
PART 3

Globalization and the Knowledge Economy

The dominance of globalization in the worldwide economy has created a structure in which knowledge has become the most important economic resource. The rapid growth of the technology industry and the increasingly important role of intellectual capital are dominating the new global economic framework, and creating new economic, political, and societal problems for governments. Presented in this part are views from industry, labor, academia, and government on the benefits and detriments of globalization.

In Chapter 7, Bernard Robertson of the DaimlerChrysler Corporation speaks about the effects the knowledge economy is having on global business and the automotive industry. He says that globalization and the knowledge economy are converging, and points to the flood of capital into knowledge businesses and Internet companies as examples. For Robertson, globalization “is not a choice; it is a fact,” and with it come challenges in the areas of intellectual property, trade barriers, protectionism, and piracy. His discussion of whether the post-merger DaimlerChrysler is an American or German company raises interesting implications for national competitiveness and future global expansions and challenges the current paradigm used to define a company’s nationality. He concludes by proposing that, “The issues and problems are global, not local. The solutions are global as well.”

Thomas Palley of the AFL-CIO provides labor’s perspective on globalization in Chapter 8. He reminds us that globalization is changing the very structure of our economy, and consequently engendering many new problems. While globalization has created benefits such as increased market competition and lowered prices, these are outweighed by serious negative effects. He sees globalization as “having created ‘leaky’ national economies.” Within this framework, product demand, jobs, and money leak out of the economy. This has produced significant detrimental effects, for example forcing governments to rely increasingly on exports for growth, and encouraging tax competition to attract business. According to Palley, globalization has eroded the strength of labor by giving businesses the leverage to win wage concessions and reducing workers’ benefits. In order to correct the currently unstable

structure, he recommends new international rules that encourage investors to “invest with proper regard to risk and return, and that creates the space for domestic economic policy autonomy.”

Chapter 9 is by Dennis Pirages of the Harrison Program on the Future Global Agenda at the University of Maryland. He extends Palley’s cautionary theme and focuses on what he considers the “seamy” side of globalization. He lists four sets of problems brought about by globalization: the weakening of the political authority of the state; an increase in the risks of spreading economic maladies; cultural simplification and destruction; and increasing ecological insecurity. Pirages finds the additional problems of contagion, vulnerability, exploitation, and dislocation to be direct consequence of economic integration. He warns that economic maladies should not be our only concerns. We face ecological insecurity in the form of illness and epidemics, and an increased risk of bio-invasion from species that previously evolved in isolation. Globalization has also endangered cultural diversity as Western values overcome other cultures to create a “a homogenous and boring new reality.” Pirages suggests that a political dialogue on the pace of integration is necessary if we are to avoid causing permanent economic and ecological damage.

Frank Loy, under secretary for Global Affairs at the U.S. Department of State, concludes this section with a look at science’s role in the State Department in this era of globalization. Science plays an important role in addressing global foreign policy in the areas of climate change, loss of biodiversity, environmental degradation, nuclear proliferation, and narcotics trafficking. He says, “I have found in the State Department a widespread and thoughtful understanding of how important science and technology are in the pursuit of our foreign policy goals.” He outlines several steps that State plans to undertake to augment its capability. These steps include establishing a science advisor for the Secretary, creating science roundtables to provide advice or recommendations on specific issues, increasing the number of staff with science backgrounds, and training the current staff on science and technology issues. While he looks forward to an expanded role for science in State, he issues the caveat that “As long as our budget remains relatively constant, resources for science and technology will necessarily be limited.”

7 The Knowledge Economy and Corporate Globalism

Bernard I. Robertson

About a year ago, two very strong companies, Chrysler and Daimler-Benz, merged into one stronger company. This new company had about \$150 billion in sales and 440,000 employees around the world. We have operations in over 200 countries and we manufacture in 34 of those countries. We are obviously a global company, whatever that means, and we have been referring to ourselves as a transnational company. We have two headquarters and one stock traded around the world on over 20 exchanges, both in dollars and euros. We are domiciled in Germany, but exactly what nationality company we are is open to discussion.

I will first address the knowledge economy. Knowledge is an interesting resource because it is one that grows, almost exponentially. It is not consumed. Modern technology has enabled a lot of things, and our industry has profited enormously from the knowledge economy.

We now have virtual organizations and virtual marketplaces. We are able to simulate almost every facet of vehicle behavior. We can render, and approve, vehicles in the digital domain. We can build prototypes, packaging them in three dimensions in the computer. The program is essentially approved before we ever cut the first piece of clay or plastic or metal.

We can also simulate the driving experience in the virtual domain. And we are rapidly developing expert systems to take advantage of the knowledge that we have and further accelerate the process. It makes us quick-

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er and more flexible. We think it makes better products, too, and it enables us to operate around the clock.

At the same time our customers are getting better informed. I find it fascinating that people who cannot program a VCR are on the Internet every night. People get information on products, compare them, and in some cases shop for them, all on the Internet. We have tiny dealerships in the middle of nowhere that sell phenomenal numbers of vehicles over the Internet. We are taking advantage of this new commerce, and our customers are also taking advantage of it. It is the new reality.

But we also see some caveats. Access to information does not make you well-informed any more than having a library card makes you well-read. Increased communication technology can absolutely drown you in information. I am not sure that the Internet has increased the production of rubbish but it has certainly improved the distribution and dissemination of rubbish.

The Internet places a huge premium on selectivity, qualifying your sources, and screening and managing the information. In our case, we are developing our own internal information system where we screen the information and sources, and then attempt to retain only the information we think is qualified. Otherwise, you can drown in information. Far from being more productive you waste a lot of time and effort trying to dig through all of this supposed information to find something of value.

With the move to a knowledge economy, huge investments are going into the knowledge business and Internet companies. But these Internet companies must rely on some other industry to use the output. We at DaimlerChrysler are in the business of making things. We make cars, trucks, airplanes, rockets, and satellites. We use this knowledge. We have no particular interest in accumulating knowledge for its own sake. We try to accumulate and deploy knowledge to enable us to make things. Lou Gersner, CEO of IBM, said six years ago, "How do I use this stuff to do something useful?" That is our motto. This is all fine, but how do I use it to do something useful?

Efficient production relies on information. Factory workers use their heads more than their hands these days. About 25 percent of the assembly line people we hire are college graduates, and that percentage is growing. We spend more time on training than we do on supervision. The manufacturing business is increasingly one of highly qualified workers. There is no room left for illiterate people, for people who cannot cope

with a knowledge economy. The key point is that knowledge is a means to an end for us. We use knowledge. Knowledge is not an end in itself.

