geophysics, and has been supported through the program Geoscientists Without Borders in a project to characterize aquifer degradation in Bénin, West Africa.

JOANA E. PEREZ

joined the Geophysics Department last September as Administrative Assistant. She worked at the University of Colorado Anschutz Medical Campus for several years before moving to Florida. She is a Colorado native who returned home last year, and fortunately joined the department.

JEFF SHRAGGE

joins us as an Associate Professor. He arrived in July from the University of Western Australia in Perth. Jeff received a PhD degree from Stanford University and has broad experience in Exploration Seismology and near-surface Geophysics. He will join the Center of Wave Phenomena (CWP) and will bring in expertise in industrial aspects of computational seismology and high-performance computing. He is known for his enthusiasm and perseverance, which he recently showed by bicycling across Australia, a distance of 2600 miles, in six weeks.

ALI TURA

became Director of RCP in December, 2016. His expertise is in the areas of seismic data processing, seismic analysis, time-lapse seismic, rock physics, fiber optic technology and data analytics. Prior to joining the department, he was a Geophysical Senior Fellow at ConocoPhillips and Geophysical Advisor at Chevron. Ali was also a founding member of a seismic R&D company. Ali leads RCP research as Phase XVII begins with a focus on a unique and comprehensive integrated pilot project in the Eagle Ford Basin. You can find more information on page 10.

Your Support Matters!

Our generous individual and corporate donors have made possible many projects this year. This includes the Geophysics field session, and travel funding for students to attend scientific conferences or to participate in specialized design projects and undergraduate research experiences. We have been able to assist our new faculty with professional development opportunities and new research projects. Your contributions also make this annual newsletter publication possible.

In particular, we acknowledge our biggest financial sponsors, including Anadarko Petroleum Corporation, Apache Corporation, Chevron, ConocoPhillips, ExxonMobil, Hess Corporation, and Shell. We thank in particular a donor, who wishes to remain anonymous, who pledged $25,000 to establish the Terence K. Young fund. Your gifts, whatever the size, are all the more significant to us, given the variable markets. We appreciate all of our sponsors.

HONORS & KUDOS

YAOGUO LI

will receive Honorary Membership of the Society of Exploration Geophysicists at its Annual Meeting in September. Yaoguo serves as an Associate Editor of the journal GEOPHYSICS, and has contributed to the field of gravity, gradiometry, magnetic, and electrical methods by publishing more than 80 papers on leading geophysical journals.

ANDREI SWIDINSKY

received the Geophysics Senior Class Faculty Award. Andrei not only runs an active research program, but he is a much-appreciated teacher. Andrei also leads the annual Geophysics Field Camp, which is an important part of our curriculum and which provides a formative, hands-on, applied geophysical experience for our students.

ILYA TSVANKIN

will take a sabbatical leave in the spring of 2018. He will work on joint research projects at the Curtin University of Technology in Perth, Australia, and the Free University of Berlin in Germany. During the sabbatical he also plans to teach his professional short course on seismic anisotropy for local geophysical societies.
Studying abroad was the single best experience of my undergraduate career. Students come from all over the world to attend the University of Cape Town, so I was able to connect with people from Namibia, Uganda, Norway, Kenya, Denmark, Angola, Canada, etc. The global perspective I gained by studying abroad also benefited my career by showing me first hand the types of problems that are prevalent in the world and how the tools I’ve gained at Mines can help solve some of these problems. I would recommend studying abroad to everyone interested in personal and professional growth.

-Aspen Anderson, Senior Class of Dec. ’17

2017 Geophysical Field Camp

Senior Design Projects - Hawaii Volcanoes National Park
Monitoring changes in lava lake level in the Halema’um’u crater on Kilauea Volcano (with gravity and EM) and detection of ancient agricultural walls at Kahuku (EM, mag, GPR)
Environmental impact and the cost of acquiring geophysical data are major factors to consider when designing and conducting a geophysical survey. Modern advances in robotics, computing, and sensor design have allowed for the innovation of conventional geophysical acquisition instruments and surveying methods. The Center for Wave Phenomena (CWP) is currently collaborating with the Electrical and Mechanical Engineering departments to develop autonomous airborne and land-based acquisition systems to propel geophysics into the 21st century.

