INSIGHTS

Rutgers researchers uncover new knowledge in the sciences and humanities.

Devonian Doom

ASTEROIDS SNUFFED OUT EARLY LIFE FORMS

As a paleobiologist, George McGhee spends most of his time looking at the past. But he knows one thing about the future: An asteroid or a series of asteroids will fall and wipe practically all life off the face of Earth. "Every couple of years, astronomers track massive asteroids in our solar system," says the professor of geology at Rutgers–New Brunswick. "If one hit Earth, it would be at least as devastating as a nuclear war."

"If an asteroid hit Earth, it would be at least as devastating as a nuclear war."

McGhee specializes in the Devonian period, the second of the "big five" mass extinctions that have hit the planet over the last 600 million years. Two decades of research have culminated in his new book, *The Late Devonian Mass Extinction* (Columbia University Press). "The Devonian was a very important time for the planet, although it is not as glamorous as the Cretaceous period, known as the time of the dinosaurs," he says. "In the Devonian, our terrestrial ecosystem was just getting started; the first plants and insects appeared. At the end of the period, the very first amphibians, *Ichthyostega*, began to come out of streams and on to land."

But this evolutionary progress came to a sudden halt; scientists have been puzzled as to why. McGhee theorizes that the Devonian period differs from the Ordovician, Permian, Triassic, and Cretaceous periods in that its demise was predicated, not by one great impact from a single asteroid, but by "a peppering of smaller asteroids for a period of about 6 million years." The vaporizing effect of asteroids hitting Earth caused dust clouds to block the sun, which resulted in global cooling, explains McGhee. Many species died off, and it took another 6 million years for the ecosystem to recover. "Had not a few species slipped through the cracks and survived, there would have been a great setback in evolutionary history," he says.

Geologists dating Devonian-era fossils and rocks "have found a heavy carbon anomaly, which is evidence of things dying," says McGhee. Further evidence supporting McGhee's theory has been discovered in Sweden, China, Belgium, and Nevada. "This evidence has established two impacts and we have circumstantial evidence pointing to at least three others," McGhee says. "It may be hard to buy into something that occurred more than 300 million years ago, but the facts speak for themselves."

Laser Show

TEST DETECTS ULCERS WITH A BREATH

Few things in life are as dreadful as an ulcer. Besides the pain of the ulcer itself, a diagnosis entails the cutting away of stomach tissue or the ingestion of radioactive material. But Daniel Murnick, a professor of physics at Rutgers–Newark, had a hunch that his basic research might provide a less invasive, less risky procedure that was equally effective. He devised a breath test called the Laser Assisted Ratio Analyzer (LARA) that can easily, accurately, and economically detect the presence of *H. pylori*, a bacterium found in 80 percent of people suffering from stomach and intestinal ulcers, intestinal disorders like dyspepsia, and stomach cancer.

The test detects minute changes in the natural ratio of carbon-12 and carbon-13 in a patient's breath before and after the ingestion of a small amount of urea. If the ratio has changed, there's a high probability that *H. pylori* is at work. "About five years ago, I learned of a medical diagnostics need for isotope ratio analysis, and I thought some of the basic research I was working on could be applied to the problem," says Murnick, explaining how he came to develop the LARA system. "A visiting professor took the test, found he had an intestinal problem, and was successfully treated for it."

The test, which has been licensed by Rutgers' Office of Corporate Liaison and Technology Transfer to Alimenterics, Inc. of Morris Plains, is now in the final stages of clinical evaluation. FDA approval for commercial use is expected this June. Alimenterics hopes to eventually use the test to diagnose liver and pancreatic disorders as well.

The system also holds potential in geological, biological, and environmental studies. In geological studies of rock sediment, for example, the ratio of carbon isotopes is important in determining the age of fossils. In environmental studies, the measure of carbon isotopes could be used to trace pollutants or to determine effects associated with global warming.

"A visiting professor took the test, found he had an intestinal problem, and was successfully treated for it."

The Research and Development Council of New Jersey presented Murnick with its 1996 Thomas Alva Edison Patent Award for the clinical application of his research. "Rutgers' partnership with Alimenterics is enabling fundamental research to be developed into hospital- and clinic-based systems that could benefit thousands of ulcer patients," says Murnick. "Since my background is primarily in basic research rather that applied research, you never really believe that something you're working on will be used in a positive way in such a short period. I'm thrilled."