Another issue is globalization. It is not a choice; it is a fact. For example, during the Christmas holidays we introduced a Jeep powered by a fuel cell at the Los Angeles auto show late in the day. The following morning stories about that introduction, and pictures of me with the Jeep, were on the front page of a newspaper in a small town in India and in the *Aruba Times*. (I don't read either one of those. I just happen to know a couple of engineers who were in India and Aruba respectively over the holidays.)

People rail against globalization and then they publish their essays on the World Wide Web. Coca-Cola and Jeep, which are among two of the best-known brand names in the world, personify America to most people. They are known throughout the world. Coca-Cola, as I recall, does over two-thirds of its business outside of the United States. Globalization is a fact.

Another important issue is the convergence of globalization and the knowledge economy. We see this in obvious areas like language and measurement systems. Even though English is becoming the de facto worldwide language of business, speaking English does not necessarily mean you understand each other or are really speaking the same language. A lot of people mean a lot of different things by the same words. That is something we have to deal with.

Another issue is corporate culture. The differences between "American" and "German" culture were largely irrelevant in our merger. But every corporation has a culture, and that was what we found more challenging to put together. In our case, we were two strong companies and each company had its own operating style and culture. Because we were both successful we both felt that our success was a direct result of our culture. Had one of us been unsuccessful it might have been a lot easier to say, "Obviously that didn't work. We'll abandon that and go to something else." But when both of you are successful and you are both making record profits, it becomes a challenge to decide which of those two methods is the better one. Obviously we wanted to keep the best of both approaches and we are making progress at that. I think we are doing fairly well, but it is a challenge. Our merger was a lot harder than a clear-cut case of an acquisition of a weaker player by a stronger player.

I would like to give an example. Our policies on working with outside partners on intellectual property were radically different. Chrysler's approach was to form partnerships with outside agencies, suppliers,

academia, and so on, and leverage those relationships by sharing our goals at the very beginning of a program. For example, we would commit to the supplier for the duration of that product, whatever its life cycle was, and we would work together on it. The supplier typically would own the intellectual property or we would share it. We would leverage both of our investments to achieve our objectives at the lowest possible cost. DaimlerBenz, however, typically had a very strong in-house research operation. It did not approach suppliers until it had already developed whatever it wanted to build and protected it to whatever degree seemed appropriate. Then it would go to the supplier with an offer to, in effect, make it to print. Those are obviously radically different approaches.

Each of us felt that our approach was fundamental to our success. Daimler felt that owning this intellectual property enabled it to be first to market. This helped create a technical leadership image and reality. But, of course, it came at a cost. We are not going to pick one or the other. It is our intention to continue to do things the way the former Chrysler did them when that is appropriate, and do them the way the former DaimlerBenz did them when that is appropriate. The challenge will be for us to decide in each case which is which.

We also have a challenge with the intellectual property management business. We at Chrysler have a view that it is extremely difficult, if not impossible, to protect intellectual property. Your greatest protection of intellectual property is to deploy it faster than others do. You can get patents, and we do that. But a patent is largely a means of motivating people to be innovative and to reward people for innovation. We make no attempt as a corporation to profit directly from patents or licensing patents. In fact, our general practice is that we do not attempt to license patents and profit from them. The only profit we get from intellectual property is the indirect effect of trying to be first to market with innovation. But that is not the DaimlerBenz approach.

Other issues at the convergence of government policy include trade barriers and protectionism. Several years ago we walked away from a \$2-billion proposition in South China to build minivans. We were finalists in this competition. But we walked away because, fundamentally, the Chinese government could not deal with the piracy problem and could not ensure us that the technology we were bringing to it would be protected.

There is a distinction between protecting intellectual property and piracy. You cannot protect intellectual property. Information and knowledge is transferred too rapidly for significant protection. But piracy is

something else entirely. We build Jeep Cherokees in Beijing. At least 12 companies in China have cloned the Cherokee and are openly selling copies of the vehicle. This violates all of our principles and all of our laws in this country and in China. But nobody does anything about it. We cannot tolerate that.

The financial policy is an interesting one. We have one stock that is traded worldwide. I think this is the first time that has been done. We were ultimately dropped from the S&P500 because "we weren't an American company." At the time of the merger 44 percent of our stock was held by Americans, which was the single largest nationality holding our stock. Because a lot of mutual funds are indexed to the S&P500, when we were dropped those funds then dropped our stock. We are now roughly 25 percent held by Americans. The policies of American financial institutions have driven us to be a less American company if you measure it in terms of who owns the stock.

I want to conclude by discussing the Partnership for a New Generation of Vehicles (PNGV). This program involves several of the points already mentioned. PNGV was started five years ago between the federal government and USCAR, which in turn is an organization of the three domestic automobile companies. PNGV had three goals. The most well-known goal was to try to achieve up to three times greater fuel economy in a middle- to large-size passenger car like Dodge Intrepid or Ford Taurus. The ultimate purpose was to reduce dependence on foreign oil and help achieve energy independence. Other goals were added along the way: to reduce carbon dioxide emissions and "to enhance national competitiveness."

We have made tremendous progress. A peer-review committee of the National Research Council is in the process of publishing its fifth review on the program. The program has had some criticism but generally it has gotten rave reviews for the progress we have made in fuel cells, hybrid car trains, lightweight interior body construction, and lean NOx catalysts. We have also seen controversy under the general heading of corporate welfare. Our best answer to that is that we do not take a dime of government money. Nevertheless we spend a lot of time talking about whether or not we get corporate welfare. The controversy increased when we announced the merger because DaimlerChrysler is incorporated in Germany. Are we still a domestic company? Is it appropriate and conducive to national competitiveness to have one of the players domiciled in Germany? This question has led to others: What is national competitiveness in this environment? What is a domestic automobile industry?

Are General Motors, Opel, Volvo, and Saab domestic automobile companies? Opel and Volvo are in EUCAR, the European equivalent of PNGV. They are also in ACEA, which is the European Manufacturers Association, along with DaimlerBenz, and yet they are owned by GM and Ford respectively. Lately, we have been trying to put PNGV together with EUCAR and JCAR, the Japanese equivalent. We see that these are global problems and that we need to work together on global solutions. But we have this basic dilemma that keeps coming up: Are we a domestic company and should we be involved in PNGV?

The Administration has been extremely supportive. Ford and General Motors have been generally supportive. I think we have this issue handled, but we have been talking about it since we announced the intention to merge. Some of the fundamental underlying questions are still there.

