

Directions for a More Peaceful World

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I would like to thank Sigma Xi and, more specifically, the organizers of this conference for asking me to address such a distinguished group of scientists on the occasion of the annual meeting of Sigma Xi.

Unfortunately, because of visa restrictions, I am not able to attend your conference in person. I appreciate the fact that Phillip Griffiths has agreed to speak in my absence. His willingness to fill in for me at the last moment reflects both his commitment to the development of science and technology in poor countries and the value of North-South cooperation in these troubled times.

This audience, more than most, knows that Sigma Xi represents the most appealing aspects of our scientific community. The organization's long-standing ability to foster a cooperative environment of scientific exchange, free of political pressure – an environment in which scientists from around the world are able to exchange ideas and learn from one another – represents an invaluable contribution to our global community.

Science itself has been instrumental in advancing the material well-being of our societies and its impacts are likely to grow in importance in the years ahead, as science-based knowledge and the application of that knowledge become the cornerstones of economic growth and prosperity.

But I think it is also important to emphasize that the way in which scientific research is carried out – regardless of what it uncovers – has a great deal to teach a world that has become increasingly apprehensive, fractious and violent. The process of science can sometimes be as significant as its purpose.

That is why I would like to focus today on the importance of scientific cooperation – both South-South and South-North cooperation – as an invaluable tool for addressing not just key issues of science but critical issues of society. For such cooperation to take place, scientists must be able to move freely in order to interact with their colleagues across the globe.

What I have found deeply disturbing is that, ever since the terrible events of 11 September 2001, the country that has been instrumental in teaching the world about the broader social values of science – the country that has led the way in international

scientific exchange – has now dismissed the lessons that it had so successfully incorporated into its own social fabric and conveyed to others. That country is the United States.

Since 11 September, the United States and other countries have waged a vigorous and relentless war on terrorism. The war has found direct expression in Afghanistan and Iraq – both through successful air campaigns and not so successful military occupations. It has been expressed through increased spending on national defense and the creation of a Department of Homeland Security. It has found its way into the budgets of the US State Department and even led to the reshaping of the nation's scientific research agenda. All told, the United States has spent hundreds of billions of dollars on anti-terrorism measures over the past two years.

I am not suggesting that the United States does not have a right to defend itself. Nor am I suggesting that the terrorist attacks of 11 September did not warrant a muscular reaction. The killing of thousands of innocent people was a horrific act that deserves to be punished, and steps must indeed be taken to minimize the likelihood that similar attacks will be repeated.

But it is important to recognize that the reaction to terrorist threats must be not just muscular but also mindful of the root causes of terrorism. And, moreover, that the reaction, if it is to be successful, cannot only deal with immediate threats, but must also seek long-term solutions to what is clearly a deeply rooted problem.

For these reasons, I fear that the visa restrictions that have been put in place by the US government over the past two years – restrictions largely directed towards scientists in Islamic countries – may prove to be counterproductive on several counts.

First, they consume substantial resources investigating many individuals who pose no risk to the security of the United States. These resources, I believe, could be more effectively spent on those who do pose a threat.

Second, they stymie progress in science. When the world leader in scientific research closes its doors to exchange, everyone suffers, including the United States.

And third, they illustrate that we have yet to learn that the war on terrorism is a war that must be fought on many fronts.

That's why I think it's important for the United States to launch a global war on poverty with the same determination and commitment as it has waged the global war on terrorism. I am convinced it is in the US's and the world's interest to do so because the war against terrorism cannot be won unless we attack its primary causes: poverty, hopelessness and resentment.

Think of what just 10 percent of the US's commitment to anti-terrorism could buy if it was invested in counteracting the sources of terrorism through improvements in

education, basic living conditions, and employment opportunities. Think of how the perceptions of those living in the Arab world might change if the United States was fighting the war against terrorism not just with bullets, bombs and bayonets but with assistance designed to build the capacities of impoverished nations to address their problems on their own. It's on this second front that the scientific community can play a significant role.

The US has served as a training ground for some of the developing world's brightest and most enthusiastic students in science. America's "open door" policy has been a primary factor in turning the United States into the first and, in many instances, the sole destination for the world's best scientists.

This "open door" policy matters to the United States in ways that extend beyond moral and ethical questions.

First, I don't have to remind scientists at this conference that the influx of excellent scientists from abroad has been a boon – indeed a lifeline for success – for many science university departments and laboratories across the United States.