There are many geophysical data types; however, in CWP we are currently focusing on gathering ground penetrating radar (GPR) and seismic data using autonomous vehicles. Development of such systems is motivated by current inefficient and inaccurate acquisition techniques, which commonly rely on human-driven instruments. Survey efficiency, accuracy, and safety can be improved by removing the reliance on a human driver through the integration of robotic autonomy.

The Geobot project, led by Alicia Arias, uses an autonomous terrestrial vehicle to gather high density GPR data for more accurate shallow subsurface prospecting.

Thomas Rapstine is leading an airborne project aiming to acquire seismic data by incorporating stereo camera and laser systems. The Geobot and drone vehicles are shown on CSM campus in front of Mt. Zion. To date, several reports and presentations at the CWP sponsors CWP Project Review Meeting and the SEG Annual meeting have been submitted pertaining to this project.

For more information about CWP.
Dr. Ali Tura joined MINES as Director of RCP and Professor of Geophysics. Previous responsibilities include technology leadership as Senior Fellow at ConocoPhillips, time-lapse seismic reservoir monitoring at Chevron and Shell, and amplitude-preserving migration-based AVO analysis at ELF. Ali received a BS degree from Istanbul University, and an MS and PhD from the University of California, Berkeley, all in Engineering Geosciences. Ali is active within the SEG, serving as SEG Vice-president, Vice-Chairman and Chairman of the SEG Global Affairs Committee, and Chairman of the SEG Research Committee. He has served as Chairman of the editorial board of The Leading Edge and Associate Editor of GEOPHYSICS.

As data sets become higher resolution and larger and as society’s needs change, the Department of Geophysics developed a vision for geophysics in the 21st century and how we can set the standards for excellence in geophysics research and education that address major societal challenges. The Reimagine Geophysics committee, chaired by Paul Sava, identified three key research themes where we can build on our existing strengths and develop new lines of research:

(1) robotic and autonomous geophysical data acquisition;
(2) geophysical processing and interpretation of increasingly large volumes of data;
(3) geophysical assessment that integrates geological features and geophysical fields at multiple scales.

Inherent with each of these themes is the need for excellence in computing to meet the needs of modern computational geophysics in the high-performance computing era. The research portfolio of the department is starting to address these themes, but we see opportunities for immense growth. To continue this growth, we anticipate using future faculty positions to increase the breadth and diversity of the department.

While defining our vision, we also evaluated our current curriculum and will propose a new curriculum to the administration for implementation in Fall 2018. The proposed curriculum maintains current strengths we have — field camp, geophysics methods, and senior design — but adds new components and flexibility. With data volumes and computing being central to 21st century geophysics, we are including probability and statistics, linear algebra, data analytics, and two geophysics computing courses to the curriculum. We also added two physics of the earth courses to build strong links between geology, geophysics, geodynamics, mathematics, and computing to understand the mechanisms shaping our world and the solar system at global and planetary scales. Another adaptation is offering greater flexibility in geology and geophysics electives to allow students to design their own pathways. As we Reimagine Geophysics within the department, we will maintain our high standards, expand our horizons, push forward research boundaries, and train the next generation of geophysicists. We welcome any input and thoughts you have on geophysics in the 21st century.
Congratulations to our May 2017 Graduates

Abigail Michel; Andrea Balza; Austin Bailey; Benjamin Bloss; Carlos Convers Gomez; Jacob Utley; James Johnson; Karla Avila Vizeutt; Paula Barbosa Murillo; Piyanan Chanchompoo; Prat Boonyasatphan