We are going to continue to focus the industry on applying knowledge. Our goal is not to generate knowledge for its own sake. Our goal is to use knowledge as a tool to create products. We are in a very exciting and dynamic era. I have never known a more exciting time. Just a few years ago if you had suggested that we might be on the brink of doing hybrid power trains or fuel-cell vehicles you would have been thought crazy. Now it is just a matter of who is going to do it first.

Five of the six concept vehicles we showed at the Detroit show were nontraditional car trains typically running on nontraditional, synthetic fuels. We are going to do occupant sensing to identify and profile the occupant in a car (by age, weight, etc.). Then we will deploy the occupant protection devices accordingly.

We are on the brink of bringing all of the computing capability in vehicles into a network in the same way that everyone's PC is on the Internet. Vehicles will soon be on their own network, which offers tremendous opportunity. We will have more driver-assistance devices like the Intelligent Speed Control that the S class has. I am not sure if we will ever see autonomous vehicles but we will get pretty close.

Technologically, we are in a fascinating era and we are using all of the knowledge in the world to accelerate the application of the things we learn. The issues and the problems are global, not local. The solutions are global as well.

The knowledge economy is the language of corporate globalism. We should recognize that as a fact. We should leverage the knowledge economy to provide the finest products we can. We should also identify the issues, determine if they are regulatory, financial, or whatever, and go about fixing them. We do not need to debate whether it's a good idea or not.

8 The Economics of Globalization: A Labor View

Thomas I. Palley

Globalization is a process that is impacting profoundly the lives of workers everywhere, and the AFL-CIO is therefore deeply committed to ensuring that it is made to work for the benefit of working people. In particular, our goal is to see that the benefits of globalization are fairly shared, and that any economic and social dislocations are properly addressed.

Regrettably, all too often the debate over globalization is cast in terms of a conflict between trade openness and protectionism. This characterization completely misses the mark. It is not a matter of openness versus protection; rather, it is one of how we deal with the problems that are unleashed by globalization while preserving its benefits.

If we are going to manage successfully the process of globalization, we must recognize three things. First, globalization brings problems as well as benefits, and these problems run deeper than just the fact that there are winners and losers. Yes, those who lose through no fault of their own need to be made whole. But beyond this, there is a deeper problem whereby globalization is changing the very structure of our economy, and in doing so it is establishing patterns of incentives that can have negative societal effects long into the future.

Second, we must realize that globalization is not a natural process over which we have no control. Instead, it is being driven by the choices of business, governments, and international policymakers.

Third, given that globalization is not a natural process, we must recognize that we have choices and the way in which we exercise those choices will determine the pattern of outcomes. Whether globalization

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produces a world in which prosperity is shared and stable, or whether it produces one in which prosperity is unstable and unequally distributed, depends on the choices we make. This, rather than protectionism versus openness, is the essence of the debate.

The Economics of Globalization

Globalization refers to a process of international integration of national goods, financial, and labor markets. It is a process that is being driven by firms through their competitive search for profits, and it is also being driven by the process of market arbitrage which works to ensure that the same goods sell for the same price no matter where they are traded. In a sense, none of this is new, and globalization is just the logical extension to the international economy of processes that have long operated within our own domestic economy for over one hundred years. Thus, the creation of a unified national economy in the second half of the 19th century, through the fusing together of the different regional economies, involved the same processes. Similarly, the competition between the Rust Belt and the Sun Belt in the 1970s also involved these processes. However, in earlier times these processes operated within the confines of the national economy. Today, they are operating at the global level, and this is both the source of the benefits and the source of the costs. Just as national economic integration produced benefits, so too can global economic integration. But national economic integration also brought problems, and we addressed those problems through the creation of modern government. Addressing the problems raised by global economic integration is more difficult because of the deeper political problems, and because of the lack of proper structures of international economic governance.

Market forces are one source of impetus to globalization. Technical innovation is another. Such innovation has increased the mobility of both physical and financial capital. If we have any doubts about this, think of the history of the factory. At the beginning of the 19th century, production took place on the factory floor while management sat above in overlooking offices. Today, companies can be headquartered in New York while production takes place thousands of miles away in China, and yet the production process remains intimately controlled via electronic communication and integrated computer systems that ensure production to specification.

Finally, globalization is also being driven by economic policies which have sought to remove barriers to the flow of goods and capital between countries, and in doing so have increased the international integration of national economies.

Without doubt, globalization brings significant economic benefits. These benefits include increased goods market competition that has contributed to lower prices and improvements in quality. It has also contributed to improvements in production efficiency with domestic firms forced to go head-to-head with their foreign rivals. There have also been improvements in the provision of financing which has helped developing countries acquire the capital necessary for their own development.

But side-by-side, there have been serious negative effects with globalization creating new forms of wage and workplace competition that have twisted the distribution of income in favor of the most well to do. It has also twisted the economic structure such that policy makers now face a pattern of incentives that has them increasingly compelled to run economic policy for the benefit of those corporate interests which have been empowered by the globalized economy.

If we are to achieve our goal of ensuring that the benefits of globalization are fairly shared and the costs properly dealt with, we need an economic understanding of how globalization is impacting our economic world. A framework that I have found useful is to see globalization as having created “leaky” national economies. There are three forms of leakiness.

The first is what I call “macroeconomic leakiness” whereby there is a tendency for demand to leak out of the national economy owing to an increased propensity to import goods. Today, in the U.S. we see this leakiness in the form of larger and larger trade deficits that result from our spending more on imported goods. This increase in macroeconomic leakiness is true for almost all industrialized countries, with trade (i.e. imports and exports) as a share of GDP having increased by more than 50 percent over the last 30 years. In the 1960s, exports and imports constituted ten percent of GDP in the U.S. economy. Today they constitute almost 25 percent, and in the European economies that proportion is even larger.

A second form of leakiness is “microeconomic leakiness” whereby there is a tendency for jobs to leak out of an economy if labor markets are not sufficiently flexible, or if profit taxes are relatively unfavorable

compared to conditions elsewhere. Microeconomic leakiness has been promoted very much by technological developments that have lowered costs of transportation and costs of coordinating production. For example, the first container ship crossed the Atlantic in May 1966, a mere 33 years ago. Back then, transportation costs used to be about ten percent of final sales costs; now they have fallen to less than one percent. Economic policy has also contributed to increased microeconomic leakiness by bringing down trade barriers and making it cheaper and more economically feasible to shift production between countries.

