

# FACULTY newsletter

CPMS Physical and Mathematical Sciences

## Battle of the Crusts



You may be surprised to learn that portions of the North American continent didn't actually originate on the North American continent. In fact, North America as we know it was formed as different landmasses, which were initially located far away across ancient oceans, collided with North America.

Professor Mike Dorais, a BYU geology professor who regularly researches the Appalachian Mountains in parts of New England, tells us that rocks are a history book of sorts: "Sometimes we have to look on a very small scale in order to see the big picture," he said. "The composition of a rock can tell us a lot about how Earth formed."

Through his analysis of rocks in New England, Professor Dorais has found that some North American rocks match

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**Left:** Researchers at Howser Towers in the Bugaboo mountain range in British Columbia. Photos courtesy of Mike Dorais

## Starving Cancer

What if we could starve cancer?

Dr. Joshua Andersen, of the Department of Chemistry and Biochemistry, aims to do just that, with his team of eight students and a slew of tumors in petri dishes.

"If we can prevent tumors from using energy, we can basically starve them and the tumors die," Andersen said.

All cells have a metabolism that uses energy, typically in the form of glucose. But tumors use this energy in a fairly unique way. Andersen's team hopes to inhibit proteins involved in tumor metabolism with the hope of starving the cancer cells.

Because metabolic proteins are used differently in tumors, Andersen hopes that they can create drugs that target only these proteins without hurting other parts of the body.

Chemotherapy, in theory, should be more effective at killing tumors if the tumors are unable to sustain themselves because these proteins are inhibited.

"In reality, there are always side effects to any treatment," Andersen said. "But the Holy Grail is to design therapies that target tumors and spare other tissues in the body. It is our hope that by gaining an understanding of the unique

aspects of tumor metabolism, we can get closer to that ultimate goal."

Andersen has been studying cancer metabolism for the past seven years. This year, he wrote an article for

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**Above:** Biochem student Vajira Weerasekara works in the lab studying the metabolism of tumors. Photos courtesy of Josh Andersen

## Dates to Note

### Chemistry Open Lab Day

Saturday, May 11 and May 18

10 a.m.-1 p.m.

Orientation: W140 BNSN

### College Admin/Staff Retreat

Friday, May 17

9 a.m.-4 p.m., Aspen Grove

### Astrofest

Saturday, May 18

10 a.m.-4 p.m., ESC

## College Grants

### Chemistry & Biochemistry

[Paul Savage](#)

Sponsor: Sandia National Laboratory (DOE)

Title: Investigation of Novel Coating Materials

### Physics & Astronomy

[Branton Campbell](#)

Sponsor: CRDF Global (NSF)

Title: Structural State and Magnetic Properties of Nano Composites Formed by Exfoliated Graphite and 3D Transition Metals

## Research Development



### Research Development Seminar Coming Soon

Watch for an announcement about a seminar that Research Development will provide on proposal writing tips. It will include information about effective pre-proposal activities, catching a reader's attention, and proposal tips from successful proposal writers, including several from the college.

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the composition and characteristics of rocks found in South America and even Africa.

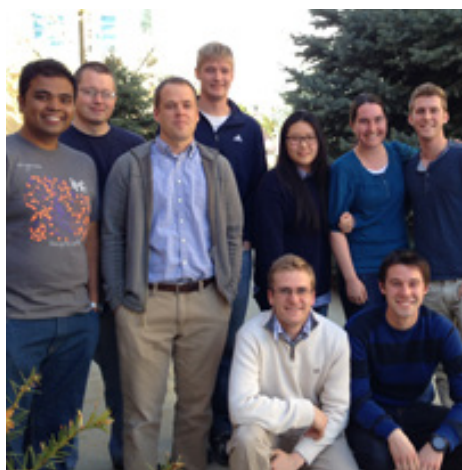
According to Professor Dorais, subduction is to blame. Occurring at a rate that is too slow to be seen by human eyes is a battle that happens between our planet's tectonic plates. This battle, called subduction, happens when one plate slides under another. The plate on the bottom is recycled into the Earth's mantle by this subduction process.

Over millions of years, "the oceanic plates have moved and been consumed in subduction zones. This causes the ocean basins to get smaller and smaller over time," Professor Dorais said. "Oceanic islands, microcontinents, and even other continents that are attached to these oceanic plates move as well. They are carried by the oceanic plate "conveyor belt" until they arrive at a subduction zone and collide with each other. When continents collide, it's a car wreck!"

