[Title slide]
I would like to begin by reinforcing the case made in earlier sessions that development (especially human capacity development in the sciences) and security are linked. I'll do that by quoting C.N.R. Rao, the eminent chemist from India. The TWAS newsletter published shortly after the terrorist attacks on September 11, 2001, included an editorial by Prof. Rao, who was then the president of TWAS. He wrote:

[Slide 2: TWAS newsletter cover; Rao photo]

> It is somewhat surprising that so little attention has been paid to the role that science – and, more generally, science education – could play in defusing the forces that have led to this unsettling moment in our history. The adverse impact of the absence of science on a society's material well-being is obvious. What is equally important to observe is the impact that the absence of science has on a society's and a culture's thought process. It is my firm belief that the absence of science – and scientific education – leave a void in analytical thinking that is often filled with parochial and antihuman sentiments that can (when mixed with other factors) ultimately drive fundamentalists to ram airplanes into buildings.

[Slide 3: SIG board members]
My organization, the Science Initiative Group at the Institute for Advanced Study in Princeton, has been involved with science capacity-building programs in the developing world for the last decade. Our original program, the Millennium Science Initiative, supports centers of scientific excellence, so far in South America and Africa.

[Slide 4: Selected MSI Centers in Chile, Brazil & Uganda]
The successful MSI's started out as partnerships among the international scientific community (represented by our group), national governments, and the World Bank. The most mature MSI's – those in Chile and Brazil – have evolved into fully country-owned and country-financed initiatives. In Chile especially, the MSI is said to have transformed the way science is practiced in that country, where transparent competitions with international peer review have largely replaced the old-boy networks that once dominated grant programs in the sciences.

While my main subject today is a newer program, the African Regional Initiative in Science and Education, or RISE, I wanted to mention the MSI just briefly as an example of a program that started out as an international partnership, with financing from the World Bank, and has become sustainable in two countries so far. At the risk of oversimplifying, I would say the main reasons for success in those countries are two. One, the governments recognized that supporting science is in the long-term economic interest of the countries. And two, established international best practices were followed. After some initial resistance on the part of the scientific establishment, other grant programs started using international peer review mechanisms introduced through the MSI. I would also note that the MSI has failed in a couple of countries; in Mexico because of lack of continued government buy-in after a successful first round, and in Venezuela because the scientific community wasn't adequately engaged in the planning process. It will be interesting to see whether what did work well in two middle-income countries (and not so well in two others) will be effective in a low-income country. The MSI in Uganda is now underway with a $35

million soft loan from the World Bank and strong support from the government and the scientific community. But its long-term sustainability is an open question.

[Slide 5: RISE required elements]
Turning to RISE, I'll talk about what it is, how it came to be, its current status, and how we hope US universities and research organizations will become involved.

RISE will provide PhD training in selected areas of science and engineering through university-based research and training networks in sub-Saharan Africa. Its primary goals are to prepare new faculty to teach in Africa's universities, where the shortage of qualified faculty is acute, and to help existing faculty who don't have terminal degrees obtain their PhD's.

With funding from the Carnegie Corporation, we'll be able to support three networks, selected through a competition that's underway and nearing conclusion. Each network will receive about $800,000 for its first two and a half years of operation, and we anticipate there will be a second round of funding. That way each network will be supported for at least one full PhD training cycle. Support is likely to come also from TWAS and the International Foundation for Science; both organizations have said they would consider providing supplementary research grants directly to groups within the RISE networks. The World Bank has been involved from the start with the development of RISE, and we've been in discussion with them all along about avenues for longer-term sustainability.

Each RISE network will consist of departments or centers in three or more universities located in different countries in sub-Saharan Africa. Each network will be expected to grant a minimum of 10 PhD and 5 Masters degrees over 4-6 years. (Other requirements are listed on the slide. Details are in the Request for Proposals, which can be downloaded from the website.)

Mechanisms for operation will be up to the networks to determine, but the general idea is that students will benefit from the expertise and the facilities available at each site. (Note that whenever I refer to students, I mean both college graduates just starting work on their PhD's and existing faculty upgrading their qualifications.) Students might spend periods of time at each institution; professors might travel among the different sites; there could be instruction or consultation via video linkage; scientific equipment at one site could be accessed remotely by students in another; faculty and students from the different sites could conduct joint research projects. A network could use any or all of these or other ways to function as a true partnership, to which all partners contribute and from which all benefit.

[Slide 6: Planning workshop participants]
The RISE concept was developed in very close cooperation with the African scientific community, as well as representatives of the World Bank, foundations, US universities, and other organizations. RISE took shape at a planning workshop co-organized with the African Academy of Sciences in Nairobi in June 2007. It continued to evolve through a series of consultations in a number of African countries.

[Slide 7: RISE recommended elements]
It was through the workshop and consultations that the priority areas were identified and the details of the RFP were worked out.

With any development initiative, there's a risk of reinventing the wheel and not taking advantage of what already exists. The concept of regional networks in Africa is not new, and we're not trying to start from scratch. Rather, preference is being given to proposals that build on existing networks. This could be done in any of a variety of ways, including, but not limited to, adding partners, adding a PhD training component to a network that only does research, implementing new curricula, increasing the number of PhD's trained, or expanding existing components.

For this talk, I was asked to address the question "where do countries begin when they don't know where to begin." My short answer to that is find something that's working – in one's own or another country – and build on it; identify smart, driven, charismatic local leaders; and actively engage the stakeholders, including funders, every step of the way.