A third form of leakiness is “financial leakiness” whereby money flows between countries. Today, more than \$1.5 trillion is traded in foreign exchange markets every day, whereas the actual value of international trade is less than three percent of this amount. Financing of trade is therefore no longer the main purpose of international financial markets. Once again, this change has been driven by technological innovation in the form of lowered costs of electronic communication and transacting, and once again it has also been driven by policy which has removed controls on the international movement of money.

These different forms of leakiness have significant economic effects. Macroeconomic leakiness has tended to promote an increased reliance on exports, which means that countries are more exposed to shocks originating abroad. This exposure is evidenced by the recession in U.S. manufacturing which was badly hit by the collapse in exports to East Asia. Macroeconomic leakiness also means that countries rely more heavily on imports so that demand leaks out of the economy when policy makers try to expand economic activity. This in turn has made it more difficult to pursue the economic stabilization policies that were used so successfully in the 1950s and 1960s. When faced by recession, policy makers used to be able to use monetary and fiscal policy to stimulate demand and restore employment. Now such policies also produce large trade deficits. This feature explains why European policy makers have been unwilling to pursue expansionary policies, and this has contributed to Europe getting stuck in recession. In the U.S. the problem is not one of recession, but rather one of a burgeoning trade deficit caused by an economic boom, but this deficit could eventually contribute to financial instability that undermines the boom.

Microeconomic leakiness poses a different set of problems. In particular, it has increased the bargaining power of business vis-à-vis both labor and government. Business now knows that it has alternative sources of labor elsewhere, and it has used this option to put pressure on la-

bor to win wage concessions and to reduce benefits. This is clearly visible in the NAFTA experience. Thus, a recent study out of the Cornell Industrial Labor Relations School found that after NAFTA was implemented there was a 33 percent increase in business use of threats to relocate production during wage bargaining rounds.

However, it is not just labor that loses as a result of increased microeconomic leakiness. Government has also been put under pressure through the use of threats to move to win tax concessions. If tax conditions are deemed relatively less favorable than elsewhere, business now threatens to invest only in those places where conditions are more favorable. An example of this is the Mercedes Benz plant that was built in Alabama. Mercedes Benz set up a competition between Alabama and North Carolina that involved an auction regarding the tax concessions each was willing to give to attract the new plant. At the end of the day, Alabama won, but it is estimated that this cost the state \$250,000 per job in terms of tax concessions. The point is that there was always going to be one Mercedes Benz plant, and it was going to be in either North Carolina or Alabama. The tax auction effectively stripped the public purse of huge amounts of revenue that were transferred to Mercedes. The incentive to engage in such auctions poses real problems because states are either going to have to make up the shortfall by raising taxes elsewhere (which is why the burden of taxation has increasingly shifted away from capital incomes and onto labor incomes), or states will have to cut public spending on education, public services, and public infrastructure. Shifting tax burdens is bad for fairness, while cuts in such spending are bad for both fairness and future economic growth.

The Alabama-North Carolina tax auction is not an isolated example. Exactly the same form of tax competition has been played out in Europe, where there has been competition for Japanese plants between France, Spain, and Britain. The European Community is now trying to deal with this problem by introducing tax harmonization rules that prevent such forms of tax competition. Similar rules are needed both domestically in the U.S., as well as internationally.

Responding to Globalization

So much for the economic problems posed by globalization. What can be done about them? Dealing with the problem of macroeconomic leakiness requires the establishment of a new global economic development

agenda. This agenda must encourage countries to shift away from exclusive reliance on export-led growth to a more balanced policy in which growth is also driven by expansion of domestic markets. It is impossible for all countries to rely on export-led growth because one country's exports are another's imports so that all cannot run trade surpluses. Moreover, export-led growth also fosters wage competition, deteriorated work place conditions, degraded environments, and weakened systems of governmental social support. This is because countries and business have an incentive to try and gain international competitive advantage by any means possible. This is the infamous "race to the bottom."

However, getting countries to grow their domestic markets requires rising wages, and this in turn requires a leveling of the playing field between business and labor. The global enforcement of core International Labor Organization (ILO) labor standards that give workers the rights of free association and collective bargaining is key. These standards do not set quantitative wage rates. Instead, they are qualitative and give workers rights. Trade unions are not a market distortion as is so often asserted. Instead, they are a private sector solution to massive market failure, namely the huge imbalance of power between business and labor.

Core labor standards are also good for national economic governance, and we all now recognize that good governance is good for growth. A major problem in many developing economies is corruption and economic cronyism. Simply opening economies to the global market will not eliminate this problem because it is political in nature. However, enforcement of human rights and labor standards can contribute to the development of the counter-veiling political powers that are needed to block such behaviors.

Core labor standards also contribute to solving the problem of microeconomic leakiness by establishing global standards that cannot be avoided by shifting production between countries. In doing so, they block off the inappropriate forms of competition that constitute the race to the bottom. With the low road blocked off, companies will then have an incentive to follow the high road that focuses on growing productivity rather than exploiting workers and the environment.

In a similar vein, there is a need for new rules to prevent international tax competition. Labor standards can prevent the race to the bottom in labor markets. Tax harmonization rules can prevent a race to the bottom in tax fairness and the funding of government.

Finally, with regard to financial leakiness, there is a need to make changes to the international financial architecture. The weakness and

instability of the existing architecture was clearly evident in the global financial crisis of 1998, and the world economy flirted dangerously close with economic catastrophe. The existing structure is unstable, and it also gives financial interests too much sway over domestic and international economic policy. We need a new structure that reduces speculation, that gets investors to invest with proper regard to risk and return, and that creates the space for domestic economic policy autonomy.

If we do these things, globalization can be made to work for all working people. Its benefits can be widely shared, and the prosperity it creates can be firmly rooted.

9 Globalization: A Cautionary Note

Dennis Pirages

This short article moves beyond the international economics of research and development and is intended to strike a more cautionary note about the broader implications of globalization. In some respects it focuses on the “seamy” side of the process. While there are obvious benefits associated with globalization, particularly the pace of the process raises critical questions of unanticipated costs and how to minimize collateral damage.

There are obviously many positive aspects of globalization. Analytically, a much more refined division of labor and the emergence of global markets should maximize production of goods and services. A worldwide flow of images, information, and ideas could produce better understanding among people, and also holds the potential for closer scientific collaboration. On the personal level it is useful to be able to send e-mail to colleagues in Asia or to watch the evening news from Paris on local television.