The eastern side of the North American continent has been victim to this sort of tectonic attack several times. "Just since about 470 million years ago, practically yesterday in terms of Earth's history, there have been about four, if not five, collision events in the Northern Appalachians," said Professor Dorais.

This kind of collision, called an orogeny, is one of the ways that mountains are created. When the Atlantic Ocean began to open around 200 million years ago, portions of crust that collided with North America were left behind.

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**Above:** Dr. Joshua Andersen and his team of researchers.



**Above:** Mike Dorais stands at Gannett Peak, Wyoming.

"Some parts of New England weren't originally part of North America at all, but rather are fragments left behind from the ancient supercontinent of Gondwana," said Professor Dorais. This supercontinent included almost all of the current continents on Earth. Dr. Dorais added that during the formation of Gondwana things got, "...plastered on, and when everything split apart again, they remained attached to North America."

America hasn't always been a victor in these tectonic wars, however. Sometimes we lose a piece: "Scotland comes from North America," remarked Professor Dorais.

by Brian Shaw

[Molecular Cell](#) outlining most of the research done so far on the topic of cancer metabolism. He also outlined his hopes of where this type of research should be headed.

"This is a very exciting time in the field of tumor metabolism. Clinicians and scientists alike are developing strategies to target tumor metabolism as we speak. But at the same time, we still have a lot to learn," Andersen said.

by Curtis Penfold

# College Publications

## Chemistry

S.E. Kalman, A. Petit, T.B. Gunnoe, [D.H. Ess](#), T.R. Cundari, M. Sabat, "Facile and Regioselective C-H Bond Activation of Aromatic Substrates by an Fe(II) Complex Involving a Spin-Forbidden Pathway", *Organometallics*, 2013, volume 32/issue 6, pp. 1797-1806

J.H. Kim, I.H. Hwang, S.P. Jang, J. Kang, S. Kim, I.Noh, Y. Kim, C. Kim, [R.G. Harrison](#), "Zinc Sensors with Lower Binding Affinities for Cellular Imaging", *Dalton Transactions*, 2013, volume 42, pp. 5500-5507

P.N. Nge, C.I. Rogers, [A.T. Woolley](#), "Advances in Microfluidic Materials, Functions, Integration, and Applications", *Chemical Reviews*, 2013, volume 113/issue 4, pp. 2250-2583

D. Li, A.D. Rands, S. C. Losee, B.C. Holt, J.R. Williams, S.A. Lammert, R.A. Robison, [H.D. Tolley](#), [M.L. Lee](#), "Automated Thermochemolysis Reactor for Detection of Bacillus

Anthracis Endospores by Gas Chromatography-Mass Spectrometry", *Analytica Chimica Acta*, 2013, volume 775, pp. 67-74

## Geology

E.J. Steig, Q. Ding, J.C.W. White, M. Küttel, [S.B. Rupper](#), T.A. Neumann, P. Neff, A. Gallant, P.A. Mayewski, D.C. Taylor, G. Hoffmann, D.A. Dixon, S. Schoenemann, B. Markle, D.P. Schneider, T.J. Fudge, A.J. Schauer, R.P. Teel, B. Vaughn, L. Burgener, J. Williams, E. Korotkikh, "Recent Climate and Ice-sheet Changes in West Antarctica Compared with the Past 2000 Years." *Nature Geoscience*, 2013, doi: 10.1038/ngeo1778

## Mathematics

H. Fan, [T. Jarvis](#), Y. Ruan, "The Witten Equation, Mirror Symmetry, and Quantum Singularity Theory", *Annals of Mathematics*, 2013, volume 178/issue 1, pp. 1-106

## Statistics

B.C. Healy, [D. Engler](#), B. Glanz, A. Musalam, T. Chitpis, "Assessment of Definitions of Sustained Disease Progression in Relapsing-Remitting Multiple Sclerosis", *Multiple Sclerosis International*, 2013, volume 2013, p. 9

D. Li, A.D. Rands, S. C. Losee, B.C. Holt, J.R. Williams, S.A. Lammert, R.A. Robison, [H.D. Tolley](#), [M.L. Lee](#), "Automated Thermochemolysis Reactor for Detection of Bacillus Anthracis Endospores by Gas Chromatography-Mass Spectrometry", *Analytica Chimica Acta*, 2013, volume 775, pp. 67-74

