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In the two months since returning from Japan, many people have been asking me what I learned about Japan while I was there.

As it turns out, there is something about living thousands of miles from home that presses a person to think more carefully about his own country. At least, this was true for me. Thus, I had a great opportunity to learn not only about Japan. I learned some important lessons about America, too.

One of the most important of these lessons is that our two nations face many common challenges as we advance into the next century and millennium. A lot of these challenges come together in the field of science and technology — a field which I am convinced holds the key to the future prosperity and well-being of the world's population.

I don't wish to stand here this evening and offer myself as an expert on science and technology. After all, I can hardly get my own VCR to work!

But my past three and half years across the Pacific Ocean gave me a front-row seat on some emerging trends in the global economy — especially in the area of science and technology. Indeed, the question of America's technological leadership was a subject of considerable discussion at the Embassy in Tokyo as we reviewed the different strategies of the United States and Japan. This is pretty important, considering that — together — the United States and Japan account for almost two-thirds of the world's ~~spending on~~ science and technology.

This evening, I would like to share a few thoughts about the direction in which I see Japanese science and technology going — and contrast this with what I see happening in America. Then I will be pleased to answer your questions.

Japan's economic system is under severe pressure right now — with five years of sluggish growth, an ocean of bad debts, a sinking stock market, and growing frustration with an over-regulated economy. As a result, many Japanese voices are now calling for reform to make their system more open.

Given the bad economic news, it might be tempting for Americans to dismiss Japan as no longer a serious economic rival. But Japan has enjoyed astonishing

economic growth over the past several decades — emerging from the devastation of war to become the world's second largest economy. For all of Japan's current problems, she is neither down nor out. Many Japanese companies — especially exporters like Sony, Toyota, and Canon — are prospering. While the projections on economic growth this year remain pessimistic, the return of the very cheap yen will almost certainly mean rising exports and declining imports for Japan — and, once again, a growing trade imbalance with the U.S.

It would be a great mistake for us to underestimate the resilience of Japan's economy — especially now that Japan has embarked on a very ambitious national strategy to expand her science and technology capabilities.

As you know, the United States is generally considered ^{the} world leader in basic research and development, while Japan is seen as more adept at commercializing technologies. America is often described as a "technology pioneer" — talented at inventing and innovating — while Japan is a "technology follower" — skilled at ~~borrowing and~~ perfecting what's already been invented. A rough indicator of this difference is the Nobel Prize. A total of five Japanese are Nobel laureates in the sciences, compared to more than 180 Americans.

These different national approaches to science may well have been true in the past. But, today, this reality is changing.

In the past few years, Japan's political, bureaucratic, corporate, and educational leaders have reached a consensus that their country "must stop being a nation of technology followers and become a nation of technology innovators." As they see it, their nation's future economic well-being is at stake. *Japan's unstated goal is to become the world leader in S & T. It is making progress*

This is a very important decision for Japan, one that was reached only after much deliberation and consensus-building among the key sectors of society. It is often observed that Japan's tradition-bound culture is not as receptive to rapid change as America. It's probably true that the Japanese system can't turn on a dime. But once the Japanese decide to turn, they know exactly in what direction they're going — and they move ahead with impressive determination.

A good measure of this determination is money. Last summer, the Japanese cabinet approved a plan to spend 155 billion dollars — yes, that's billion — on government science and technology programs over the next five years.

As someone once said: A billion here . . . a billion there . . . and pretty soon, we're talking real money! This projected increase in Japan's R&D spending is only a little bit less than the total of what our government is projected to spend on civilian R&D during the next five years.

This comparative pattern is not entirely new. As a percentage of gross domestic product, Japan's civilian R&D spending has exceeded ours since the mid-1970s. With this new science initiative, it will soon exceed in absolute terms our government spending on both civilian and military R&D. This fact is especially dramatic when you consider that we have twice the population of Japan — and our economy is almost two-thirds larger than theirs.

Japan's push to increase her R&D spending to match, and exceed, ours is consistent with the theme of "catching up with the West," which has been a powerful force throughout much of modern Japanese history. This persistent sense of vulnerability drives what one scholar calls the country's "technonationalism" — the conviction that Japan's national security and independence is best protected by building up her technological capabilities.

anxiety
educ. system is too compliant
univ. educ. that is merged
protected markets that stifle competition
and thus, the innovation that competition demands

~~Ninety-five percent of the Japanese government's R&D budget is dedicated to civilian technologies. The Japanese government is focusing its new strategy on basic and applied R&D for commercial applications. With product life cycles getting shorter, Japan believes it can no longer depend on its traditional strategy as a "technology follower" to stay competitive. Instead, it must improve its own capability to conduct innovative research by transforming itself into a technology pioneer, with close cooperation between business and government.~~

The Japanese government has decided that the nation must become a world leader in basic research, because this is where R&D breakthroughs often occur. The largest budget increases are targeted at programs to improve Japan's basic research infrastructure and to develop "frontier technologies" which Japan believes are critical to its economic future.