Contemporary globalization represents a real revolution in human affairs. It is a massive change in the way that civilization is organized. The related revolution in the information and knowledge economy obviously has its benefits, but like all revolutions, there are unforeseen costs and unforeseen casualties. Caught up in globalization fervor, there is normally little reflection on the downside. Globalization exacts very significant costs, and these costs often are exacted largely from those who do not have voices in the process.

There are four sets of problems and issues associated with rapid globalization. The first of these is the weakening of the political authority of the state with no substitute authority in sight. The second is an in-

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crease in the risks of spreading economic maladies. The third is cultural simplification and destruction. Last, but not least, is something that could best be called increasing ecological insecurity.

Homo sapiens live in and identify with basic groups called populations or societies. The history of the movement of *Homo sapiens* out of North Africa and the Middle East has been admirably documented in a recently published book *The Great Human Diasporas*.

Without tracing the movements of these prehistoric peoples, assume a moment in time at which migrating human populations reached maximum scatter across the earth's surface. Since that point in time, the world's dispersed populations have been slowly and sporadically coming back together. Thus, integration and globalization are not necessarily a new thing. Looking back to the Roman or Persian Empires, for example, the integration of peoples under one empire could be seen as a precursor of contemporary globalization. The thing that is novel about this era is the scope and pace of the globalization process.

There is no reason to dwell on the world of ancient empires. Let us fast forward to the present. The contemporary world is still composed of between 5,000 and 6,000 distinguishable biological human populations. On the other side of the disciplinary divide these are called cultures. Each of these populations carries a collective biological and sociocultural genome that represents evolutionary learning. In other words each population represents a unique biological and a cultural heritage. This is the evolutionary material that globalization is leveling in unprecedented genetic and cultural simplification.

The pace of this re-integration is now frenetic by historical standards. The combined impact of well-known innovations in transportation, telecommunications, computers, and aerospace is to draw or drive together human populations or cultures that have been evolving apart for millennia. The problem is not that it is occurring. These and other technological innovations make it inevitable. But it is the pace of change that is critical. The question that now must be addressed is how much globalization and how quickly.

Let us focus briefly on some of the often ignored costs, problems, and issues associated with rapid globalization. The image often used to describe the process is that of creating a global village. But this emerging village or city has many different neighborhoods. Some neighborhoods are rich and others are poor. And one of the most critical problems that must be faced is that the growing global village or city has no village council.

Let me begin with the first category of concerns—the many new challenges to political authority, also known as the state. Politics refers to the methods by which societies collectively decide upon goals and policies. To retreat to some professional jargon, politics is called the “authoritative allocation of values.” The political arena is where we supposedly collectively debate and decide the nature of our future societies. But globalization is in many ways dramatically weakening the capabilities and authority of the state and providing no obvious replacement for it.

Globalization challenges the power of the state because it increasingly makes state borders obsolete. There are growing concerns that activities banned as immoral within states may simply be transferred to the Internet. These activities include gambling in virtual casinos, pornography, and even prescription drug sales. And as commerce increases over the Internet, the loss of sales tax revenue is becoming an important consideration. There are also challenges to state power in the economic realm. Of the one hundred largest economic units in the world, as measured by the value of their products, nearly one-half are now corporations. And while corporations, for the most part, do not raise armies, they have enough clout to interfere with politics in many countries. In brief, governments have increasing difficulty controlling the flow of images—which could be a negative or positive development—and a diminishing role in determining their own economic destinies.

There are related changes that increasingly complicate foreign policy decision-making. The most prominent is the loss of time and distance buffers. In the good old days—before e-mail, before the Internet, and before CNN—policymakers had time to reflect carefully on issues. There was an opportunity to reflect, deliberate, and to decide. Today decision-making must be immediate. The media revolution has accelerated and globalized foreign policymaking. In recent administrations, presidents have turned from intelligence analysis to watching CNN to get more immediate information on foreign events. The global telecommunications revolution freely penetrates the borders of previously protected nation-states. And televised images increasingly have an impact on domestic politics. Witness the political odyssey of little Elian Gonzalez in Miami or the impact of live television coverage of Serb atrocities in the former Yugoslavia.

The second category of globalization concerns relates directly to the process of economic integration. Much is made about the virtues of an integrated global economy. But is there a downside? I see four sets of

problems to be directly associated with deeper economic integration: contagion, vulnerability, exploitation, and dislocation.

Contagion. The emerging global economic system now has more closely linked economies that can quickly become victims of rapidly spreading economic “viruses.” Why the persisting concern with the health of the Japanese economy? Why the frequent concern with inflation in Brazil? Why in recent years has there been such concern with the economic health of Asian countries? The answer is simple. With all key economies closely connected in a globalization process, they now have become mutually vulnerable. This means that various forms of economic diseases can spread rapidly from one country to another.

Vulnerability. Vulnerability refers to rapid capital movements and the associated destabilizations of currencies. Predators can make a lot of money speculating on currencies, but at a heavy cost to the countries being attacked. Recent examples are the huge fluctuations in the value of the yen over the last five years or the wholesale destruction of the currencies of several other Asian countries.

Exploitation. This, in many ways, could be considered old wine in new bottles. Exploitation of labor and natural resources has been taking place since the beginning of the Industrial Revolution. But the exploitation of cheap labor has increased greatly as has the devastation of natural resources in poorer countries. Witness the ecological devastation associated with the recent collapse of the Indonesian economy.

Dislocation. Globalization is accompanied by a related human tragedy in displaced workforces. Regard the wandering heavy industries that move frequently from one country to another. My favorite example of this is the tennis shoe industry in Asia. It has moved every few years from one country to the next, leaving behind displaced workers while jobs are created in other countries.

My third set of concerns is that greater global integration brings increasing ecological insecurity. Bringing together thousands of different populations that have previously evolved in isolation is filled with risks of the spread of various kinds of illnesses and possibly epidemics. McNeill’s classic work, *Plagues and Peoples*, demonstrates that from the time of the Roman Empire to the present, occasions when previously isolated civilizations or societies have been brought together have been times of increased risk of disease and plagues. This occurs because native immune systems suddenly encounter pathogenic microorganisms with which they have little previous experience.

Globalization is also associated with increased bio-invasion, species hitchhiking from the ecosystems in which they have evolved to other ecosystems where they often create havoc. Many kinds of animals and some kinds of plants are now moving around the world with commercial cargoes. These scourges range from the zebra mussel, which is doing tremendous damage in the Great Lakes region, to the Formosan termite, which is munching its way through Louisiana.