Second, I think it's fair to say that failed societies such as Afghanistan's have served as breeding grounds for terrorists and that efforts to 'drain the swamp,' as public officials in the United States have often noted, must be vigorously pursued. Yet, as I have stated above, those efforts must rely on both brawn and brain, muscle and mind power.

Terrorism flourishes when societies, largely in developing countries, are unable to put science to work to address critical economic and social problems. It is startling to realize that countries in the Islamic world spend just 0.2 percent of their gross domestic product on research and development while countries in the North spend 2 to 3 percent. The scientific divide between the North and South has not narrowed and, in many instances, has actually widened over the past decade, as nations without the capacity to embrace cutting-edge scientific discoveries and technologies fall farther behind those that have the wherewithal to do so.

But even as the North-South divide has widened, another gap has appeared: a South-South divide.

Today, a number of developing countries – notably, Brazil, China, and India – have made great strides in the advancement of science and science-based development. Brazil and China, for example, now devote about one percent of their gross domestic product to research and development and plan to boost that percentage even higher in the years ahead. India, meanwhile, has also made greater investments in R&D and has built a domestic software and communications technology industry that has generated thousands of high-tech and knowledge-based service jobs.

The progress experienced by Brazil, China and India holds great promise for the rest of the developing world. But can these countries serve as models for others? What lessons do they provide for small, more impoverished, developing countries?

On the one hand, the most scientifically proficient in the South have several characteristics that distinguish them from their counterparts.

For the most part, they are large countries, with large populations, and extensive natural resources. Yet their diverse cultures and political structures suggest that science and science-based development can flourish in a variety of political settings and that governments committed to such advancements can choose from a variety of options to advance their goals.

Leaving these philosophical musings aside, the fact remains that scientific communities in several developing countries now have a great deal to offer the rest of the world, and are playing an ever-greater role in their own nation's development strategies and global scientific enterprises – whether the emphasis is on plant science (as is the case in Brazil); space science and biotechnology (as is true in China); or physics and communications technologies (as we find in India).

Such endeavours could provide a strong foundation for South-South cooperation with the developing world's most scientifically proficient nations, serving as a source of inspiration and, more importantly, a source of education and training for developing nations that lag behind.

Yet, the challenges facing the developing world's emerging scientifically stalwart nations are formidable.

First, they must continue to build their own scientific infrastructures. Second, they must continue to broaden the policy avenues that enable science to be put to work in addressing critical economic and social problems. Third, they must find ways to ensure that the progress they make is shared equally within their own societies and does not increase social and economic disparities rather than diminish them. And, fourth, they must pursue strategies that allow less fortunate nations in the developing world to benefit from the recent success of the South's most scientifically proficient nations. References to the 'haves' and 'have-nots' no longer apply only to differences between the North and South, but have assumed increasing significance between countries in the South too.

On this front, I am delighted to report a significant step forward announced just last month at the Third World Academy of Sciences' (TWAS) 20th anniversary celebration held in Beijing. At the conference, the governments of Brazil, China, and Mexico each agreed to provide 50 fellowships a year for students from throughout the developing world to pursue post-graduate studies at universities in their countries. These three countries have joined India – which announced its own fellowship programme in biotechnology at the TWAS conference in New Delhi the previous year – to create a

broad fellowship network within the South for the training of young scientists. TWAS will administer the programme.

The scientific progress that has been made by several developing countries also broadens the potential for South-South-North scientific cooperation by setting the stage for a triangular framework of interaction. Such a framework could enable Northern scientific institutions to work with their counterparts in the South, which, in turn, could partner with other institutions in the South operating under less favourable conditions. Such arrangements could also provide additional avenues for Northern scientists to visit scientific institutions in the developing world, especially institutions in the world's 49 Least Developed Countries (LDCs).

This is just one small example of how science can be used to help fight the sources of poverty, hopelessness, and resentment that trouble so many countries in the South. Before 11 September, the North – and, particularly, the United States – often viewed such problems as unfortunate but largely local in nature. That is no longer the case.

It is clear that United States is now focusing with laser intensity on combating terrorism. Yet, its efforts, so dependent on exercising its military power, have failed to make either America or the rest of the world any safer. What I am suggesting is that the US government embrace a broader strategy to fight this global threat – one that relies on tools that foster hope as well as fear, and that generate understanding and appreciation as well as shock and awe. I only wish I could have been there in person to convey these sentiments. My presence, in itself, could have represented a step forward on this front. Thank you.