FAST AND HIGH-TECH: Japan's "Bullet" trains, already marvels of technology, have recently added Wi-Fi service for passengers. WIKIMEDIA COMMONS

The competitive edge

U.S. ponders its declining leadership in innovation as Asia and Europe gain steam

By MICHAEL DABNEY

In his seminal 2002 best-seller "The Creative Class," author Richard Florida had a thing or two to say about America's diminishing leadership in innovation.

He wrote: "The United States appears to have thrown its gearshift into reverse. At all levels of government and even in the private sector, Americans have been cutting back crucial investments in creativity—in education, in research, in arts and culture—while pouring billions into low-return or no-return public projects like sports stadiums ... If these trends continue, the U.S. may well squander its once-considerable lead."

It is America's declining hegemony in high-tech innovation and research that has got decision makers in the U.S.—from the Oval Office and the National Science Foundation in Washington to researchers, business leaders, and educators across the country—concerned.

"For more than half a century, the United States has led the world in scientific discovery and innovation. It has been a beacon, drawing the best scientists to its educational institutions, industries and laboratories from around the globe," The Task Force on the Future of American Innovation wrote in the report "The Knowledge Economy: Is the United States Losing Its Competitive Edge?"

"However, in today's rapidly evolving competitive world, the United States can no longer take its supremacy for granted. Nations from Europe to Eastern Asia are on a fast track to pass the United States in scientific excellence and technological innovation," the report said.

Indeed, there are warnings on the horizon. Here are just some of them:

Fewer graduates in science and engineering: America's educational system was once at the forefront of producing the best scientists and engineers; but today, undergraduate science and engineering degrees in the United States are being awarded less frequently than in other countries.

For example, according to the Council on Competitiveness, the ratio of first university degrees in natural sciences and engineering to the college-age population in the United States is only 5.7 degrees per 100. Some European countries, including Spain, Ireland, Sweden, the United Kingdom, France, and Finland, award between 8 and 13 degrees per 100. Japan awards 8 per 100, and Taiwan and South Korea each award about 11 per 100.

Stagnant growth: Although the United States remains a competitive leader in innovation, it has made the least progress of all developing nations in competiveness and innovation capacity over the last decade, according to a 2009 report by the Information Technology and Innovation Foundation titled "The Atlantic Century: Benchmarking EU & U.S. Innovation and Competitiveness."

A fall from grace in key high-tech sectors: From 1998 to 2003, the balance of trade in the manufacture of aircraft—which for years was one of the strongest U.S. export sectors—fell from $39 billion to $24 billion, a loss of $15 billion, reflecting increased sales of foreign-made commercial aircraft to U.S. carriers. In areas of information technology, biotechnology, nanotechnology, and fusion energy science, the United States is also losing ground to Asia and some countries in the European Union (EU).

"'Can America compete?' is the nation's new No. 1 anxiety, the topic of emotional debate," wrote Fortune magazine's Geoffrey Colvin. "We're not building human capital the way we used to. Our primary and secondary schools are falling behind the rest of the world's. Our universities are still excellent, but the foreign students who come to them are increasingly taking their educations back home. As other nations multiply their science and engineering graduates—building the foundation for economic progress—ours are declining, in part because those fields are seen as nerdish and simply uncool."

To be sure, experts are quick to point out that despite these challenges, no one is saying that Americans can't adapt and get back on track. The Task Force on the Future of American Innovation report stated: "The United States still leads the world in research and discovery, but our advantage is rapidly eroding, and our global competitors may soon overtake us."

To remain competitive in the global arena, the task force said, the United States must redirect its attention to the factors that have driven American innovation for years: research (especially that which is funded through federal and private entities for science and engineering), education, the technical workforce, and economic growth.

Columbia University professor Dr. Jeffrey Sachs, cited in Colvin's article, underscores this point. In a competitive global market, he said, it is science and technological breakthroughs that fundamentally influence economic development, and in an economy where technology leadership determines the winners, education trumps everything.

That's a problem for America, Bill Gates told Fortune magazine. He said while American fourth-graders are among the world's best in math and science, by ninth grade they've fallen way behind. "This isn't an accident or a flaw in the system; it is the system," said Gates.