The last set of concerns involves cultural simplification and destruction. Cultural diversity, like biological diversity, is an important resource. Cultures contain important survival wisdom that is the product of hundreds of generations of evolutionary experience. Indigenous cultures around the world are now being threatened by the monoculture associated with western industrialization. The process of cultural integration is much more of a monologue than a dialogue. Western values, or lack thereof, will soon overcome these other cultural voices speaking from a weaker position. This “soft power” of the United States is anchored in control of the mass media, films, and global telecommunications. The term “McWorld” has been used to describe this homogenous and boring new reality. Why travel to distant parts of the world to have the experience of feasting on a Big Mac?

But cultural diversity is also an issue among developed countries. Under the guise of free trade, for example, Canadians cannot interfere with the cultural invasion from the United States and the French cannot even protect their domestic film industry. From the U.S. perspective, protecting domestic cultures could be considered reactionary. But it is essential to pause and reflect for a moment on preserving some of the attributes of different cultures and the losses that might be involved in the long run.

In conclusion, I return to the main point. The issue is not whether globalization should be reversed, but rather whether the pace can be slowed and tremendous collateral damage can be avoided. Significant ecological and cultural trade-offs are involved in this hectic rush to globalize. Are the rapidly changing and supposedly more efficient markets worth the associated cultural and ecological damage? Surely an extended political dialogue over the risks and rewards of globalization is in order, unless market forces are to be the sole arbiters of the direction of human progress or possibly regress.

10 Science at the U.S. Department of State

Frank E. Loy

I want to talk about a subject that is very important to Secretary Albright and to me: the role of science in shaping our foreign policy. A few weeks ago, I had the pleasure of meeting with your board chair, Dr. M.R.C. Greenwood. She was most generous in sharing her experience and providing her advice on how we might go about getting more “science savvy” into the State Department. During the course of our conversation, I noted that the Department was not a scientific agency. She raised one eyebrow and said, “we’ve noticed.”

Now, I am not quite sure what she meant. But I know what I meant: Our job is to develop and conduct a sound foreign policy—taking fully into consideration the science and technology that bears on that policy. It is not to advance science. Therefore, scientists have not been, and probably will not be, at the center of our policy-making apparatus.

But I also know this: The advances and changes in the worlds of science and technology are so rapid and so important that we must ask ourselves urgently whether we really are equipped to take these changes “fully into consideration” as we go about our work.

I believe the answer is “not quite.” We need to take a number of steps—some of which I will outline in a moment—to help us in this regard. Some we can put in place right now. Others will take years to work their way through the system. One thing I can say: I have found in the State Department a widespread and thoughtful understanding of how important science and technology are in the pursuit of our foreign policy goals. The notion that this has somehow passed us by is just plain wrong.

I might add that this sanguine view of the role of science was not always prevalent. In a 1972 Congressional Research Service study on the

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interaction between science and technology and U.S. foreign policy, Dr. Franklin P. Huddle wrote: "In the minds of many today, the idea of science and technology as oppressive and uncontrollable forces in our society is becoming increasingly more (sic) prevalent. They see in the power of science and technology the means of destruction in warfare, the source of environmental violation, and the stimulant behind man's growing alienation."

Today, though, as we look into the 21st century, we see science and technology in a totally different light. We see that they are key ingredients that permit us to perpetuate the economic advances we Americans have made in the last quarter century or so and as the key to the developing world's chance to have the same good fortune. We see at the same time that they are the key factors that permit us to tackle some of the vexing, even life-threatening global problems we face—climate change, loss of biodiversity, the destruction of our ocean environment, proliferation of nuclear materials, international trafficking in narcotics, and the determination by some closed societies to keep out all influences or information from the outside.

We began our review of the role of science in the State Department for two reasons. The first was part of a larger task the Secretary asked me to undertake: to assure that the various "global foreign policy issues"—such as protecting the environment, promoting international human rights, meeting the challenges of international narcotics trafficking, and responding to refugee and humanitarian crises—are fully integrated into our overall foreign policy and the conduct of U.S. diplomacy abroad.

She felt that the worst thing we could do is to treat these issues, which affect in the most profound ways our national well-being and our conscience, as some sort of sideshow instead of issues that are central challenges of our turn-of-the-millennium foreign policy. We all, of course, are fully aware that these global issues—as well as our economic, non-proliferation, and weapons of mass destruction issues—cannot be adequately addressed without a clear understanding of the science and technology involved.

This brings me to the second impetus for our review: We have heard the criticism from the science community about the Department's most recent attention to this issue. We are very sensitive to your concerns and we take them seriously. That is, of course, why we asked the National Research Council to study the matter and why we are eager to hear more

from you. Our review is definitely spurred on by our desire to analyze the legitimate bases of this criticism and to be responsive to it.

Let me also note that while we have concluded that some of these criticisms are valid, others are clearly misplaced. However misplaced they may be, somehow we seem to have fed our critics. The entire situation reminds me of something Casey Stengel said during the debut season of the New York Mets. Called upon to explain the team's performance, he said: "The fans like home runs. And we have assembled a pitching staff to please them."

I would like to outline my thoughts on three topics:

- A vision of the relationship between science and technology and foreign policy in the 21st century.
- One man's evaluation of how well the Department has, in recent times, utilized science in making foreign policy determinations.
- How we might better organize and staff ourselves in order to strengthen our capacity to incorporate science into foreign policy.

The Role of Science and Technology

Until a decade ago, our foreign policy of the second half of this century was shaped primarily by our focus on winning the Cold War. During those years, science was an important part of our diplomatic repertoire, particularly in the 1960s and 1970s. For example, in 1958, as part of our Cold War political strategy, we set up the NATO Science Program to strengthen the alliance by recruiting Western scientists. Later, we began entering into umbrella science and technology agreements with key countries with a variety of aims: to facilitate scientific exchanges, to promote people-to-people or institution-to-institution contacts where those were otherwise difficult or impossible, and generally to promote our foreign policy objectives.

The Cold War is now receding into history—and the 20th century along with it. We in the Department have retooled for the next period in our history with a full understanding of the huge significance of science in shaping the century ahead of us. But what we have not done recently is articulate just how we should approach the question of the proper role of science and technology in the conduct of our foreign policy.

I would like to suggest four parts to such an approach:

- First, and most important, we need to take the steps necessary to ensure that policymakers in the State Department have ready access to scientific information and analysis, and that this is incorporated into our policies as appropriate.
- Second, when consensus emerges in the science community and in the political realm that large-scale, very expensive science projects are worth pursuing, we need to be able to move quickly and effectively to build international partnerships to help these mega-science projects become reality.
- Third, we should actively facilitate science and technology cooperation between researchers at home and abroad.
- And fourth, we must address more aggressively a task we undertook some time ago—mobilizing and promoting international efforts to combat infectious diseases.

