

Q&A:

China's Scientist Premier

In a rare one-on-one interview, Premier Wen Jiabao spoke with *Science* about China's efforts to ground its economic and social development in sound science



BEIJING—2008 has been a roller-coaster ride for China and for Premier Wen Jiabao. Recent highs were the spectacular Olympics and the successful space walk late last month during the Shenzhou-7 mission, a key step toward China's aspirations of building a space station and sending astronauts to the moon. Lows included the Tibet riot, a devastating earthquake in Sichuan Province, and the tainted milk scandal.

In 2003, early in his first term as head of China's government, Wen promoted measures to address the spread of AIDS and the emergence of SARS. His leadership qualities were tested again after the 12 May Wenchuan earthquake. Within hours, Wen was on the scene, rallying rescuers and comforting victims.

Wen led the earthquake response with technical authority few politicians anywhere could match. The Tianjin native studied geological surveying as an undergraduate and geological structure as a graduate student at the Beijing Institute of Geology from 1960 to 1968, then spent the next 14 years with Gansu Provincial Geological Bureau in western China. In the 1980s, Wen rose through the ranks of the Communist Party and became vice premier of the

State Council, China's Cabinet, in 1998 and premier in 2003. Wen began a second 5-year term as premier last March.

In a 2-hour conversation with *Science* Editor-in-Chief Bruce Alberts at the Zhongnanhai leadership compound in the heart of Beijing on 30 September, Wen, 66, spoke candidly and forcefully, without notes, on everything from social and economic development being the "well-spring" of science and technology to cultivating scientific ethics and reducing China's reliance on fossil fuels. Here are highlights edited for clarity and brevity; a more complete version is posted on the *Science* Web site.

—HAO XIN AND RICHARD STONE

Bruce Alberts: *You were famous all over the world for going to the site of the earthquake as a professional geologist immediately afterwards and having a great effect on China's response. Could you tell us more about your response to the earthquake and what you see in the future in the way of earthquake protection for China?*

Wen Jiabao: When the Wenchuan earthquake occurred on 12 May, I was sitting in my office.

Beijing shook, too. My instinct told me it was an earthquake. I instantly knew this disaster would affect a large area and the devastation would be severe.

I decided to go to the scene immediately. I understood clearly the importance of the [initial] 72 hours and especially the importance of the first day in saving people's lives. Simply put, the faster the better.

Within 3 days, we mobilized a force of more than 100,000 people and rescued some 80,000 from underneath the rubble. Often it is the inattention to aftershocks that causes more severe damage than the main shock. This required us to mobilize the residents to leave their homes and to find shelter.

More than 100 quake lakes were formed, the largest of which was Tangjiashan quake lake, which contained 300 million cubic meters of water. A possible bursting of the dammed-up quake lake would endanger large cities such as Mianyang and more than 10 million people along the path of the water. I went to the site of the quake lake many times and, together with engineers and experts, researched technical solutions and decided to solve the quake-lake problem quickly, safely, and efficiently. We dealt with perhaps the biggest quake lake in the world very success-

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Taking charge. Hours after the Sichuan earthquake struck, Wen was on the scene.

fully; not a single person was injured or died.

We need to gradually restore life, production, and ecological function in the region. This is a very arduous task.

B.A.: Will new buildings in this area be built in a special way to make them highly resistant to future earthquakes?

W.J.: We must establish building codes according to the magnitude and intensity of possible earthquakes in this region. Especially for public buildings such as schools and hospitals, we need to apply even safer standards, to assure parents and make children feel at ease.

B.A.: In the United States, we read every day about what you were doing and the earthquakes ... but also how people came as volunteers from all over China to try to help.

W.J.: We put into practice the principle of opening to the outside and announced news about the earthquake in real time to China and also to the world. The reason we did this is to tell people ways to avoid harm and help them properly settle [in shelters].

