Paleontologist Makes No Bones About Passion for Fossils

By Carla DeMarco

A STRANGE THING HAPPENED when Professor Robert Reisz attempted to earn a degree in physics in the mid-1960s. "I hated it" Reisz said, cringing. "In high school physics was really fascinating, but in university it was just awful and dull."

As a result, Reisz felt uncertain about what educational direction to pursue. After taking various courses at McGill, his curiosity was piqued by a course being offered on fossils. "I took it and just loved it and that was it," Reisz said.

He completed his studies at McGill and worked at University of California at Los Angeles for a year before accepting a faculty position at the University of Toronto Mississauga in 1975. Today he is chair of the biology department, a world-renowned vertebrate paleontologist and this year's recipient of a prestigious Alexander von Humboldt Research Award.

Focusing mainly on extinct vertebrates in his research, Reisz is particularly interested in the evolutionary consequences of the amniotic egg, which originated 315 million years ago. "The amniotic egg has a large amount of yolk and a series of structures called extra-embryonic membranes," Reisz explained. "This innovation allowed animals to lay relatively few eggs and invest a lot of energy in those eggs and allowed them to separate themselves completely from reproduction in the water."

Reisz said that animals did come onto land prior to this time but had to go back into the water to reproduce. However, with the advent of the amniotic egg, they were able to become fully terrestrial. Reisz is fascinated by this time period because of the great expansion of terrestrial vertebrate life that is superbly reflected in the fossil record.

Reisz and his research team attempt to piece together a clearer picture of what these animals looked like, how they behaved, who their relatives and descendants are and reconstruct their evolutionary history. Reisz pointed out that 310-305 million years ago all the terrestrial vertebrate life was on one large supercontinent called Pangaea and that the fossils of animals have been found along the equator, which extended from New Mexico, Texas, Nova Scotia, England and central Europe. At this time there was also a huge ice age that covered most of the southern part of the supercontinent, freezing up South America, Africa, India and Antarctica, but when the ice age ended the fauna appear to have spread everywhere.

"So I'm going all over the world looking for these fossils," said Reisz. "I have studied material from North America, Europe, Russia, South Africa and I'm currently working on material from India."

As part of the Humboldt Research Award, which annually honours internationally recognized scientists and scholars from abroad for career-long achievements in research and teaching, Reisz will be given the opportunity to pursue a research project of his own design in Germany. He has chosen to study the origin of turtles and his work will be carried out at the Stuttgart Museum of Natural History.

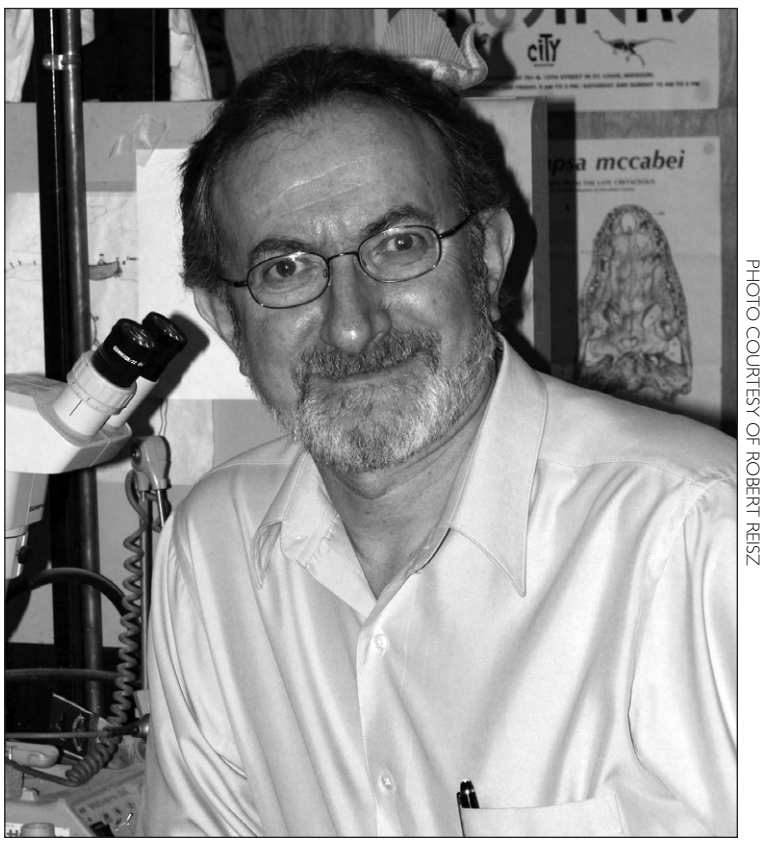

PHOTO COURTESY OF ROBERT REISZ

Professor Robert Reisz

"We're going to actually look at the oldest turtles with some modern techniques and devices, such as CAT sans and laser scanning," explained Reisz.