Japan's technology strategy includes four major elements:

- primary educ. is great*
basic math/science
but grad. educ.
- a doubling of government spending on science and technology by the year 2004, especially for basic research;
 - education reform, especially of university education at the graduate level;
 - financial reform to expand venture capital; and
 - continued targeting of selected foreign technologies for development by Japanese industry.

On balance, we have good reason to welcome Japan's new efforts. We have long encouraged Japan to invest more in her scientific capabilities. This nation has much to offer the world — especially in areas like health, energy, the environment.

open up financial markets, open up minds of young

More Money, of course, ³ does not guarantee results. It will take genuine reform to correct J's ~~st~~ weaknesses. Whether they can do that is the real question that remains to

open up rigid corporate structures, open up protected markets

and disaster prevention. As Japan's scientific capabilities increase, opportunities also increase for us to benefit from Japanese research — in much the same way that Japan has gained from our own research.

There are also reasons for us to worry, however.

One issue is intellectual property protection. Just as the global regime of free trade depends on all nations opening their markets to fair competition, a global system of scientific and technological progress requires that all nations abide by fair rules of intellectual property protection.

Increasingly, as you well know, the most valuable resource of many companies is knowledge and ideas — especially as they are embodied in technology. For America to stay ahead in the high technology race, our companies need to be able to protect their intellectual property. Unfortunately, many nations have weak systems of protection. I think we have all heard horror stories about what can happen — everything from sophisticated patent flooding to outright piracy.

The U.S. Patent Office recently issued its list of top ten patent recipients from last year. Number one on the list was IBM; number three was Motorola. The other eight were all Japanese corporations. This reflects the dynamism of Japan's economy, their commitment to high technology, and their enormous cash reserves.

Our patent system is wide open and readily available to protect the legitimate commercial interests of any corporation, foreign or domestic. But American companies often don't enjoy the same protection in other countries.

In Japan, for example, foreign corporations often find it difficult to obtain patents; the patents that are granted tend to be very narrow; and there is often a lengthy delay in the processing of patent applications (though now there is the option of a 36-month accelerated process). We have asked Japan to change.

Emerging high-tech companies are among those most vulnerable to these intellectual property problems. These companies have the ideas and the technology. They must work with investors, partners, suppliers, and customers — who, in turn, are apt to become knowledgeable about the product — and perhaps assume they have a right to it.

The process of commercial technology development and transfer needs to proceed in a fair and honest way. Japanese firms are adept at acquiring our commercial technology, but we do not always enjoy a reciprocal technology flow with Japan. One way to improve this situation is to foster a greater presence of our students, researchers and industries in Japan — so they can benefit from Japanese research progress.

As important as intellectual property protection is, it is not the most serious problem we face from Japan's technological challenge.

In fact, the most alarming threats are entirely of our own making.

While the Japanese are now taking ^{risk} giant steps forward to address their relative weakness in basic research, we ~~are~~ stumbling along a path that will diminish our own lead in science and technology. The economic consequences are potentially catastrophic.

The threats to American science include:

- a decrease in federal support for R&D (not only basic research, but also technology development and applied research);

- a deterioration in the quality of our K-12 education system; (*God knows how many kids we're losing, talented*)

- the growing unwillingness and inability of our government and corporations to invest in long-range research projects; and

- a declining interest by many of our brightest young people in pursuing scientific careers.

I am sure that you know better than I do the dangers for our economy — and our society — if these trends are allowed to continue.

Without a doubt, ^{America's} ~~our~~ scientific and technological prowess, coupled with our open entrepreneurial system, continues to be ^{high-tech} ~~America's~~ ^{our} greatest competitive advantage in the global economy. We know this very well in Minnesota. We are fortunate to be home to many successful companies ~~with strong commitments to R&D~~ — 3M, Honeywell, Medtronic, and St. Jude Medical, to name just a few. We know how much there is to gain from a strong technology base.

To the extent our nation neglects science and technology, ^{however,} we are permitting the very basis of our wealth to disintegrate.

insert from p. 6 → A new analysis by the National Academy of Sciences finds that the overall federal science and technology budget — excluding the military — has fallen in real terms by five percent since 1994. If we exclude spending by the Institutes of Health, the decline is closer to 10 percent. That's in just a three-year period.

individualism

Strengths

traditions that value/honor the inventor/entrepreneur

independent thinking/creativity

openness to the world —

higher education

open to immigrants who enrich the talent pool

open to new ideas

open to int. competition that forces us to improve

discipline of competition

already made

Because of ~~these~~ reductions, a larger percentage of total American spending on R&D is coming from private industry instead of the federal government. Twenty years ago, the federal government supported 50 percent of all R&D performed in the nation. Ten years ago, the figure was 45 percent. Today, it is less than 35 percent.

