WINTER 2007

geosciences
AT VIRGINIA TECH
Magazine

Global Oil Reserves. Running On Empty?

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Building the Himalaya: Flow and Extrusion of Mid-Crustal Rocks During Continental Collision

Carl Kirby Sees Red or Maybe Chicago Orange

VirginiaTech
Invent the Future

Message From The Chair

The Changing Face of Geosciences at Virginia Tech

by Robert Tracy, Chair

Having just returned from the Fall Annual Meeting of the American Geophysical Union in San Francisco, where I met with most of our new incoming faculty, I am more impressed than ever with them. They range in age from late twenties to mid-forties and rank from assistant to full professor, and provide a secure and exciting bridge to the future for our department as a few of us approach the transition to retirement from active faculty status. This process of faculty renewal and replenishment is an essential one for an academic department, and if carefully done keeps a department on a desirable upward track of increasing quality and academic reputation. We believe we are well embarked on the path to our strategic goal of being one of the best and highest-ranked geosciences departments in the country with significant strengths in theoretical, experimental and applied geosciences.

In an earlier issue of the magazine, I told you something of our progress in hiring. Last spring semester, we set out to interview 10 candidates in computational geophysics and four in computational earth systems science, and ultimately selected seven in geophysics and one in earth systems as worthy of offers. We were able to make five offers in geophysics, of which three were accepted, and one in earth systems that was accepted. As a result, our new faculty will include Professor Scott King (Geodynamics), Assistant Professor Jake Sewall (Paleoclimatology and Climate Modeling), Associate Professor Chet Weiss (Electromagnetics) and Assistant Professor Ying Zhou (Theoretical Seismology and Mantle Tomography). In addition, we were joined in September by a geophysicist who retired early from Georgia Tech, Professor Bob Lowell (Marine Geophysics and Seafloor Hydrogeology), and we will be joined next summer by Dr. Erin Kraal (Geomorphology and Planetary Geology). I invite you to check out the research of these new faculty additions on our website (www.geos.vt.edu). We expect that planned retirements of Arthur Snoke in 2007 and Krishna Sinha in 2008 will lead to further renewal of our faculty. We are also actively engaged in development efforts that we hope will result in as many as three endowed chairs in geosciences. If all works out as planned, by 2009-2010 one-third or more of the faculty will have joined our department in the 2006-2007 academic year and afterward.

I am also pleased to report that President Steger announced this past fall that the request for proposals for the design stage of a new geosciences building has gone out to architectural firms for bids. No firm plans or timing for actual construction are yet announced, but we hope to be planning soon for our new lab and office spaces, and a superb new Geosciences Museum, and perhaps we will be ready to occupy the new building by the end of the decade or shortly after.

We know very well the affection and pride all of our alumni and friends have in our department, and we trust as well that you appreciate our continuing need for your financial help in accomplishing our ambitious goals. Over the next few years we will need additional resources to take maximum advantage of the educational and research opportunities presented by the addition of so many new faculty. All public universities are moving to a model of increased private funding, and Virginia Tech now gets only about 20% of its total operating money from the commonwealth. There are many places where your contributions, large or small, can have a major impact, including supporting field trips, funding scholarships and fellowships, providing endowed chairs, and enhancing the learning and research environments in our classrooms and laboratories. We need you to be an active part of our present and future, and encourage you to be involved!

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Letters to the editor, suggested articles, and other comments are welcome at this address:
Publication Editor
Department of Geosciences (0420)
Virginia Tech, Blacksburg, VA 24061
Office phone (540) 231-6521
Fax (540) 231-3386
E-mail: mcmurray@vt.edu

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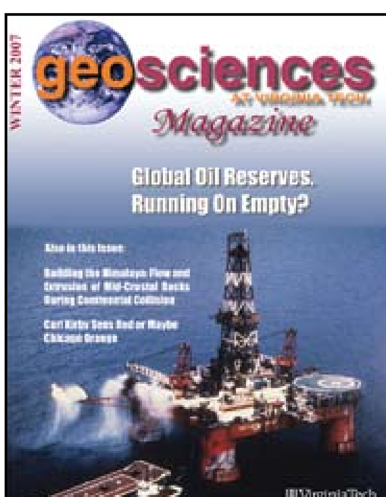
View of Mount Everest, Khumbu icefall and Nuptse from Nepal (photograph by Rick Law).



Also in this Issue

Cover: A semi-submersible drilling vessel on location in the deep water Gulf of Mexico. See story on page 2.

Global Oil Reserves. Running On Empty?

By Matt Mikulich, Principal Technical Advisor, Chevron (Retired),
Adjunct Professor of Geophysics at Virginia Tech

There has been a lot published about the oil reserves of the earth, and many people have been forecasting that the global oil peak has already happened, is here now, or will be shortly. Articles forecasting almost total economic destruction and doomsday after "peak oil" are common. The premise is that oil production will peak due to a lack of resource to produce, and after that is only chaos. But, according to the Energy Information Administration (EIA) (2006), "Oil resources are adequate to meet (projected) growing worldwide demand for at least the next 25 years." The concept of the globe running out of oil is not new. Back in the 1930s, John Rockefeller decided that his Standard Oil Company's refining business was in jeopardy due to the depletion of oil fields in Pennsylvania and Ohio, and it could even go out of business unless more oil could be found. He decided that his company needed to buy, find, and own reserves of its own. So, he vertically integrated his company, adding exploration and production functions to his refining and transportation components.

The truth is that oil has been an enigmatic resource for both the producing countries and companies. They have struggled with oversupply and low price for a century or more. As recently as 1986, oil prices fell to less than $9.00 per barrel and stayed around $14-$16 per barrel (in then current $) into the early 1990s due to a surplus of oil on the market. This resulted in dramatic shocks in the oil industry, significant staff and budget cutting, and slowed investments for most of a decade. How could this have happened in a world with a limited global endowment that is rapidly being depleted?