And we need to find a way to ensure that the Department continues devoting its attention to these issues long after Secretary Albright, my fellow undersecretaries, and I are gone from there.

Our Performance

Before we chart the course we want to take, let me try a rather personal assessment of how well we have done in the past. And here we meet a paradox: Clearly, as I noted earlier, the State Department is not a science and technology-based institution. Its leadership and senior officers do not come from that community and relatively few are trained in the sciences. And as some of you have pointed out, our established career tracks, within which officers advance, have labels like political, economic, administrative, consular, and now public diplomacy—but not science.

Some have suggested that there were no science-trained people at all working in the State Department. I found myself wondering if this were true, so I asked my staff to look into it. After some digging, we found that there were more than 900 employees with undergraduate majors and more than 600 with graduate degrees in science and engineering. That is about five percent of the people in the Foreign Service and six

percent of those in the Civil Service. If you add math and other technical fields such as computer science, the numbers are even higher.

Now you might say that having 1,500 science-trained people in a workforce of more than 25,000 is nothing to write home about. But I suspect it is a considerably higher number than either you or I imagined. More important, I would say we have gotten fairly adept at getting the science we need, when we need it, in order to make decisions.

One area where this is true is the field of arms control and nuclear non-proliferation. There, for the past half-century, we have sought out and applied the latest scientific thinking to protect our national security. The Bureau of Political-Military Affairs, or more accurately, the three successor bureaus into which it has been broken up, are responsible for these issues and are well-equipped with scientific expertise. One can find there at any given time as many as a dozen visiting scientists providing expertise in nuclear, biological, and chemical weapons systems. Those bureaus also welcome AAAS Science and Engineering Fellows on a regular basis and work closely with scientists from the Departments of Energy and Defense. The Undersecretary for Arms Control and International Security Affairs has a science advisory board that meets once a month to provide independent expertise on arms control and non-proliferation issues. This all adds up to a system that works quite well.

We have also sought and used scientific analysis in some post-Cold War problem areas. For example, our policies on global climate change have been well informed by science. We have reached out regularly and often to the scientific community for expertise on climate science. Inside the Department, many of our AAAS Fellows have brought expertise in this area to our daily work. We enjoy a particularly close and fruitful relationship with the Intergovernmental Panel on Climate Change (IPCC)—which I think of as the world's largest peer review effort—and we ensure that some of our best officers participate in IPCC discussions. In fact, some of our senior climate experts are IPCC members. We regularly call upon not only the IPCC, but also scientists throughout the government, including the EPA, the DOE, NOAA, NASA and, of course, NAS and NSF as we shape our climate change policies.

Next, I would draw your attention to an excellent and alarming report on coral reefs, which was released by the Department just last month. This report is really a call to arms. It describes last year's bleaching and mortality event on many coral reefs around the world and raises awareness of the possibility that climate change could have been a factor. Jamie Reaser, a conservation biologist and current AAAS Fel-

low; and Peter Thomas, an animal behaviorist and former AAAS Fellow, now a Senior Conservation Officer, pulled this work together—drawing on unpublished research shared by their colleagues throughout the science community. The Department was able to take these findings and put them in the international spotlight.

A third example involves our recent critical negotiation in Cartagena, Colombia, concerning a proposed treaty to regulate transborder movements of genetically-modified agricultural products. The stakes were high—potential risks to the environment, alleged threats to human health, the future of a huge American agricultural industry, and the protection of a trading system that has served us well and contributed much to our thriving economy. Our negotiating position was informed by the best scientific evidence we could muster on the effects of introducing genetically-modified organisms into the environment. Some on the other side of the table were guided less by scientific analysis and more by other considerations. Consequently, the negotiations did not succeed. This was an instance, it seemed to me, where only a rigorous look at the science could lead to an international agreement that makes sense.

Augmenting the Science and Technology Capability at State

In painting this picture of our performance, I do not mean to suggest that we are where we ought to be. As you know, Secretary Albright last year asked the National Research Council (NRC) to study the contributions that science, technology, and health expertise can make to foreign policy, and to share with us some ideas on how the Department can better fulfill its responsibilities in this area.

The NRC put together a special committee to consider these questions. In September, the committee presented to us some thoughtful preliminary observations. I want to express my gratitude to Committee Chairman Robert Frosch and his distinguished colleagues for devoting so much time and attention to our request. And I would like to note here that I have asked Richard Morgenstern, who recently took office as a Senior Counselor in OES, to serve as my liaison to the NRC committee. Dick, who is himself a member of a National Academy of Sciences committee, is going to work with the NRC panel to make sure we are being as helpful as we can be.

We will not try to develop a full plan to improve the science function at the State Department until we receive the final report of the NRC.

But clearly there are some steps we can take before then. We have been discussing them within the Department, with the NRC Committee, and with scientists from this organization, including Chairwoman Greenwood, past Chairwoman Dresselhaus, Dick Getzinger, Bob Stern, and others.

We have not yet made any final decisions. But let me share with you a five-point plan that is designed to strengthen the leadership within the Department on science, technology, and health issues and to strengthen the available base of science, technology and health expertise.

Establish a Science Advisor

The Secretary should have, it seems to me, a science advisor to make certain there is adequate consideration within the Department of science, technology, and health issues. To be effective, such an advisor must have appropriate scientific credentials, be supported by a small staff, and be situated in the right place in the Department. The “right place” might be in the office of an Undersecretary or in a bureau—such as the Bureau of Oceans and International Environmental and Scientific Affairs. If we chose the latter course, it would be prudent to provide this advisor direct access to the Secretary.

Either arrangement would appear to be a sensible way to assure that the advisor has access to the Secretary when necessary and appropriate, but at the same time, is connected as broadly as possible to the larger State Department structure and has the benefit of a bureau or an Undersecretary’s office to provide support. There is an existing position in the State Department that we could use as a model for this—the position of Special Representative for International Religious Freedom, now held by a Ambassador Robert Seiple. Just as Ambassador Seiple is responsible for relations between the Department and religious organizations worldwide, the science advisor would be responsible for relations between the Department and the science community. And just as Ambassador Seiple, assisted by a small staff, advises the Secretary and senior policymakers on matters of international religious freedom and discrimination, the science advisor would counsel them on matters of scientific importance.