That is why America's decline in producing top-notch scientists and engineers is such a serious concern, experts say. While America lags, "low-cost countries—not just China and India but also Mexico, Malaysia, Brazil, and others—are turning out large numbers of well-educated young people fully qualified to work in an information-based economy," said Colvin.

For example, he said, China in 2005 produced about 3.3 million college graduates, India 3.1 million (the majority of them English-speaking), and the United States just 1.3 million. In engineering, China's graduates numbered over 600,000, India's 350,000 and the United States' only about 70,000, making it highly probable that the United States may be required to outsource its research and development overseas eventually if this trend is not addressed.

"Americans who thought outsourcing only threatened factory workers and call-center operators are about to learn otherwise," Colvin warned.

While many studies exploring the competitiveness of America in science and technology indicate that America still leads other countries in key areas of these fields, the 2009 report from the Information Technology and Innovation Foundation found cause for both the United States and the EU to be concerned in the face of increasing Asian competition.

The report evaluated and rated global innovation-based competitiveness in science and technology of 40 nations and regions (including the EU-10 and the EU-15) as they currently stand, and in terms of the progress they have made over the last decade.

In it, the United States was rated fourth place in global competitiveness among all nations, and the EU 18th place. However, the study found that the United States has made the least progress of the 40 nations and regions in improvement in international competitiveness and innovation capacity over the last decade, while China was rated first in this category.

The EU-15 region was found to have made more improvements over the last decade than the United States but slower than the overall average and, as a result, was ranked 29th among the 40 nations and regions.

"If the EU-15 region as a whole continues to improve at this faster rate than the United States, it would surpass the United States in innovation-based competitiveness by 2020," the report said.

However, with the positive showing of Asian nations in the study, the report's authors Robert Atkinson and Scott Andes wrote, "To find global leaders [in high tech], Asia is the place to look."

The study's findings also have significant implications for Europe and the United States, the authors said. First, the rise of global economic competition means that the United States and Europe need to think of themselves as a big state or a big nation, and proactively put in place national or continental economic development strategies.

"This particularly applies to the United States, where the prevailing view among many Washington policymakers is that the United States has been number 1 for so long that it will continue to be number 1," Atkinson and Andes wrote.

However, competition between countries and regions, if conducted in the right spirit, can actually be beneficial by pumping new life blood into various sectors of the global economy.

"The competitive pressures between nations can lead them all to do better, spurring them to put in place a host of policies that drive productivity and innovation, which at the end of the day will benefit not just individual nations and regions," Atkinson and Andes wrote. "The United States and Europe, having led in the 20th century, have a special responsibility to lead this process in the 21st century."

Read "The Knowledge Economy: Is the United States Losing Its Competitive Edge?" at http://www.futureofinnovation.org/PDF/Benchmarks.pdf

Read "The Atlantic Century: Benchmarking EU & U.S. Innovation and Competitiveness" at http://www.itif.org/files/2009-atlantic-century.pdf

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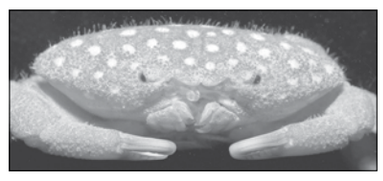
New species of crab discovered in Taiwan

By STEPHANIE LAM
Epoch Times Staff

A new species of crab has been discovered in Kenting, Taiwan, during the Long-Term Ecological Research project in the Kenting National Park Sea Area. Kenting National Park entrusted National Taiwan Ocean University to conduct the research.

In June last year, a Dubai tanker stranded on the beach of Jialeshuei, Kenting. Dr. Ho Ping-ho of National Taiwan Ocean University was investigating the oil spill's impact on the ocean when he discovered two individuals of the new crab species.



STRAWBERRY CRAB: This new species of crab was discovered in Kenting, Taiwan. AFP/GETTY IMAGES/KENTING NATIONAL PARK HEADQUARTERS

The new crab's carapace is 2.5 cm (1-inch) wide and red with white spots, leading researchers to call it the "strawberry crab."