M. King Hubbert and the Depletion Curve. In 1956, M. King Hubbert published his forecast that oil production would peak in the United States in 1970, and it did. But, no one in the United States even noticed that peak; it was a non-event. Some people say that Hubbert was right, because he forecast the year of the U.S. peak oil production. However, after annual U.S. production peaked at 3.52 billion barrels in 1970, it declined to 2.98 billion barrels in 1976, only to peak again at 3.27 billion barrels in 1985, a behavior not forecast by Hubbert. But, Hubbert did more than forecast a production peak. In fact, he forecast a production curve, or a depletion curve, for both the United States, and for the world. He did this by fitting a "logistical" curve to the production history to date, and extending that curve into the future. A production curve, or depletion curve, shows annual oil production as a function of time.

In Figure 1, note the global peak in the year 2000, a maximum production of about 13 billion barrels/year,

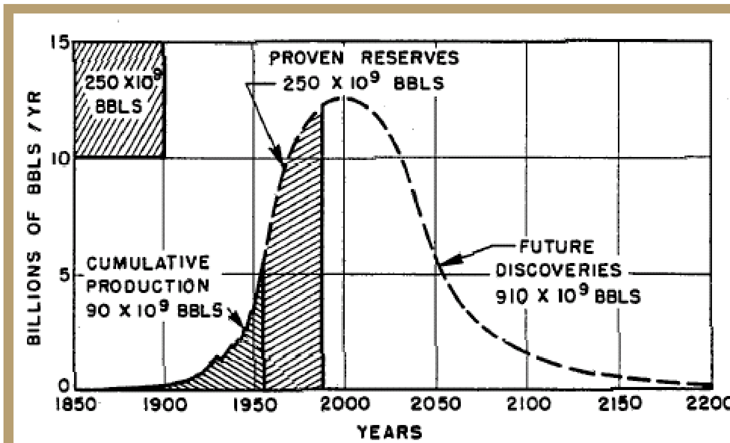


Figure 1. Hubbert's global depletion curve, 1956, *Nuclear Energy and Fossil Fuels*, M.K. Hubbert, 1956

and an ultimate global production of 1.25 trillion barrels (by summing the annual production to depletion). Each of these forecasts is wrong.

Some oil facts. Oil has been produced in the world since about the year 1900. Before that, although some oil was consumed, the amounts are truly insignificant. By our best estimates, about 1.0 trillion barrels of oil have been consumed in the world through the end of 2005, and today there are about 1.3 trillion barrels of reserves on the books of the producing countries. "Reserves" are defined as oil in subsurface reservoirs, known to a high certainty, and economically producible. (One outcome of the definition is that as price goes up, reserves go up.) These two numbers alone imply a global ultimate recovery of 2.3 trillion barrels. Another interesting fact is that, in spite of the consumption, there are more oil reserves in the globe today than at any time in history (see Figure 2). In 2002, global production was about 78 million barrels per day, and has increased today to about 84 million barrels of oil per day, or about 31 billion barrels per year. Taken together, these data strongly support the fact that we are not yet at global peak oil. However, global oil production and consumption are as close to balance as they have ever been, with little surplus production capacity above demand. This drives the price up, as does global political unrest and natural disasters. However, global economic recession and high price drive demand down.

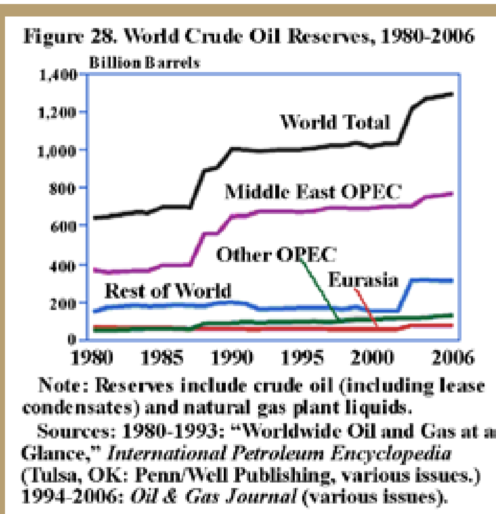


Figure 2. Global oil reserves, 1980-2006, *International Energy Outlook*, 2006, June 2006, EIA

But, haven't we been hearing that there have been no new discoveries recently? Then how can reserves be increasing? Actually, there have been very significant discoveries around the globe, and there are many places left to look. Certainly new discoveries have not entirely offset production for many years. But, there have been significant "reserves additions" in existing fields, and together the sum is greater than the production; hence global reserves continue to increase. Take Kuwait as just one example. Kuwait has been producing about 2.2 million barrels of oil per day over the last 10 years. In 1995, its reserves were 90 billion barrels, and in 2005, its reserves are 102 billion barrels; they've gone up. Simply put, there is a lot of oil in existing fields that has not yet been booked as reserves. So in addition to new discoveries, more oil can be booked in existing fields with further development and increased investments from higher prices. Furthermore, new technology helps make it feasible to recover more oil economically.

The 2000 USGS study of global oil endowment. In the year 2000, the USGS published comprehensive results of many years of study of the oil basins and reservoirs of the world. *AAPG Memoir 86*, published in 2005, is a partial update to that work. No one else has done such a study to my knowledge. In the 2000 study, they conclude that given current reserves numbers including production to date, anticipated reserves additions in existing fields, which they term "reserves growth," and new discoveries, the most likely ultimate global production (recoverable oil) potential is about 3.0 trillion barrels.