Having started out without a clear direction, Reisz has managed to carve out a life's work that has proven to be inspiring, rewarding and even pleasurable for him. He considers his research to be a career-long approach to vertebrate paleontology and he is always looking forward to the next project and the discoveries that might be unearthed. "It's a mystery; it's observational science," Reisz said. "But then you put it together to present a cool story — and that's where the fun is."

Antarctic Ice Yields Student Research Discovery

By W.D. Lighthall

WHILE RESEARCHING THE "bottom of the world," Jeffrey Geddes made a discovery about sea ice formation that has the potential to provide scientists with another piece of the climate-change puzzle

As part of a research project on the St. George campus last summer, Geddes, an undergraduate science student, was analysing data supplied by a NASA satellite when he detected a previously unknown multi-year ice formation cycle in Antarctica's Cosmonaut Sea. Climate scientists and researchers study sea ice and its formation patterns in the polar regions because sea ice, or the lack of it, affects local climates and potentially impacts the global weather system. Geddes determined that large bodies of water surrounded by ice on three sides — known as embayments — tend to occur every three years in the Cosmonaut Sea.

"Our discovery that embayments occur approximately every three years at the same time in the same place seems to indicate there may be some inherent predictability in the variability of sea ice in that region," said Geddes, now a fourth-year student at the University of Toronto Mississauga.

Working in the lab of Professor Kent Moore, chair of the chemical and physical sciences, Geddes studied NASA data on ice formations in the Cosmonaut Sea from 1979 to 2004. He found that while the volume of sea ice might change from year to year embayments and polynyas (embayments after they become enclosed on all four sides by the ice pack) reappear at regular three-year intervals in the same areas.

Moore supervised Geddes' project, which was funded by a grant from the Natural Sciences and Engineering Research Council of Canada, and said studying the formation of sea ice is important because in Antarctic waters ice serves as an insulator that traps heat in the ocean. When large open stretches of water occur during the austral winter, there's no insulation and heat from the ocean can transfer to the atmosphere.

"The climate system is clearly under stress right now but we don't understand all the variables," Moore said, adding that Geddes' contribution has been to "place another piece into the puzzle. We now understand that in this part of the world, there are processes going on related to this repeating variation of sea-ice cover."

Geddes has published an article he wrote on his findings in a recent edition of *Geophysical Research Letters*, a leading journal of the geophysical sciences.

Moore noted that Geddes' paper has received positive reviews for its insights about sea-ice formation in the Cosmonaut Sea. He also noted Geddes accomplished the work and wrote his paper while an undergraduate.

"Generally, writing scientific papers is quite a challenge for most people. He wrote the paper, he produced everything and for an undergraduate to do that, I think, is a singular accomplishment," Moore said.

New Brake Light System Could Mean Fewer Collisions

By Sonnet L'Abbé

A DYNAMIC BRAKE LIGHT SYSTEM that enables rear lights on a leading vehicle to contract or expand during hard braking could help lessen how often rear-end automobile collisions occur, says new research from the University of Toronto.

Zhonghai Li, a post-doctoral student, and Professor Paul Milgram of mechanical and industrial engineering worked with the fact that drivers perceive the time separation between themselves and a vehicle they are following based on the size of image of the leading vehicle on the driver's retina. They hypothesized that if it were possible to exaggerate how quickly the retinal image expanded, drivers might brake sooner in potential crash situations. A preliminary study using a driving simulator confirmed that they did. The next challenge was to find an application for this knowledge.

"In the real world, we can't manipulate the retinal images of cars," said Milgram. "But we thought we could change the image of taillights. We guessed that if we could make a taillight system that appeared to change in size, it might have a significant effect on braking behaviour."

Milgram and Li investigated their concept by using a low-fidelity driving simulator to test the reactions of 40 young male participants to driving scenarios under various visibility conditions. A roadway was projected onto a large screen and participants used a standard game control steering wheel and brake pedal to respond to the brake lights of a leading vehicle.

Li and Milgram manipulated optical looming cues of the lead vehicle — that is, the rear window and right and left taillights, which sit in a triangular formation — so they would imperceptibly expand and separate in response to the distance between and relative velocity of the two vehicles. In nighttime driving conditions where drivers rely heavily on brake light cues to gauge their distance from other vehicles, drivers showed a clear response to the illusion of the leading car nearing more quickly.

"We got people to brake 100 to 300 milliseconds sooner," said Milgram, who emphasizes that while the inter-vehicle separation sensing technology required to create such a braking system does exist, much more development and testing is necessary before implementation. "That fraction of time may seem small but given the millions of braking events every day, the difference could mean thousands of averted crashes per year."