Private Matters

RUSSIAN CAPITALISTS MEAN BUSINESS

There isn't much good news coming out of Russia these days: concern over President Boris Yeltsin's health, the toll taken by the war in Chechnya, organized crime, high unemployment. But a trio of Rutgers researchers says that not all can be considered bleak in a country that, since 1992, has seen 80 percent of its businesses pass from state to private hands. In their new book from Cornell University Press, *Kremlin Capitalism*, the authors argue that privatization of businesses has helped Russia to make huge economic strides.

"Many companies have become more efficient than they were under the old Soviet system," says Joseph Blasi, a professor in the School of Management and Labor Relations at Rutgers–New Brunswick and an adviser to the Russian government. "There are certainly problems that have occurred due to privatization, but those problems aren't unique to Russia and won't be solved overnight. The point is that Russia has made a far more–promising start than its critics seem willing to admit."

Blasi and colleagues Doug Kruse, an associate professor, and Maya Kroumova, a senior research associate, spent four years interviewing company managers, local officials, and workers across Russia's 89 regions, or states. In the privatization plan approved by Parliament in 1992, every Russian citizen received a 10,000-ruble voucher valid for the purchase of stock or mutual funds. The authors found that employees bought an average of 66 percent of each enterprise; 21 percent went to outsiders. The Russian government, which retained 13 percent, will eventually sell these shares to outsiders—particularly Russian or foreign investors who agree to put money into the companies.

Today, 60 percent of the sales at 200 Russian companies are to private businesses, a sharp contrast to the past, when sales were almost exlusively to state-owned firms. The companies have also cut employment rolls by 20 percent since 1991, contracted with foreign investors to explore joint ventures and other projects, and changed their product lines to reflect the goods that consumers really want to buy.

"Russia has made a far more–promising economic start than its critics seem willing to admit."

"The public perception in the West is that most citizens sold their vouchers for food, that managers and bureaucrats bought control of the enterprises, and that the mafia has hijacked the entire process," says Blasi. "Most workers, however, held onto their vouchers and used them to buy large stakes in their companies. Obviously, there have been some irregularities—so huge a program could hardly be carried out smoothly—and the Russian press has chosen to play them up. But our research uncovers a better picture."—*Bill Glovin*

Illustrations by Richard Beards

INSIGHTS

Rutgers researchers uncover new knowledge in the sciences and humanities.

Devonian Doom

ASTEROIDS SNUFFED OUT EARLY LIFE FORMS

As a paleobiologist, George McGhee spends most of his time looking at the past. But he knows one thing about the future: An asteroid or a series of asteroids will fall and wipe practically all life off the face of Earth. "Every couple of years, astronomers track massive asteroids in our solar system," says the professor of geology at Rutgers–New Brunswick. "If one hit Earth, it would be at least as devastating as a nuclear war."

"If an asteroid hit Earth, it would be at least as devastating as a nuclear war."

McGhee specializes in the Devonian period, the second of the "big five" mass extinctions that have hit the planet over the last 600 million years. Two decades of research have culminated in his new book, *The Late Devonian Mass Extinction* (Columbia University Press). "The Devonian was a very important time for the planet, although it is not as glamorous as the Cretaceous period, known as the time of the dinosaurs," he says. "In the Devonian, our terrestrial ecosystem was just getting started; the first plants and insects appeared. At the end of the period, the very first amphibians, *Ichthyostega*, began to come out of streams and on to land."

But this evolutionary progress came to a sudden halt; scientists have been puzzled as to why. McGhee theorizes that the Devonian period differs from the Ordovician, Permian, Triassic, and Cretaceous periods in that its demise was predicated, not by one great impact from a single asteroid, but by "a peppering of smaller asteroids for a period of about 6 million years." The vaporizing effect of asteroids hitting Earth caused dust clouds to block the sun, which resulted in global cooling, explains McGhee. Many species died off, and it took another 6 million years for the ecosystem to recover. "Had not a few species slipped through the cracks and survived, there would have been a great setback in evolutionary history," he says.

Geologists dating Devonian-era fossils and rocks "have found a heavy carbon anomaly, which is evidence of things dying," says McGhee. Further evidence supporting McGhee's theory has been discovered in Sweden, China, Belgium, and Nevada. "This evidence has established two impacts and we have circumstantial evidence pointing to at least three others," McGhee says. "It may be hard to buy into something that occurred more than 300 million years ago, but the facts speak for themselves."