So, when will oil production peak? Assuming a 2% compounded growth rate in production (demand), they forecast a high confidence global peak in 2026, a most likely peak in 2037, and a low confidence peak in 2047. Figure 3 further estimates the ultimate global production as follows: 2.248 trillion barrels at 95% confidence, 3.003 trillion barrels at 50% confidence (the most likely value), and 3.896 trillion barrels at 5% confidence. In addition, it is estimated that if global oil consumption can be held flat, global resources are sufficient to maintain the current production rate to the year 2100.

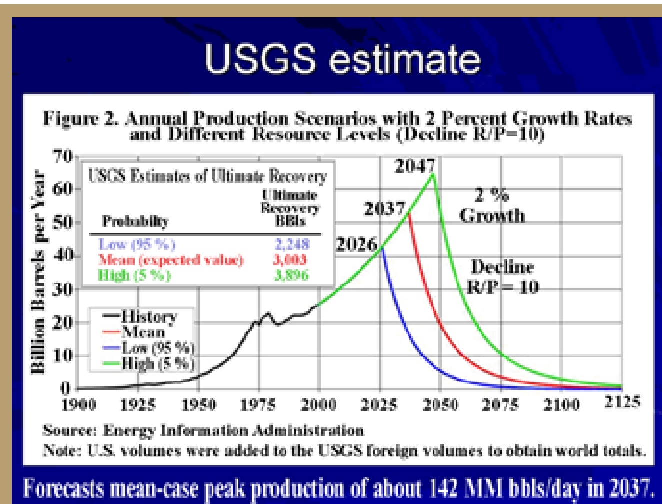


Figure 3. Global peak scenarios assuming 2% compounded growth in demand, *Long-Term World Oil Supply Scenarios*, August 18, 2004, J.H. Wood, G.R. Long, D.F. Morehouse, EIA

In Figure 4, we see that the production forecast for the year 2025 is about 105 million barrels per day, or about 38.3 billion barrels per year, or slightly less that the 42 billion barrels per year as forecast from the 2000 study (see Figure 3 above).

And, there's more to the story. Ah, but like all good stories, this isn't the end. All the above discussion includes "conventional" oil only. Non-conventional oil, such as "heavy oil" is not included, nor is "shale oil." Current estimates are that the globe contains 6 trillion barrels of heavy oil, less than 2% of which has been booked as reserves. Heavy oil fields in Canada and Venezuela have just barely started production. It is very likely that at least 1 trillion barrels of this heavy oil will come to market, raising global ultimate production to more than 4.0 trillion barrels as a mostly likely case. If half of the world's heavy oil can be produced, then the globe will produce 6 trillion barrels, about 3 trillion conventional and 3 trillion heavy oil, until depletion. Shale oil is an additional upside.

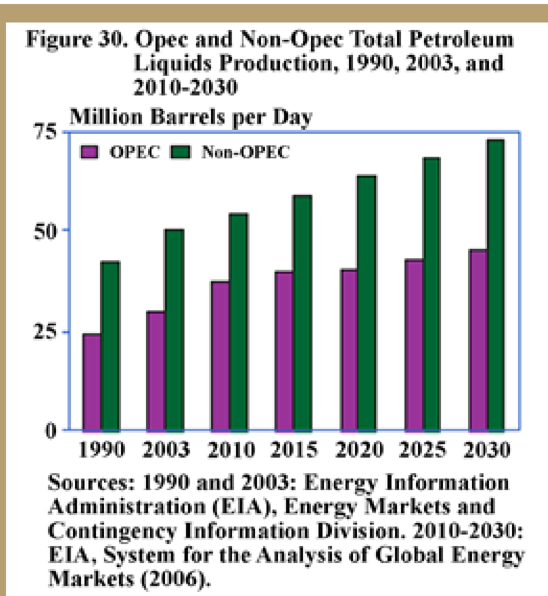


Figure 4. Latest forecast of future production, *International Energy Outlook*, 2006, June 2006, EIA

In addition to Hubbert, many people have forecast "peak oil." Campbell et al. forecast it for 1995, and 2000. Deffeyes is mostly quoted these days. He forecasts 2.0 trillion barrels as ultimate production, and says the peak already happened in late 2005. But the facts are that both production and reserves are still increasing. These forecasters, and others of their ilk, are wrong for several reasons. First, they significantly underestimate the conventional ultimate global production. This was Hubbert's single greatest error. Second, they forecast future production by using past production data. This is unsound because it ignores the effect of new technology in recovering more oil from existing conventional reservoirs. For example, as late as the 1970s, most reservoirs were considered depleted when 25% of the oil-in-place was recovered. Today we can get up to 50%, and future technology will allow us to get even more. So forecasting future production by projecting past production data cannot provide an accurate forecast. Third, they seem to not recognize that reserves and production are a function of price. A sustained higher price will result in increased investments and ultimately more oil production and more reserves. Lastly, heavy oil, which has enormous upside potential, is not included in their forecasts.