Establish Science Roundtables

It seems to us that when a particular issue on our foreign policy agenda requires us to understand better some of the science or technology involved, we should reach out to the science and technology community and form a roundtable of distinguished members of that community to assist us.

We envision that these roundtable discussions would take the form of one-time, informal gatherings of recognized experts on a particular issue. The goal would not be to elicit any group advice or recommendations on specific issues. Rather, we would use the discussions as opportunities to hear various opinions on how developments in particular scientific disciplines might affect foreign policy.

I see the science advisor as being responsible for organizing such roundtables and for making sure that the right expert participants are included. But, rather than wait for that person's arrival in the Department, I would like to propose right now that the Department, AAAS, and NAS work together to organize the first of these discussions. My suggestion is that the issue for consideration relate to genetically-modified organisms, including particularly genetically-modified agricultural products. It is clear to me that trade in such products will pose major issues for U.S. policymakers in the years to come, and we must make certain that we continue to have available to us the latest and best scientific analysis.

It is not clear whether such roundtables can or should take the place of a standing advisory committee. That is something we want to discuss further. It does strike me that while "science" is one word, the Department's needs are so varied that such a committee would need to reflect a large number and broad array of specialties and disciplines to be useful. I would be interested in your views as to whether such a committee could be a productive tool.

So far, we have been talking about providing leadership in the department on science, technology, and health issues. But we also need to do something more ambitious and more difficult—that is, to diffuse more broadly throughout the Department a level of scientific knowledge and awareness. The tools we have available for that include recruitment of new officers, training, and reaching out to scientific and technical talent in other parts of the government and in academia.

If you are a baseball fan, you know that major league ball clubs used to build their teams from the ground up—by cultivating players in their farm systems. Nowadays, they just buy them on the open market. We would do well to emulate the old approach, by emphasizing the importance of science and technology in the process of bringing new officers into the Foreign Service. We have got a good start on that—eight of the 46 members of a recent junior officers' class had scientific degrees.

Train State Personnel

In addition to increasing our intake of staff with science backgrounds, we need to stimulate the professional development of those in the Department who have responsibility for policy, but no real grounding in science.

During the past several years, the Foreign Service Institute (FSI)—the Department's training arm—has taken two useful steps. First, it has introduced and beefed up a short course in science and technology for new officers. Second, it has introduced environment, science, and technology as a thread that runs through the entire curriculum. Regardless of officers' assignments, they now encounter these issues at all levels of their FSI training. But we believe this may not be enough, and we have asked FSI to explore additional ways to increase Department staff's access to other professional development opportunities related to science and technology.

A couple of weeks ago we wrapped up the inaugural session of a new Environment, Science, and Technology training program for Foreign Service National staff who work at our embassies. Twenty-five of them spent two weeks at the Foreign Service Institute learning about climate change, hazardous chemicals, new information technologies, intellectual property rights, and nuclear non-proliferation issues.

Leverage Our Resources

I have not yet raised the severe resource problem we encounter at State. I believe that we can and must find ways to deal with our science and technology needs despite this problem. But make no mistake about it: State has not fared well in its struggle to get the resources it needs to do its job. Its tasks have increased and its resources have been reduced. For example, between 1991 and 1998, the number of U.S. embassies rose

by about 12 percent and our consular workload increased by more than 20 percent. During the same period, our total worldwide employment was reduced by nearly 15 percent.

That has definitely had an impact on the subject we are discussing today. For example, we have had to shift some resources in the Bureau of Oceans, Environment, and Science from the science to the enormously complex global climate change negotiations.

But I want to dwell today on what we can do and not on what we cannot. One thing we can do is to bring into the Department, on long- or short-term assignments, more scientists from other agencies or from academia.

Let me share with you a couple of the other initiatives we have going:

- We are slowly but surely expanding the AAAS Diplomatic Fellows Program in the Bureau of Oceans and International Environmental and Scientific Affairs. That program has made these young scientists highly competitive candidates for permanent positions as they open up. To date, we have received authorization to double the number of AAAS Fellows working in OES from four per year to eight, and AAAS has expanded its recruiting accordingly.
- We are talking with the Department of Health and Human Services about a health professional who would specialize in our infectious disease effort. We are also talking with several other agencies about similar arrangements.

I should point out here a particular step we do not want to take: We do not want to re-establish a separate environment, science and technology cone, or career track in the Foreign Service. We found that having this cone did not help us achieve our goal of getting all the officers in the Department—including the very best ones—to focus appropriately on science. In fact, it had the opposite effect—it marginalized and segregated science. After a while, the best officers chose not to enter that cone because they felt it would limit their opportunities for advancement. We are concerned about a repeat performance.

Use Science as a Tool for Diplomacy

As for our scientific capabilities abroad, the State Department has 56 designated environment, science, and technology positions at our posts overseas. We also manage 33 bilateral science and technology “umbrella

agreements" between the U.S. government and others. Under these umbrellas, there are hundreds of implementing agreements between U.S. technical agencies and their counterparts in those countries. Almost all of them have resulted in research projects or other research-related activities. Science and technology agreements represented an extremely valuable tool for engaging with former Warsaw Pact countries at the end of the Cold War and for drawing them into the Western sphere. Based on the success of those agreements, we are now pursuing similar cooperative efforts with other countries in transition, including Russia and South Africa. We know, however, that these agreements differ in quality and usefulness and we have undertaken an assessment to determine which of them fit into our current policy structure and which do not.

We have also established a network of regional environmental hubs to address various transboundary environmental problems whose solutions depend on cooperation among affected countries. For example, the hub for Central America and the Caribbean, located in San Jose, Costa Rica, focuses on regional issues such as deforestation, biodiversity loss, and coral reef and coastline management. We are in the process of evaluating these hubs to see how we might improve their operations.

Conclusion

The eminent British physicist C.P. Snow observed that politics is concerned with the short term while science is more concerned with the long term. He said he hoped there would come a day when politicians will start to take a longer view of the world and their role in it, and scientists, occasionally, will take a shorter one.

So, to conclude, let me say that I have tried candidly to give you an idea of the state of our thinking on science at State. And I have tried to give you some reason for optimism while keeping my proposals and ideas within the confines of the possible. Needless to say, our ability to realize some of these ideas will depend in large part on the amount of funding we get for them. As long as our budget remains relatively constant, resources for science and technology will necessarily be limited.

Again, I know the NRC plans to give us its final recommendations in the fall. We look forward to that and we expect to announce some specific plans soon thereafter. We will be very interested in working with you in refining those plans if need be and in bringing them to fruition.