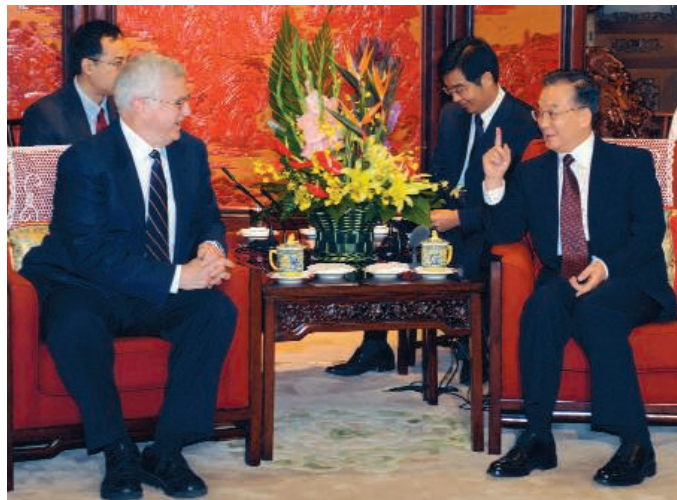
B.A.: I assume that what you did in the earthquake is related to your new campaign to implement something you call "The Scientific Outlook on Development." I think most of us don't understand exactly what that is. Could you explain what the plans are and how Chinese scientists are going to contribute?

W.J.: The number-one principle is to put people first. The second is comprehensive development, the integration of economic development with social development, the integration of economic reform with political reform, the integration of an opening-up and inclusive approach with independent innovation, and the integration of advanced civilization with traditional Chinese culture. Thirdly, we need to resolve the disparities—rich-poor disparity, regional disparity, and urban-rural disparity—in our country's developmental process. Fourthly, sustainable development: That is, to meet the challenges of population, resources, and environmental protection faced by a population of 1.3 billion in its modernization process. We want to achieve sustainable development by adopting a resource-conserving and environment-friendly approach. These four goals cannot be

achieved without science and technology or without innovations.

B.A.: We just published a major article from China (Science, 19 September, p. 1676) that shows that your transgenic cotton, used in your country, has reduced the need for pesticides not only for the cotton but also on other crops in the vicinity.

W.J.: You know, 10 years ago, we did not have this transgenic technology in cotton plants. Back then, the cotton bollworms would not die even when immersed in pesticides. Since we began transgenic engineering of cotton, the plants not only increased their ability to resist bollworms but also increased yield. Therefore, I strongly advocate making great efforts to pursue transgenic engineering. The recent food shortages around the world have further strengthened my belief [in developing such technologies].



Meeting of the minds. Bruce Alberts and Wen Jiabao share a light moment during their 2-hour discussion of China's scientific challenges.

B.A.: As you know, in Europe there's been a big reaction against transgenic crops, and this has affected the use of this important technology all across Africa as well.

W.J.: Don't mix transgenic science with trade barriers. That would block [the] development of science.

B.A.: May I turn to the issue of your attempts to create a more innovative system, which, of course, means you must attract innovative, talented people to China and train your own people to be innovative as well as smart. How is that going?

W.J.: This has two aspects. One is we need to cultivate our own large numbers of innovative talents. This needs to start with children, to develop independent thinking from a young age. After they enter secondary schools and

universities, there needs to be a free environment to enable them to develop creative thinking and critical thinking. I often say that to raise a question or to discover a problem is more important than solving a problem. This is exactly the kind of talents we need.

Secondly, we also need to integrate closely science and technology with economic and social development, because science and technology finds its wellspring in economic and social development. That's why we strongly push for integration of production, academic study, and research.

Thirdly, our scientists need to cultivate scientific ethics; most importantly, they need to uphold the truth, seek truth from facts, be bold in innovation and tolerant to failure. Only science and the spirit of seeking truth from facts can save China. I firmly believe in this.

We hold fast the policy of opening up to the outside world. To bring in the best brainpower and scientific and technological talents through opening up is most important.

From this perspective, scientists can leap over barriers of ideology and national boundaries to serve all of humanity. I can assure you that we will certainly create a good environment for scientists from the outside to work in China. But I don't believe this is the main thing. They should feel that they have the right conditions to develop their careers in China, that they are respected by China, that the results of their work are respected by China. This will require us to protect their independent creative spirits and intellectual-property rights.

B.A.: In the United States, we often talk about the fact that the real innovation, if we look backwards, comes from fundamental science, basic science, that was done 20 to 25 years earlier. When I visited the Ministry of Science and Technology, I was told that China's investment in what we call basic research has been fixed at 5% of total research investment. Do you think that is the right number?

W.J.: Personally, I attach great importance to research in fundamental sciences because I believe that no applied or developmental research can do without basic research as the wellspring and driving force. But, in this world of ours, often because of material gains and immediate interests, it is easy to neglect basic research. This should be avoided. In recent years, we have continuously increased

the level of support, but I think the [investment] ratio is still insufficient.

B.A.: *One of the things that I think is very impressive about China is the extent to which Chinese-Americans feel a great sense of belonging also to China. There's a very effective organization of Chinese scientists in the United States dedicated to helping China develop its own science. This is unusual—other countries do not have this kind of loyalty of their scientists to their homeland.*

W.J.: Our policy is to let them come and go freely. They can serve the motherland in different ways. We impose no restrictions on them and adopt a welcoming attitude.