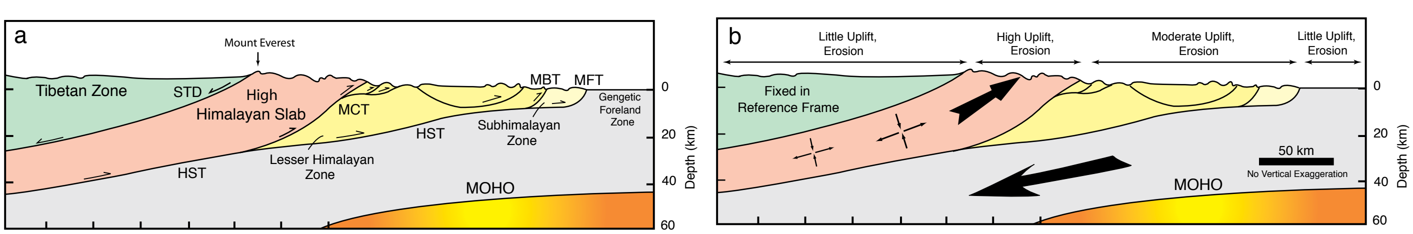
In conclusion. Oil prices will remain relatively high as long as demand is close to developed producing capacity. OPEC and others have learned that having surplus production capacity and oil on the market only drives the price down, so new investments will likely be made only as necessary to maintain production equal to demand. New investments will result both in new discoveries and increased recovery from existing fields, hence adding to conventional reserves. And, we must still add in heavy oil's contribution. Natural gas resources, using natural gas-to-liquids technology (i.e., green diesel), and hydrogen-from-methane, will help stretch our transportation fuels into the future. It is estimated that less than 10% of the global gas endowment has been consumed to date. Electric power generated from increased use of nuclear plants in the future can reduce demand on oil for this purpose. By the time of peak oil, we will already be moving to a less oil-dominated energy scenario. Does this mean that we can become complacent about energy, and not conserve, or ignore the development of alternatives? Of course not. But, when the world oil peak does come, it should have no more effect on us than the U.S. peak did in 1970. It is even possible that when peak oil does occur, it will not happen due to the exhaustion of the resource, but lack of interest in it.

About the Author: Matt Mikulich is the retired Corporation Chief Geophysicist and Principal Technical Advisor of the Chevron Corporation, a member of the Chevron Reserves Advisory Committee for several years, and currently appointed as Observer to the Oil and Gas Reserves Committee of the Society of Petroleum Engineers. He is also Adjunct Professor of Geophysics at Virginia Tech.

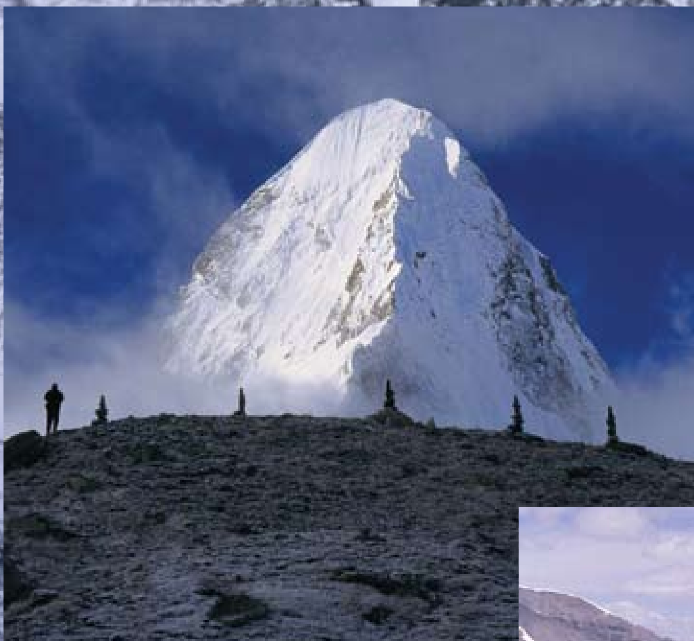
Building the Himalaya: Flow and Extrusion of Mid-Crustal Rocks During Continental Collision

by Rick Law, Professor of Geology

The Himalaya is frequently cited as the classic example of a mountain chain produced by continent-continent collision, with the chain progressively evolving as thrust sheets are stacked up on top of one another during continued collision between India and Asia. But what has been much less commonly talked about is how high temperature flow within the metamorphic core of the Himalaya may itself be an important driving mechanism for uplift and exhumation of these mid-crustal rocks along with subsequent formation of some of the highest peaks on Earth. That began to change in the late 1980s and 1990s when MIT geologists proposed that rocks forming the metamorphic core of the Himalaya were originally located beneath the Tibetan Plateau and have been squeezed and extruded southwards as a slab-shaped body towards the Earth's surface, driving upwards the crest of the Himalaya [see inset diagram]. Then, starting in 2001, a new generation of more sophisticated computer



Generalized geologic cross section through the Himalaya and southern part of Tibetan Plateau; adapted from Hodges et al. (2001). The Greater Himalayan Slab (GHS) is bounded above by the South Tibetan Detachment System (STDS) and below by the Main Central Thrust (MCT). Top - From bottom left clockwise: Rick Law, Ph.D. student Micah Jessup and Nepalese sirdar Tashi Sherpa at Lukla airstrip; southern edge of Tibetan Plateau and High Himalaya peaks; Lhotse (left) and summit of Everest (right) from Kangshung Glacier; Jessup and Law on trek out from Kangshung Glacier.



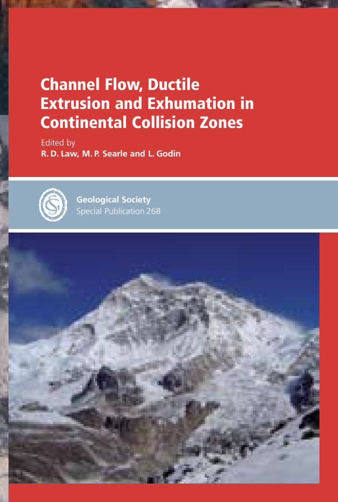
models (referred to as channel flow models) were developed by Chris Beaumont and his collaborators at Dalhousie University, Canada, in which southward and upward flow of these rocks from the middle crust under the Tibetan Plateau towards the Himalaya was driven by horizontal gradients in lithostatic (or vertical) load. A common feature of all these models is that the greater the degree of vertical squeezing and shortening of the rocks in this flowing channel, the greater the amount of material that has to be extruded towards the Earth's surface. Also, if surface erosion cannot keep pace with extrusion, the greater the amount of extrusion then the greater the amount of surface uplift - hence explaining why the highest Himalayan peaks (at least in the Central Himalaya) always coincide with the outcrop position of this channel or slab of mid-crustal rocks.