Laser Show

TEST DETECTS ULCERS WITH A BREATH

Few things in life are as dreadful as an ulcer. Besides the pain of the ulcer itself, a diagnosis entails the cutting away of stomach tissue or the ingestion of radioactive material. But Daniel Murnick, a professor of physics at Rutgers–Newark, had a hunch that his basic research might provide a less invasive, less risky procedure that was equally effective. He devised a breath test called the Laser Assisted Ratio Analyzer (LARA) that can easily, accurately, and economically detect the presence of *H. pylori*, a bacterium found in 80 percent of people suffering from stomach and intestinal ulcers, intestinal disorders like dyspepsia, and stomach cancer.

The test detects minute changes in the natural ratio of carbon-12 and carbon-13 in a patient's breath before and after the ingestion of a small amount of urea. If the ratio has changed, there's a high probability that *H. pylori* is at work. "About five years ago, I learned of a medical diagnostics need for isotope ratio analysis, and I thought some of the basic research I was working on could be applied to the problem," says Murnick, explaining how he came to develop the LARA system. "A visiting professor took the test, found he had an intestinal problem, and was successfully treated for it."

The test, which has been licensed by Rutgers'

Illustrations by Richard Beards

Office of Corporate Liaison and Technology Transfer to Alimenterics, Inc. of Morris Plains, is now in the final stages of clinical evaluation. FDA approval for commercial use is expected this June. Alimenterics hopes to eventually use the test to diagnose liver and pancreatic disorders as well.

The system also holds potential in geological, biological, and environmental studies. In geological studies of rock sediment, for example, the ratio of carbon isotopes is important in determining the age of fossils. In environmental studies, the measure of carbon isotopes could be used to trace pollutants or to determine effects associated with global warming.

"A visiting professor took the test, found he had an intestinal problem, and was successfully treated for it."

The Research and Development Council of New Jersey presented Murnick with its 1996 Thomas Alva Edison Patent Award for the clinical application of his research. "Rutgers' partnership with Alimenterics is enabling fundamental research to be developed into hospital- and clinic-based systems that could benefit thousands of ulcer patients," says Murnick. "Since my background is primarily in basic research rather that applied research, you never really believe that something you're working on will be used in a positive way in such a short period. I'm thrilled."

Private Matters

RUSSIAN CAPITALISTS MEAN BUSINESS

There isn't much good news coming out of Russia these days: concern over President Boris Yeltsin's health, the toll taken by the war in Chechnya, organized crime, high unemployment. But a trio of Rutgers researchers says that not all can be considered bleak in a country that, since 1992, has seen 80 percent of its businesses pass from state to private hands. In their new book from Cornell University Press, *Kremlin Capitalism*, the authors argue that privatization of businesses has helped Russia to make huge economic strides.

"Many companies have become more efficient than they were under the old Soviet system," says Joseph Blasi, a professor in the School of Management and Labor Relations at Rutgers–New Brunswick and an adviser to the Russian government. "There are certainly problems that have occurred due to privatization, but those problems aren't unique to Russia and won't be solved overnight. The point is that Russia has made a far more–promising start than its critics seem willing to admit."

Blasi and colleagues Doug Kruse, an associate professor, and Maya Kroumova, a senior research associate, spent four years interviewing company managers, local officials, and workers across Russia's 89 regions, or states. In the privatization plan approved by Parliament in 1992, every Russian citizen received a 10,000-ruble voucher valid for the purchase of stock or mutual funds. The authors found that employees bought an average of 66 percent of each enterprise; 21 percent went to outsiders. The Russian government, which retained 13 percent, will eventually sell these shares to outsiders—particularly Russian or foreign investors who agree to put money into the companies.

Today, 60 percent of the sales at 200 Russian companies are to private businesses, a sharp contrast to the past, when sales were almost exlusively to state-owned firms. The companies have also cut employment rolls by 20 percent since 1991, contracted with foreign investors to explore joint ventures and other projects, and changed their product lines to reflect the goods that consumers really want to buy.

"The public perception in the West is that most citizens sold their vouchers for food, that managers and bureaucrats bought control of the enterprises, and that the mafia has hijacked the entire process," says Blasi. "Most workers, however, held onto their vouchers and used them to buy large stakes in their companies. Obviously, there have been some irregularities—so huge a program could hardly be carried out smoothly—and the Russian press has chosen to play them up. But our research uncovers a better picture."—*Bill Glovin*

"Russia has made a far more–promising economic start than its critics seem willing to admit."