The two individuals were females and were dead when they were discovered. They have been made into specimens.

Researchers have confirmed that this species has not been documented before, and classified it in the genus Neoliomera.

Ho said that only male crabs' gonopods are useful in distinguishing species, so he hopes to find a male specimen of the crab.

Mountains of fire and ice

Scientists study 'glaciovolcanoes' in Iceland, British Columbia, and U.S.

National Science Foundation

Glaciovolcanoes, they're called, these rumbling mountains where the orange-red fire of magma meets the frozen blue of glaciers.

Iceland's Eyjafjallajökull volcano, which erupted recently, is but one of these volcanoes. Others, such as Katla, Hekla, and Askja in Iceland; Edziza in British Columbia, Canada; and Mount Rainier and Mount Redoubt in the United States, are also glaciovolcanoes—volcanoes covered by ice.

"When an ice-covered volcano erupts, the interplay among molten magma, ice, and meltwater can have catastrophic results," says Sonia Esperanca, program director in the National Science Foundation's (NSF) Division of Earth Sciences, which funds research on glaciovolcanoes.

During the week of April 11, scientists in Iceland were well prepared for the floods, called "jökulhlaups," that can happen after a glaciovolcano blows and melts its glacial covering. The floods were followed by tons of ash ejected into the atmosphere.

Most of the rest of the world, however, was unaware that an eruption from a small, northern island in the middle of the Atlantic Ocean could freeze air transportation and stop global commerce in its tracks.

That, say NSF-funded scientists Ben Edwards at Dickinson College and Ian Skilling at the University of Pittsburgh, is the nature of glaciovolcanoes.

Understanding volcano-ice interactions occupies much of Edwards's and Skilling's daily lives.

They are working at Mt. Edziza in British Columbia, Canada, and in Iceland to find out how glaciovolcanic deposits—rock fragments strewn for miles after an ice-covered volcano erupts—are formed.

Volcano-ice interaction presents unique types of hazards, say the geologists, but what is left behind after an eruption can also serve as a window into our geologic past.

Studies of glaciovolcanoes' deposits are helping scientists get a better handle on Earth's long-term climate cycles. The volcanic shards are "proxies" for climates of the past.

A key to using these rocks as proxies is the ability to correctly interpret fragmentation of lava and other textural and chemical features. From these, scientists estimate snow and ice thicknesses before and during a glaciovolcano's eruption. The quantity of ash and flowing lava changes as the eruption progresses, until magma stops being formed.

Glaciovolcanic deposits are identifiable long after an eruption ends. Pillow lava, for example, which usually forms on the ocean floor, is sometimes found high atop mountains in British Columbia and Iceland, and in the Antarctic.

These round tubes of fossilized lava, coated with shiny black volcanic glass, are indications of volcanoes that once erupted beneath ice or water.

By noting the elevation of pillow lavas on mountains or high ridges, geologists can better determine the thickness of surrounding ice.

"Pillow lavas might well be forming right now in the ice-bound caverns on top of Eyjafjallajökull," says Edwards. "By analyzing the gas content dissolved in pillow lavas' glass, we can also estimate the thickness of the overlying ice at the time of their formation."

When hot lava melts ice quickly, water can mix with magma, flash to steam, and produce powerful explosions of fine volcanic ash, according to Edwards.

"These fine particles can be carried much higher into the atmosphere than ash from similar 'dry' eruptions," he says.

When superheated fragments of liquid magma hit cold air, they freeze into billions and billions of particles, driven into the atmosphere by the power of the volcano's eruption.

"Although studies of glaciovolcanism are currently focused on longer-term questions of climate change, the research is helping scientists understand all active and dormant ice-covered volcanoes, including many in North America," says Esperanca.

Several volcanoes in the Cascades, such as Mount Rainier, and volcanoes in Alaska, like the recently active Mount Redoubt, have significant ice cover.

Research on the links between these volcanoes and their ice-covered surfaces is giving scientists and emergency planners critical information.

"We need more studies of present and old eruptions to be prepared to respond to a volcano-ice crisis in North America—or elsewhere around the globe," says Esperanca.