However, what was missing from these models was any real data on how much vertical squeezing and shortening has actually occurred in rocks during their passage up to the Earth's surface. If the material is deforming by simple shear, a mechanism similar to shuffling a pack of playing cards, then the rocks won't lengthen parallel to the shearing motion, just as a playing card doesn't lengthen when the deck is shuffled. So, in simple shear, rocks from the middle crust won't move very far towards the Earth's surface. However, if the material is both sheared and vertically shortened (referred to as a pure shear in materials science) then the rocks will lengthen parallel to the shearing motion and move towards the Earth's surface. By the late 1990s, analytical techniques had become sufficiently well developed to quantitatively measure the contributions of simple and pure shear in plastically deformed rocks, opening up the opportunity to begin testing these models for the Himalaya.

Following reconnaissance work by Mike Searle from Oxford University (UK) and me on the north side of Mount Everest in 2000, we received a $250,000 grant from the National Science Foundation in 2002 to begin assessing these models in the Everest region of Nepal and southern Tibet. The grant has also provided funds for Virginia Tech student Micah Jessup's Ph.D. research. Micah is a high-altitude climber with previous experience on the km-high vertical granite walls in the Pakistan Himalaya and quickly proved to be a natural fit for the project. The Virginia Tech - Oxford team have so far completed three field seasons under NSF funding in the Everest region, working at altitudes ranging from 3400 m to 6500 m (11000' - 21500') on the south (Nepal), north and eastern (Tibet) sides of the mountain, and in 2004 we were the

Background picture: Tibetan view of Mount Everest (l to r): the N.E. Ridge and the N. Col (lowest part of skyline at right). The banding in the Everest Series rocks can be seen even under the snow. The Lhotse Detachment, the lowest of the South Tibetan Detachment System of faults, separating the Greater Himalayan Slab from rocks of the overlying Tibetan Plateau (see figure page 5), is near the base of the banded rocks. Inset pictures (l to r): Pathangtse rearing up above Kangshung Glacier on Tibet-Nepal border, east of Mount Everest; East Rongbuk Glacier on north (Tibetan) side of Everest; north face of Everest and Northeast Ridge (left skyline) from Rongbuk Glacier; low-tech transport in Rongbuk Valley on north side of Everest. (all photographs by Rick Law.)



first geologists to get into the remote and rarely visited Kangshung Valley leading up to the east face of Mount Everest. Fieldwork has involved some challenges and steep learning curves, ranging from managing teams of porters for weeks at a time, to handling yaks when their Tibetan drivers disappear off into the mists during the frequent blizzards encountered on the long treks into some of the more remote regions.

Laboratory analyses of the samples collected have conclusively demonstrated that flow within the metamorphic core of the Himalaya has involved major components of pure shear deformation, supporting extrusion and channel flow models for the Himalaya. We are currently working on integrating this flow data with pressure - temperature - time (PTt) information provided by microprobe-based thermobarometry and radiometric dating in order to track the exhumation history of these rocks towards the Earth's surface. Ultimately, we hope to explore potential cause and effect links between the phases of rapid extrusion and exhumation we are beginning to identify in the metamorphic core of the Himalaya and phases of rapid sedimentation that are already well documented in basins, such as the Bengal Fan, to the south.

Processes similar to the Miocene (c. 22-16 Ma) age flow and extrusion we have identified in the Himalaya may also have operated in older mountain belts, although the evidence for their operation has often been obscured by later deformation. Therefore, the geologically young Himalaya could well provide important new insights on processes previously operating in older mountain belts. As part of the project, Mike Searle and I, in collaboration with Laurent Godin at Queens University, Canada, organized a conference in 2004 which was held at the Geological Society of London and was attended by numerical modelers and Himalayan geologists, as well as geologists working

on older mountain belts in the USA, Canada, Greenland, Norway, Italy, Greece and Japan. A follow-up book entitled *Channel Flow, Ductile Extrusion and Exhumation in Continental Collision Zones*, edited by Law, Searle and Godin and consisting of a range of numerical modeling and more field-based studies in the Himalaya, the Hellenides of Greece, and the Appalachians and Canadian Cordillera, was published by the Geological Society in December, 2006.

The next stage of our ongoing collaborative work between Virginia Tech, Oxford and Queens University will be to see if the pure shear driven extrusion processes we have documented in the Everest region have also operated along the length of the Himalaya. To test these ideas, we are currently planning a series of projects ranging in location from Zanskar in the northwest Himalaya of India, through the Annapurna and Makalu/Arun Valley regions of Nepal, to the geologically classic Darjeeling transect of the eastern Himalaya. These projects will offer great opportunities for a new generation of Ph.D. students to gain field experience working in spectacular geologic areas, and will also provide the opportunity for exchange of students between our three institutes, with the students taking advantage of the different laboratory-based facilities offered by Oxford, Queens and Virginia Tech.

From bottom left clockwise: Clare Law and Tashi Sherpa at Base Camp on Nepalese side of Everest; team members for the 2004 expedition including John Cottle (Oxford) and Micah Jessup (back row left), Laura Duncan (Virginia Tech alumnus, B.S. 2004), Mike Searle (Oxford) and Rick Law (front row) plus drivers and sherpas; Rick Law at west face of Nuptse; alpenglow over summit of Makalu on Tibet-Nepal border to east of Mount Everest; yak transport on trek in to Kangshung Glacier; Changtse (left) and north face of Everest from Rongbuk Valley; yak transport and rare alpine vegetation on north side of Everest; Arakam Tse to southwest of Everest; Micah Jessup and Northeast Ridge of Everest from Kangshung Glacier. Photographs by Laura Duncan, Micah Jessup and Rick Law.