B.A.: *As you probably know, the National Institutes of Health has put a very strong emphasis lately on supporting innovative young scientists. I met with many wonderful young scientists in China already, both students and young faculty, and having those kinds of opportunities would be very encouraging for them.*

W.J.: We should pay more attention to young scientists. I should say that we haven't done enough in this respect. In the future, we will definitely increase support for young scientists.

B.A.: *Your response to the milk crisis was very impressive, and it still needs, of course, a lot of attention. That terrible crisis awakens the need for more efforts in food safety, more broadly. Do you have new plans for food-safety protection in China?*

W.J.: We feel great sorrow about the milk incident. We feel that although problems occurred at the company, the government also has a responsibility. The important steps in making milk products—production of raw milk, collection, transportation, processing and making formula—all need to have clear standards and testing requirements and corresponding responsibilities, up to legal responsibilities. I once again solemnly emphasize that it is absolutely impermissible to sacrifice people's lives and health in exchange for temporary economic development. Food, all food, must meet international standards. Exported food must also meet the standards of importing countries. We have decided that the Ministry of Health will have main oversight responsibility over food safety.

B.A.: *There's another very important area in which scientists and engineers must collaborate all over the world, and that, of course, is in developing better ways to use and obtain energy. We have a world crisis with greenhouse gases and shortages of resources. What*

we do in China and the United States will be central with regard to how we treat this planet we're on and make sure that we don't destroy it. What are China's plans now for energy usage and development?

W.J.: China is a main energy consumer and, therefore, is also a big greenhouse gas emitter. We must use energy resources rationally and must conserve. This needs us to adjust our economic structure, transform the mode of development, to make economic development more dependent on progress of science and technology and the quality of the work force.

We need to take strong measures, including economic, legal, and administrative measures when necessary, to restrict high energy consuming and heavily polluting



Spilt milk. Wen, expressing sorrow, promises new food regulations after melamine-tainted milk poisoned thousands of babies.

enterprises and encourage the development of energy conserving and environmentally friendly enterprises.

Now every year, China produces about 180 million tons of crude oil and imports about 170 million tons. China's coal production exceeds 2.5 billion tons a year. This kind of huge consumption of energy, especially non-renewable fossil fuel, will not be sustainable.

We have established a goal that our GDP [gross domestic product] growth every year must be accompanied by a 4% decrease in energy consumption and a 2% reduction in COD [chemical oxygen demand] and sulfur dioxide emissions every year. We will also adopt various measures to reduce the use of oil and coal in order to reduce the

emission of greenhouse gases, including energy-conserving technologies and carbon-capture technologies.

We have only been industrializing for several decades, while developed countries have been on this road for over 200 years. But we will now begin to shoulder our due responsibilities, namely, the common but differentiated responsibilities set forth in the United Nations Framework Convention on Climate Change and the Kyoto Protocol.

B.A.: *The U.S. and China have a special role to play by working together. I wonder if we could imagine a really large-scale joint effort on issues like carbon capture. I know we're working on that in the United States, you're working on it in China, but working closely together on some of these things might make progress more rapid. It would also be a great symbol, for the world, that we are seriously, both of us, taking this issue to heart and are really going to do something about it.*

W.J.: China and the United States have just signed an agreement on a 10-year collaboration in energy conservation and adapting to climate change. This is a new highlight in our bilateral cooperation.

I agree to strengthen our cooperation. We can send a message to the world: We will make joint efforts to protect our common habitat.

B.A.: *Another area where I think we can be effective is using science for diplomacy. Scientists from all nations can work together effectively, even when their governments don't agree. I wonder if there is an enhanced role you might seek for cooperation of scientists, including China and the United States, with North Korean scientists who seem to be so isolated, and whether building new bridges to North Korea that way, through our scientific communities, might help the cause of world peace.*

W.J.: I believe that's entirely possible. Scientists from all over the world share the same desires and characteristics in their pursuit of scientific research, respect for science, and seeking truth through facts. Strengthening their collaboration and association will certainly make it easier to build consensus and mutual trust.

Secondly, the work scientists do has become increasingly relevant to economic and social development and everyday life: for example, the Internet. Therefore, exchanges and collaborations between scientists can help promote exchange and cooperation in economic and social realms between countries. More scientific language and less diplomatic rhetoric may make this world even better.