When adjusted for inflation and economic growth, even private industry's R&D spending has been relatively flat in recent years. With basic research in particular, there are real limits to how much we can expect industry to contribute. Basic research accounts for only about 16 percent of our nation's total R&D spending, private and public. But government funding is critical — picking up about two-thirds of the total bill — and more than half of this basic research is conducted at universities.

Unfortunately, efforts to balance the ~~budget~~ *federal* and reduce the size of government ~~are challenging the future of federal support for science and technology.~~ *Threaten* *Our*

Back in 1984, while running for President, I did my best (or worst) to draw public attention to America's burgeoning deficit. But now I fear that we may sacrifice ourselves on the altar of a balanced budget, even as our deficit is shrinking. According to the budget plans from Congress and the White House, nonmilitary R&D spending will decline nearly 25 percent in real terms by the year 2002. ~~If Congress insists on balancing the budget while also giving away a hundred billion dollars in tax cuts, they will have to cut total discretionary spending by 30 to 40 percent.~~

As important as it is to get our nation's fiscal house in order, this is like taking stones from the foundation to repair the roof.

More fundamental than a balanced budget is the need to reorient our national priorities toward investment rather than consumption. R&D spending represents an investment in the future, not a form of short-term consumption. America's university research system, for example, is an economic engine for our entire country — creating new technologies that lead to new industries and good new jobs. Reduced funding for our research institutions undercuts our technological and economic leadership abroad and diminishes opportunities for Americans at home.

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Federal investments in science and technology are responsible for countless advances in agriculture, aerospace, health care, computers, telecommunications, and a host of other areas. These happen to be exactly the industries where the U.S. leads the world. Everyone is talking these days about the Internet. Well, that's an American invention — and there would be no Internet at all if it weren't for the

federal investments that paid for its development. It's amazing: Even I'm using the Internet now — which qualifies as a scientific miracle in itself!

In the private sector, too, we must be careful not to squander our technological leadership. The Japanese are noted for their patience in long-term development of markets and technology. Unfortunately, our corporate practices often favor short-term financial gain — and we lose sight of the long road ahead.

I am told that fewer American companies are willing to work on research problems with a time horizon of more than three years, especially when they believe their competitors might also benefit. Even many venture capitalists have become more short-term and risk-averse in their investments. It is precisely when the market fails in this way that government has an appropriate role to play — to support applied research and technology development as well as basic research. And it's a role mostly for the federal government. The main responsibility for science and technology cannot be "devolved" to state or local governments, which have much more immediate needs to deal with.

Government-^{their}industry cooperation in R&D is where the Japanese excel. They jump at the opportunity to aid their companies in harvesting the fruits of our research to develop commercial products. They don't consider this "corporate welfare." They do it so they can compete in the global economy — which, you might have noticed, they do very well.

So, as the Japanese prepare for a major expansion of their science and technology efforts, the United States is headed in the opposite direction. We are following this course not because of any deliberate decision or thoughtful strategy, but simply as a byproduct of budget politics that give low (or no) priority to science and technology.

Thus, I think we should welcome Japan's new initiatives in this area. Just possibly, their challenge will awaken us to our own responsibilities — and inspire us make ^{to} the commitments needed to maintain and strengthen our technological advantages.

I believe we can do it. We have a lot of things going for us in America. In many ways, we are uniquely positioned to meet — and thrive on — the challenges of this global economy.

In fact, in a recent New York Times column, Tom Friedman attributes much of the stock market's sustained rise to something he calls a "globalization premium" which America enjoys:

You will know better than I do ~~the country~~ about these problems

to provide incentives for business to invest and take the long view

- We have, he says, "the world's most diverse and efficient capital markets, which reward, and even celebrate, risk-taking. Anyone with an invention and a garage can hope to raise millions overnight."
- We have "a multicultural population that speaks the language of the Internet, a constantly renewing flow of immigrants, a transparent legal and regulatory environment, and a flexible federal political system."
- We have "a job market that enables workers to move easily from one hot industrial zone to another, and a corporate sector that has, unlike Europe's or Japan's, already gone through the downsizing and restructuring needed for global competitiveness."

There is, he concludes, a sense among global investors that somehow the whole mix of America — our society, our culture, our technology, our business environment, even our geography — "meshes more naturally with globalization than either Europe or Japan."

Because of the fast-changing nature,

I think Tom is right about this. But we still must guard against complacency ~~and I'm afraid that~~ science and technology is one area where we ~~run this risk.~~

definitely cannot afford to rest on our laurels

While Japan can learn many things from us, we can also learn many things from her. Make no mistake: Japan has already learned a great deal from our example in science and technology. They understand how essential these have been to the continued strength and productivity of our nation.

But when it comes to having a clear set of goals and a broad-based commitment to science and technology for the future, I believe ~~it is now our turn to~~ learn something from Japan's ~~example.~~

recent

we may also

We need to recognize our strengths and how we got them.



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