Carl Kirby Sees Red or Maybe Chicago Orange

Whenever Bucknell Geology associate professor Carl Kirby (B.S.'87, M.S. '89, Ph.D. '93) sees acid mine drainage, he sees red…and orange and yellow. These colors are caused by iron minerals that form in streams contaminated by solutions that run off some mining sites. This runoff, called acid mine drainage, contains a combination of colored iron oxide

(Top to Bottom): Jennifer Elder (Chem Eng/Geol, '96 - Bucknell University), operating a field mixed-flow reactor developed at Bucknell University, measuring the rate of ferrous iron oxidation in mine drainage at an abandoned deep mine pump slope near the Bear Valley Strip Mine; Carl Kirby in front of the Bucknell University Geology/ Psychology building with the painted Vanagon.

minerals called "yellow boy." Carl studied mine drainage with Don Rimstidt as a small side project while completing his Ph.D. at Virginia Tech. Much of his research at Bucknell has focused on mine drainage and treatment.

Iron oxide minerals are often used as paint pigments. Carl, who has long been interested in ways to convert environmental liabilities into economic advantages, has proposed that these yellow boy iron oxides should be captured and sold as paint pigments. In order to promote this idea, Carl has painted his 1982 Volkswagen Vanagon with yellow boy pigments. He had to use ultra-sound to keep the pigment particles separated in the paint because, according to Carl, they tended to stick together. Although one industry expert predicts the problems can be overcome, it is not clear if producing the paint would be a profitable venture. Nevertheless, Carl isn't trying to make a profit, but is just trying to find a way to help pay the cost for treating mine drainage that affects thousands of stream miles and thousands of acres of impoundments in the United States.

In addition, Carl has manufactured and sold more than 100 "yellow boy" dyed tee shirts that are an attractive light orange using pigment from mine drainage sediments. This novel idea has certainly attracted a lot of attention, including a short article in the *Chronicle of Higher Education* (March 3, 2006, p. A9). Carl regrets that the van hasn't been on National Public Radio's Car Talk, yet. We salute Carl for his innovation and suggest that a few Maroon highlights on his van would make it an ideal tailgating vehicle.

(Top to Bottom): A deep mine discharge which makes up a large portion of Carbon Run; current "Yellow Boy" t-shirt was originally white before being "dyed" with mine drainage sediments from near Shamokin, Pennsylvania; a deep mine discharge tributary to the Shamokin Creek; the Yellow Boy decal©

Clockwise from lower left and L to R : Cahit Çoruh & Caroline Muller; John Costain; Don & Louise Bloss and Arthur Snoke; Bob Tracy; David Worthington; Cecil Cummins and Mary Ann Johnson

Fall Alumni Dinner In Honor of John Costain

November 10, 2006

L to R (above) Matt Mikulich & Mike Hochella

MY FRIEND, JOHN.

By Matt Mikulich. On the occasion of the Geosciences Department Alumni-Faculty Dinner honoring John Costain, November 10, 2006.

- A friend is someone who's always close, even when he's far away. You can always feel the presence of a friend in your life.
- A friend always thinks well of you, and says nice things about you to others. A friend makes you feel good about yourself.
- A friend knows how you feel. He is happy when you're happy, and can understand when you're sad. When you're down, a friend will pick you up, and when you're a bit haughty, he can bring you down, but ever so gently.
- A friend will never think badly of you, even when you make a mistake. A friend understands what you mean when the words don't come out right. A true friend has already forgiven you for any transgression, even before you ask.
- A friend rejoices in your success, and reassures you when you fail. You can learn so much from a friend, and he always makes you think he has learned something from you.
- You can take a long walk with a friend, and never say a word.
- Anything you ask of a friend he will do. You can ask him to feed the cat when you're away, or take out the garbage, and he'll do it. A friend will take you home when you've had too much to drink, or come to get you at the airport at 3:00 a.m. in the morning.
- Friendship is not earned, but freely given. You can't put a price on friendship.

- **John, what a friend I have in you. Thank you for being my friend.**

Susan & Arthur Shrader and Ed Robinson (above)

Pat Burton, Ken Eriksson and Anna Balog (above)

Jessica Smothers Eicher and Beth Spellerberg Granger (L to R above)

Back row: Tom Kolich, Fred Webb, Robert Francis, Jeff Jeffries, Leonard (Rip) Ford, Art Shrader, Kenny Megginson, Bill Presley, Steve Grimsley, Mike Hochella; front row: Beth Spellerberg Granger, Anna Balog, Jessica Smothers Eicher, Andy Gambill, David Worthington, Ken Weisenburger, Sam Peavy and Martin Chapman

Tom Kolich and Sam Peavy (right)

Kenny Megginson and Leonard (Rip) Ford (above); Barbara & Fred Webb and Robert Francis (right)

Mary McMurray receiving flowers from Alumni Relations Committee (above)

’50s

Richard Leary (B.S. ’59) writes, “I always enjoy the Geosciences Magazine. I have many good memories of my years at Virginia Tech. Some year I’m going to come back for an alumni dinner.

I retired from the Illinois State Museum at the end of 1997 after more than 35 years as Curator of Geology. When the museum revamped the entire first floor of natural history exhibits, one of the large dioramas was based on my research in western Illinois. I returned as a volunteer to provide information for the exhibit. The diorama, ‘Tropical Illinois,’ portrays a site in Rock Island County at the beginning of the Pennsylvanian. The site was unusual in that it preserved a predominantly non-swamp flora. The fossils, preserved as compressions in shale, represent plants found in few other locations in the world. The site was also unusual because the bedrock surface on which the plants grew was present.

