

Why Help a Growing Scientific Giant?

Richard N. Zare*



Richard N. Zare
Professor of Chemistry,
Stanford University

The pace of progress in Chinese science and technology, from high-speed rail to supercomputers, has been breathtaking. The Web of Science's Essential Science Indicators^[1] show China to be ranked at fourth place internationally, behind the United States, Japan, and Germany, in terms of the number of published papers in the peer-reviewed literature. The country comes in at eighth place in number of citations. Almost all of this has been fueled by central government funding which, in the basic sciences, has increased at an annual rate of over 20 percent per year for the last few years. It is a staggering rate of investment compared to other countries. Certainly, China is emerging as a scientific giant, and the rate of growth is the envy of many.

For more than a year, I have had the privilege of chairing an International Evaluation Committee (IEC) charged with the task of examining the past 25 years of the National Natural Science Foundation of China (NSFC). Like the Deutsche Forschungsgemeinschaft (DFG) in Germany and the National Science Foundation (NSF) in the United States, the NSFC is responsible for providing the majority of funding for basic science research at Chinese universities. The IEC's role is to assess NSFC's past practices and make suggestions for future policy directions. This assignment has certainly been made

easier by the expertise of the members of the IEC (listed below^[2]), especially by the knowledge and insights brought to the IEC by its two Vice Chairs, Prof. Dr. Ernst-Ludwig Winnacker and Prof. Han Qide. Professor Winnacker was President of the DFG, Bonn, Germany, from 1998–2006; Secretary-General of the European Research Council, Brussels, Belgium, from 2007–2009; and is currently Secretary-General of the Human Frontier Science Program Organization, Strasbourg, France. Professor Han Qide is a medical scientist who has been Dean of the Beijing University Medical School and is presently Vice Chair of the National People's Congress as well

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as President of the Chinese Society for Science and Technology. In June, we delivered the final committee report, and we are now waiting for it to be published and become public. Of course, I am eager to tell you about its contents but must wait for another time.

To me, it is quite remarkable when any government asks an international group to investigate and critically assess the operations of one of its funding agencies. Perhaps even more remarkable is the full cooperation of the NSFC which the IEC received during this review process that took longer than a year. Although we had several Chinese members on our committee, we were able to make an independent study based on evidence collected from thousands of

Chinese scientists through questionnaires. Some of the scientists also appeared before the IEC. These facts attest to the strong desire of the Chinese government to make the operations of the NSFC benefit from the best international practices as much as possible. "Made in China" is a label found everywhere. Clearly, in the future, the Chinese government also wants to see "Discovered in China" and "Invented in China" become more prominent. It is recognized in China that scientific advances are strongly coupled to economic progress, a concept that many politicians in the West still fail to grasp.

To my surprise, I have been asked by more than one scientist in the United States whether or not my actions should be regarded as treasonous. They argue that the United States and Europe are locked in a struggle with China for economic supremacy. By aiding China in any manner, do I not realize that I am undermining my own country and those like it? I take this question very seriously. This same attitude against helping China recently led the United States House of Representatives to pass an appropriations bill that reduces the budget of the White House Office of Science and Technology Policy (OSTP) by more than 50 percent because of the perceived failure of OSTP to restrict relations with China.^[3,4]

Hopefully, the comments and advice of the IEC will be useful to the NSFC. Is their gain accompanied by a corresponding loss outside of China? Do we in the Western world promote a better world by cutting off scientific relations

[*] Prof. R. N. Zare
Department of Chemistry
Stanford University
Stanford, CA 94305-5080 (USA)
E-mail: zare@stanford.edu

with China or by fostering closer ties? I very much believe that the latter is the correct answer. There is really no alternative.

I reject the notion that science is a zero-sum game. In a zero-sum game, such as chess or checkers, there must be a loser for every winner. If a country has enough talent to recognize a scientific advance coupled with a sufficiently advanced technological base to turn the advance into practice, then a scientific advance made anywhere in the world can lead to global economic gain. A country need not be first in all scientific disciplines to benefit from advances. Many other factors, from entrepreneurial spirit to a skilled workforce, can transform scientific advances made in other countries into societal benefits.

The scientific enterprise is truly an international one from which we can benefit by sharing what we learn. It is true that if you have food and a beggar asks you for some, feeding the beggar leaves you with less food. But in contrast, if someone asks you to share your knowledge with them, more often than not, both parties are enriched by the transaction. Indeed, this is one of the secret benefits of teaching—the teacher also learns.

Scientific exchange is a two-way street. We have already benefitted from the openness of basic research advances carried out in China, where a premium is placed on publications in high-impact journals. I point to just two of many possible examples: Prof. Yang Xueming, Prof. Zhang Donghui, and others at Dalian Institute of Chemical Physics who have provided deep insights into

the quantum nature of elementary chemical reactions, and Prof. Ren Bin, Prof. Tian Zhong-Qun, and others, State Key Laboratory of the Physical Chemistry of Solid Surfaces, Xiamen University, whose tip-enhanced Raman spectroscopy has revealed the molecular structure of single-molecule junctions in different conductance states.

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Many problems facing humanity, such as climate change, hunger, environmental sustainability, and pandemics, are global by nature. Thus, they require a global approach to their solution. We need scientists from all countries to work together. The solutions to these problems will be indispensable to our future on this planet.

But these are not the only reasons to promote ties between scientists of different countries. Science, by its very nature, demands a questioning attitude that challenges what we think we know and how well we think we understand it. Having people engaged in this activity makes for a better society. At the present time, China has major investments in the West, particularly the United States. The West and China have become increasingly interdependent. I believe we really want China to be an ally, not an enemy. Only forty years ago it was unthinkable in China that they would want or highly value connections with the West. Today, such connections are a vital part of the Chinese economy as well as in Western countries.

Finally, history teaches us that relations between countries have their political ups and downs. We gain so much in smoothing out the bumps by having people in each country who know and trust each other. In this sense, having strong scientific ties is simply good diplomacy.

- [1] <http://sciencewatch.com/dr/cou/2010/10decALL/>
- [2] The members of the IEC were Richard N. Zare (Chair, U.S., chemistry; Stanford University), Han Qide (Vice-Chair, China, medical science; Peking University, Vice-Chair of the People's Congress), Ernst-Ludwig Winnacker (Vice-Chair, Germany, biochemistry; Director General, Human Frontier Science Program), Erik Arnold (Rapporteur, U.K., science and technology evaluation; President, Technopolis Group), Xue Lan (Rapporteur, China, science and technology policy and management; Dean, School of Public Policy and Management, Tsinghua University), Lu Yonglong (Rapporteur, China, environmental science; Chinese Academy of Sciences), Richard Anthes (U.S., atmospheric sciences; President, UCAR), Akito Arima (Japan, nuclear physics; Chairman, Japan Science Foundation), Anthony K. Cheetham (U.K., materials science; University of Cambridge), Andrew (F. A.) Smith (Australia, agrobiolology; University of Adelaide), Jeannette M. Wing (U.S., information science; Carnegie Mellon University), Xu Zhihong (China, life sciences; former President, Peking University), and Ma Zhiming (China, mathematics; Chinese Academy of Sciences).
- [3] <http://news.sciencemag.org/scienceinsider/2011/04/spending-bill-prohibits-us-china.html>.
- [4] <http://news.sciencemag.org/scienceinsider/2011/07/house-spending-panel-punishes-ostp.html>.