[Slide 8: Statistics]
In November 2006 the Partnership for Higher Education in Africa, a consortium of seven major U.S. foundations supporting selected African universities, organized a forum of African university leaders. The 17 presidents, rectors and vice-chancellors at that meeting were asked about their universities' top priorities. They were unanimous in responding that what they needed most were well-qualified faculty to teach, conduct research, and thereby help strengthen the universities.

The statistics on faculty shortages are sobering. Demand for education is soaring, and the universities can't come close to keeping up with it. Recently the National Association of State Universities and Land Grant Colleges – which is working on a project with USAID to promote partnerships between US and African universities – conducted a series of conference calls with African university vice chancellors to understand their universities' key challenges. The interviewers reported that: "One of the things we heard across the board was the need for faculty development – there simply are not enough trained faculty to handle the growing student numbers."

Conditions at most African universities are not conducive to a productive career in research and teaching. Low pay and inadequate infrastructure are serious problems. But we heard over and over that those were not the main factors driving smart young post-grads to take up academic positions in Europe or America, or to abandon academia altogether. The real issue was the absence of a critical mass of peers to work with, the dearth of opportunities to engage in joint research, the cost in time and money of traveling to conferences, the difficulty of keeping up with cutting-edge scientific developments.

[Slide 9: Why Networks?]
Most countries in sub-Saharan Africa lack a critical mass of expertise in important scientific specialties or disciplines. Even in the larger countries that may have many scientists, there tends to be an inadequate concentration of active scientists in any given discipline at any one

university. An advantage of networks is their ability to link researchers who are isolated professionally and geographically.

RISE networks will offer students a comprehensive graduate training program, where they receive degrees from any one of the universities in the network but spend periods of time at other institutions that provide complementary instruction and research opportunities. Networks also enable researchers from multiple universities access to specialized scientific instrumentation that may be available at only one of the sites, or to pool their resources to obtain new equipment.

The network structure will benefit not only the individual researchers, but the universities as well, as each will stand to gain through affiliation with the others. As one of the RISE proposals put it, "The principle to be employed is to exploit the respective strengths of individual partner institutions for the collective benefit to build capacity."

[Slide 10: Proposal statistics/map]
The response to the RISE Request for Proposals, which was circulated widely across sub-Saharan Africa in December, illustrates how strong the demand is for initiatives of this kind. Recall we currently have funding to support only three networks. We received 48 concept proposals involving universities in 29 countries. Most of the proposed networks were regional, involving neighboring countries only – for example there were several involving Kenya, Tanzania and Uganda – but there were also some that included countries in different parts of Africa. Of the 48 proposals, about half were strong enough for serious consideration by the selection committee. With some difficulty, the committee identified 12 finalists who were invited to submit supplementary information.

[Slide 11: Categories eligible for funding]
RISE places great emphasis on retention. Applicants were required to explain their strategies for encouraging graduates to remain in their home countries or regions and teach in the universities. Adequate pay and benefits, access to scientific equipment, internet connectivity and other basic considerations were mentioned. But what came through as the single most important retention incentive was being part of a scientific community. To explain their proposed retention plans, most of the stronger proposals included language emphasizing community. Quoting from one of them: "The network will provide an academic community to support the newly trained PhD scientists and to give them access to a network of scientific contacts, equipment and research projects vital for advancing their careers." Another said: "The research themes and recruitments shall be designed such that candidates are formed into multi-disciplinary teams that will continue to collaborate even after the initial project life."

[Slide 12: International Partnerships]
Opportunities also will be made available through RISE for PhD students to work in advanced labs and to interact with colleagues in universities and research institutions outside of Africa. Students will be encouraged to spend at least one semester in a more scientifically advanced country, both to take advantage of facilities not available in their home regions and to increase their professional contacts.

Applicants were not required to describe in any detail their intended interactions with institutions outside their proposed RISE networks. Instead, we will be working directly with each of the three networks to help them develop these intercontinental partnerships. RISE grants will cover international airfares, but tuition and expenses outside of Africa will have to come from other sources.

Fortunately, many American universities are currently expanding their international programs, some with a particular focus on Africa. We are taking advantage of this as we begin to explore partnerships for RISE. We've had some encouraging but very preliminary discussions with several U.S. universities, and once the RISE networks have been identified, which will happen within the next couple of weeks, we will pursue partnerships more actively. University partnerships will work in both directions and for the benefit of all concerned. That is, we expect that students in RISE networks will spend time at U.S. universities and that U.S. university faculty and perhaps post-docs and graduate students will visit RISE universities in Africa to lecture, teach, and/or engage in joint research. (Partnerships with universities outside of Africa and the U.S. will be explored as well.)

I was hoping to be able to end my talk with an announcement of the three winning RISE networks and an invitation to become involved in areas that may be relevant to your own work. But so many proposals were so strong that when the selection committee convened last week by teleconference, they were only able to narrow the list to five top contenders. Then they told us to find a way to support all five. We are trying to secure funds to supplement the Carnegie grant, but realistically we can't commit to supporting more than three networks at this time. So the final decision among the five outstanding proposals remaining in the competition will be made strategically, with an eye toward maximizing the variety of fields, the number of countries involved, and the potential to strengthen the networks through international partnerships.

I opened my talk with a quote by one of SIG's eminent board members and will close with a quote by another. In a June 2006 opinion piece in the journal *The Scientist*, Harold Varmus wrote that "in a world increasingly fractured by national and cultural differences, we scientists should be seeking ways to promote science as a universal activity with the potential to advance public welfare." I hope that in some small way, and with your involvement, RISE will help to do that.