In January 2006, my wife and I traveled to Antartica, our seventh continent and in March we traveled to Guatemala and Costa Rica, bringing the total countries visited to 50. We have also camped in all 50 states (49 in a tent) and have plans for many more trips abroad as well as in the United States.

Fred Webb, Jr. (M.S. ’59; Ph.D. ’65) writes, “We very much enjoy getting the magazine and look forward to each new issue. I am still retired, but continue to do geologic mapping of the Saltville quadrangle funded by the USGS State Map program. Barbara and I would very much enjoy hearing from former field camp students. My e-mail address is webbfj@appstate.edu. I also have a web site (http://www.appstate.edu/~webbfj/VaTechSFC.html) where field camp alumni can go to see photos for most of the years when we were involved.”

’70s

John R. Lawson, II (B.S. ’75) John was recently reappointed to his second term on the Virginia Tech Board of Visitors and was elected Vice Rector. He is also the Chairman of the Building and Grounds Committee and the National Co-Chair of the University Capital Campaign. Together with his fellow fraternity brother, Ross Myers, he gave $10,000,000 to Virginia Tech to start the new School of Construction, which is the first program of its kind in the country. He is president and CEO of the family construction business, W. M. Jordan Company, one of the premier contractors in the nation, and the largest Virginia-based general contractor. He says “I still owe much to the Department of Geological Sciences, and Dr. Lowry for teaching me the value of hard work and to pursue your dreams.”

’80s

Wendy Beckman (B.S. ’80) writes, “My fourth book came out in June 2006. *Dating, Relationships, and Sexuality: What Teens Should Know* was published by Enslow. I was also interviewed by *TeenPeople* magazine for a small sidebar quote on whether you should take back someone who has cheated on you, and if you were the cheater what you should do to be taken back. (I thought I was pretty hard-nosed about it, but after hearing what some teens thought on the subject, I’m not so bad.)

My fifth book is due out late 2007 or early 2008 – it is on the banned books of Robert Cormier and is also intended for a young adult audience.

I am also singing in the May Festival Chorus, the oldest continuous choral festival in the Western Hemisphere.

At the University of Cincinnati, I have a fantastic “beat”: I am responsible for the publicity for the College of Engineering, the College of Business, the UC Women’s Center, Ethnic Programs & Services, and certain departments in the McMicken College of Arts & Sciences. I prepared the news releases for the group of students and faculty who went to GSA in October.”

Arnold I. Miller (Ph.D. ’81) is the Department Head for the Geology Department at the University of Cincinnati. Arnold writes, “My new textbook, Principles of Paleontology, 3rd edition (co-authored with Michael Foote, University of Chicago) has just been published by W. H. Freeman and Company. The previous two editions were authored in the 1970s by David M. Raup and Steven M. Stanley, and the profession has been waiting for a new edition for quite some time. Actually, in the end, about 95% of the book is new.”

Richard M. D'Angelo (M.S. '85) worked for Amoco for 13 years and has been involved with private equity investments in the oil and gas industry at WR Huff Asset Management in Morristown, New Jersey, for the past eight years. Richard is still putting his geophysics degree to work drilling wells in Canada, California, Texas, Louisiana, and the Gulf of Mexico. He is always looking for additional investments in good projects and good management teams. You can contact Richard at 1776 On the Green, 67 Park Place, Morristown, New Jersey 07960 or 973-490-6166.

Mark J. Gresco (Ph.D. '85) and his wife Jeannie have moved to Houston where he is working as an Exploration Supervisor in Devon Energy's International Division. He is supervising development projects in China, Brazil and Egypt. *mark.gresko@dvn.com*

Bob Gauer (B.S. '88) is the Business Manager at Veritas in Houston, Texas. You can write to Bob at 3110 Amesbury Court, Sugar Land, Texas 77478. *bob_gauer@veritas.dgc.com*

'90s

David Winslow (M.S. '91) writes, "After completing my Ph.D. at Lehigh and working on the uplift/cooling history of Nanga Parbat, Pakistan Himalaya, I decided not to pursue a Post-Doc at MIT. I made the switch to the environmental consulting industry and have found it very rewarding and interesting. I currently head up the environmental group at GZA Environmental Inc's New York City office. I am also the lead Project Manager on the Tritium and Strontium Hydrogeologic Investigation at Indian Point Nuclear Power Plant in Buchanan, New York. I look forward to hearing from other alumni." *dwinslow@gza.com*

David Bertolacci (B.S. '92) writes, "Hello to everyone. I am applying to Cal State University, San Bernardino for fall 2006 in a new master's Environmental Sciences program while working in the environmental field." *dbert@netzero.net*

Edward Czaja (B.S. '96) writes, "I now have three kids, Eric (5), Emily (3), and Peter (1). I am happily working in the water treatment business for ChemTreat, Inc. providing technical support on ultrapure water technologies for industrial water treatment."

Jonathan Kane (B.S. '96) received his Ph.D. in geophysics from MIT and moved to New Orleans to work for Shell. After Katrina, he was forced to relocate to Houston where he is currently working as an R & D Geophysicist at the Bellaire Technology Center.

Laura Lukes (M.S. '04) is in her second year of teaching high school Earth Science and Honors Earth Science at Saguaro High School in Scottsdale, Arizona. Laura also teaches Physical Geology at Mesa Community College. She loves living in Arizona and enjoys backpacking, hiking and river tubing. Laura says the geology there is fantastic!

'00s

Christina Lopano Clobes (B.S. '01) will be defending her Ph.D. in Geosciences on January 12, 2007, at Penn State and she will be working for RJ Lee Group, Inc. in Pittsburgh, Pennsylvania. Christina married Jason Clobes in November at the Penn State Chapel. Congratulations Christina and Jason!