While many geologists are using Iceland as an important way to inform the public about possible dangers from volcanoes, glaciovolcanologists are chomping at their rock hammers—and ice chisels.

They are waiting for Eyjafjallajökull to take a rest. Then they can creep ever closer, eventually getting a look at newly formed glaciovolcanic deposits.

To Edwards and Skilling, the eruption of Eyjafjallajökull shows how complex the dance of a volcano and a glacier can be.

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Salmon farming may be a good idea after all

By DAVID SUZUKI with FAISAL MOOLA

It would be a shame if we could never eat salmon again. On the Pacific Coast, salmon has been an important food source and a cultural icon throughout history. Salmon is a healthy, delicious, and versatile source of nutrition. But many wild salmon populations are in trouble and could be facing the same fate as East Coast cod stocks.

Is the answer to raise salmon on farms? The controversy over farmed versus wild salmon has been ongoing in B.C. since the first salmon farms were built in the early 1980s. A growing body of evidence has shown that fish farms that use open-net pens in the ocean can harm wild stocks. Some of the dangers include escaped farmed fish – which are mostly Atlantic salmon – competing with the five species of wild Pacific salmon, pollution from the farms harming the areas where salmon live and migrate, and lice infestations threatening the very survival of some stocks. It's a trade-off that doesn't make much sense.

It would be ideal if we could move these farms and protect our wild stocks to ensure they provide us with food well into the future. But wild salmon face many other threats, including overfishing, habitat loss, and climate change, and we don't yet understand all the factors contributing to their decline.

Farming may be our only option – and new technology offers some hope that we can continue to have our salmon and eat it too. Raising salmon in a way that eliminates interaction with the environments where wild salmon live has long been suggested as a way to overcome the worst effects of farming fish. Despite resistance from some people in the fish-farming industry and government, who argue that contained farming is too expensive, closed-containment salmon farming is becoming a reality.

Early attempts at salmon farming that keeps the farmed fish separate from the wild environment were mostly experimental or too small to be commercially viable. But now a Washington State company, Domsea Farms, is raising sufficient quantities of coho salmon for Canadian grocery chain Overwaitea Food Group to offer the company's SweetSpring salmon in its 124 stores in Western Canada. The salmon are raised inland in tanks with freshwater, leading to a ranking by SeaChoice and Seafood Watch as a consumer "best choice". (Overwaitea has committed with SeaChoice to a long-term plan to eventually offer only sustainable seafood in its stores, and this is a great step.)

The technology is still new, though, and farming salmon, no matter how it is done, comes with challenges. One of the biggest is that salmon is a carnivorous fish – it requires other marine resources as feed. In this case, the fish are given feed that includes ingredients made from plants and fish-processing byproducts, thus reducing the need to use other fish species. Recent research has also looked at using insects in fish feed.

Inland fish farms must also discharge used water, but water from these operations is treated to comply with environmental regulations. Recirculation systems are also being developed to reduce the amount of effluent from the fish farms.

The other issues include disease control and energy consumption. The most serious disease-related issues appear to have been addressed at the Domsea farm, in part by using clean water and constantly monitoring the fish, as well as ensuring that disease has no way of spreading to wild populations.

These systems can also use a lot of energy. But this is an easier problem to address than the many problems associated with open-net farms. Improvements in technology have helped make the closed farms more energy-efficient, and increased reliance on clean-energy sources will further reduce the environmental impact.

The industry still has a way to go before it can create a large supply of fresh salmon, but the fact that retailers are getting on board will help spur consumer demand and make the industry more viable. If this helps to resolve the problems associated with ocean-based salmon farming while taking the pressure off wild stocks and ensuring that people still have access to this great food, we'll all benefit.

Maybe the big question is, "How does it taste?" Robert Clark of Vancouver's C Restaurant, which offers inland farmed coho from B.C.'s Swift Aquaculture on its menu, says that, like Atlantic farmed salmon, it has a somewhat lighter, less fishy taste than wild salmon.

Take David Suzuki's Nature Challenge and learn more at www.davidsuzuki.org.