Chelsea McRaven Feeney (B.S. '03) was married to Dennis Feeney on September 3, 2006, and lives in Bellingham, Washington. Congratulations Chelsea and Dennis!

David L. Rodland (Ph.D. '03) writes, "I've finished a year and a half in Frankfurt, Germany, as an Alexander von Humboldt Research Fellow at the University of Frankfurt, following in the footsteps of my advisor, Michal Kowalewski. I am now a Virginia resident again. I'm at George Washington University in Washington, D.C., as a visiting assistant professor, covering the sed/strat and paleo side of things. Northern Virginia is a bit crazy but it's good to be back."

Justin Kennedy (B.S. '04) is finishing his master's degree in geological sciences at Case Western Reserve University in Cleveland, Ohio. *jdk40@case.edu*

Eddie Savarese (B.S. '04) is a project hydrogeologist with Walden Environmental Engineering, PLLC in Oyster Bay, New York. *esavarese@waldenenviornmental.com*

Jonathan Roller (M.S. '04) was married May 21, 2006, in Wilmington, NC to Laura DeMoe who he met while at Virginia Tech. They are currently living in Maryland where they are both employed at ARCADIS, an environmental consulting firm. Laura works as a Geologist, and Jon works as a Hydrogeologist/Groundwater Modeler.

Sandra M. Warner (M.S. '04) is a project manager with Olver Incorporated in Blacksburg, Virginia. In September Sandra wrote, "Things are going very well. I love my job. One of my main projects is working on Wellhead Protection Plans for small public community groundwater waterworks in central and western Virginia. This project is through a contract with VDH and has been a great experience. I also do other various environmental items from groundwater contamination clean up to air permits and regulatory compliance. I usually do something different every day, which I enjoy. I am studying for the Professional Geologist Exam this October.

My husband and I are expecting our first child for Christmas this year. We are having a boy and are very excited (although nervous) about being parents. I'm due December 27, and so far everything has been going well and healthy."

Karina Cheung (B.S. '05) writes, "I am currently pursuing my master's degree in planetary sciences/planetary geology at the University of Tennessee in Knoxville. This semester I am a GTA for two physical geology labs as well as the geology department's program coordinator for outreach programs at the university's McClung Museum. I'm living in Knoxville, but missing Blacksburg like crazy!"

Robert D. St. Claire (B.S. '06) has been commissioned as a Second Lieutenant in the U.S. Army Corps of Engineers. He completed Engineer Officer Basic Training at the U.S. Army Engineer School at Fort Leonard Wood, Missouri, and the Army has recognized Robert as a Distinguished Graduate of the 17 week training program based on a 90% or greater overall average. He is continuing his combat engineering officer training and is currently attending the U.S. Army Airborne School at Fort Benning, Georgia.

Please join us for the 100th Anniversary of the Department of Geosciences

Come help us celebrate!!!

Dr. Roy Holden advising a student circa 1925.

Planned activities (subject to change):

- field trips
- lunch at Chatteau Morrisette
- dinner reception Saturday evening
- distinguished speakers
- catch up with past faculty members

Dr. Fred Read advising Thomas Wynn, Ph.D. '03 in 2001.

There will be activities for all including spouses and children.

Watch your mail for details!!

Call your friends and former classmates to arrange your own private reunion.

Tentative Dates -- October 5-6 or October 12-13, 2007

Beth Diesel

Student Awards Received by Beth Diesel and Lisa Tranel

Beth Diesel, student of Dr. Madeline Schreiber, was presented a Distinguished Research Award at the Hydrogeology Division lunch at the 2006 Annual Geological Society of America meeting. The award included travel money and plaque shown in the picture to the left.

Beth also received the Penelope Hanshaw Scholarship given by the Association for Women Geoscientists (AWG) Potomac chapter, and Lisa Tranel received Honorable Mention. This scholarship was created in 1991 to honor the work of Hanshaw, a founding member of AWG-Potomac. Dr. Hanshaw was the first woman president of the Geological Society of Washington and served as Deputy Chief Geologist for Scientific Personnel at the U. S. Geological Survey before her retirement in 1990. Congratulations Beth and Lisa.

Lisa Tranel

Awards presented to Dr. Robert Bodnar, University Distinguished Professor of Geochemistry

Dr. Robert Bodnar was elected a Fellow and presented with the N. L. Bowen Award by the American Geophysical Union at the spring meeting in Baltimore, Maryland.

Bob was selected to be the 2006 Fermor Keynote Lecturer of the Geological Society of London. The lecture is the most prestigious lectureship of the Society and is named after Sir Lewis L. Fermor (knighted in 1935), a British geologist and first President of the Indian National Science Academy.

Bob has also been selected to be included in the Thomson ISI list of Highly Cited Researchers in Geosciences. According to the ISI web site, the list includes the top 250 preeminent individual researchers (comprising less than one-half of one percent of all publishing researchers) in each of 21 subject categories, who have demonstrated great influence in their field as measured by citations to their work. Only seven Virginia Tech faculty are included in this list. In 2006, Bodnar was elected a Fellow of the American Association for the Advancement of Science. In spring 2007, Bodnar will serve as the Edwin Allday Distinguished Lecturer in Geological Sciences at the University of Texas-Austin, and the Cloos Lecturer at Johns Hopkins University.

Dr. Robert Bodnar

DEPARTMENT OF geosciences AT VIRGINIA TECH

Department of Geosciences
College of Science
4044 Derring Hall, Virginia Tech
Blacksburg, Virginia 24061
Phone: (540) 231-6521
Fax: (540) 231-3386
E-mail: mcmurray@vt.edu
Web Info: http://www.geos.vt.edu

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