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Technical Expertise in Policy-Making – Perspectives on the U.S. and Japan*

ABSTRACT

Although the levels of scientific and technological attainment stand at essential parity in the U.S. and Japan, the ways each country integrates technical expertise into its public policy process differ radically. This short essay examines the role of technical expertise in public policy, considering the main institutions that use technical expertise, the main providers of technical knowledge, the mechanisms by which it is incorporated in to policy decisions, and some of the major controversies that have recently surfaced concerning the role of technical expertise and experts. The narrative focuses largely on institutions, processes and problems in the U.S. This exploration of the American situation has nevertheless been structured with contrasts to Japan implicitly in mind, and such contrasts brought explicitly to the fore in a conclusion.

PRINCIPAL PUBLIC USERS OF TECHNICAL EXPERTISE

Three independent branches of government were established by the U.S. Constitution: the Congress; the Executive (President); and the judiciary. In fact, it is widely recognized that there is also a "fourth branch:" the many, and vast, administrative and regulatory agencies of the Federal government. Although all branches of the government of course utilize technical expertise, it is worth emphasizing that only in the case of the "fourth branch" does technical

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expertise provide the fundamental rationale for its existence and decisions. Whereas the Constitution anticipates that Congress, the President and the courts will typically base their actions in value judgments, political imperatives or historical precedent, the administrative agencies of the U.S. government were created to assemble the expertise necessary to implement complicated policies in a technically legitimate manner. It is also worth noting that because the branches of the U.S. government are relatively autonomous, it has been necessary for each to craft its own unique approaches to the uses of technical expertise.

Congress

The U.S. Congress is the country's law-making body. In this role, it debates matters of public importance and crafts legislation to address them. According to the Constitution, Congress may make laws only in certain specified areas, which generally concern the interests of the entire nation -- local and social matters being generally left to the states. Most of the areas in which Congress can exercise its jurisdiction do not directly concern science and technology. Indeed, the only mention of science and technology in the Constitution is in the patent and copyright clause, which is intended to "encourage the progress of science and the useful arts" (i.e. technology). Even in this context, there is nothing in the Constitution that encourages or constrains Congress to seek technically "correct" judgments as the basis for its decisions. For example, the length of a U.S. patent – now 20 years – has varied widely throughout history, and has been fixed to conform to patents in other countries rather than on a determination of the "best" patent length to encourage innovation.

All this said, the Congress is nevertheless an ardent user of technical expertise. The mechanisms it has crafted to assemble and integrate technical information and informed opinion stand out among the world's legislative bodies. Still, for the Congress, the promotion of science and technology is not a principal Constitutional objective. Few members of Congress have been trained in technical fields, as law, business or other "broad" backgrounds are generally seen as a more viable base for a political career. The primacy of politics is thus assumed in the Congress, and technical expertise takes the place of one, among many, criteria that condition its politically driven law-making function.

The President

Although the Constitution apparently envisioned a circumscribed role for the President as the official who "executed" the laws Congress made, in fact the American Presidency has grown over time to the point that it is often described as "imperial." Part of the President's power lies in his supervision of the administrative agencies of the government, whose budgets and personnel far outweigh the other branches. Two other

important sources of power are the President's ability to make foreign policy and command the military.

The only explicit criterion that the Constitution provides to channel Presidential power is that he "faithfully execute the laws;" i.e. conform to legislative direction. In fact, the President has broad leeway in formulating policies to execute the laws, broad leeway to develop new policy initiatives, and relatively unfettered discretion in military and foreign affairs. The preeminence of military and international issues in the President's portfolio may account for the way all modern Presidents – from Roosevelt forward – have utilized scientific and technical advice. By and large, Presidents have used scientists as their personal staff "advisors" rather than independent decision-makers. While the institutionalization of advice to the President and throughout the Executive Branch is strong and secure, the degree to which "science" is truly empowered depends largely on the President's orientation.

The Judiciary

The Judicial Branch is given two functions by the Constitution: to interpret the laws, and to resolve disputes. Entirely passive in agenda-setting (U.S. courts, unlike some in other countries, never initiate legal processes but must wait for controversies to be brought to them), courts are also passive recipients of technical information and expertise. Judges and lawyers are rarely given any technical training. The American court system is nevertheless highly respectful of technical expertise and has developed a number of interesting doctrines and mechanisms to enlist it in judicial decision-making.

Administrative Agencies

Though its importance as a repository of technical expertise is widely acknowledged, the Administrative, or "fourth," Branch of the U.S. government is not mentioned in the Constitution. Its oldest agency is little more than 100 years old, and many of its most powerful agencies, such as the Environmental Protection Agency, are young, with only about 30 years of existence. The rationale for the existence of the many agencies of the U.S. government is generally the same: to implement the "details" of policies that Congress can only outline in legislation, and to assemble the personnel and information that will assure technically sound implementation.

From the point of view of Constitutional theory, the agencies are simply exercising a Congressional power that has been "delegated" to them. But as this "delegation doctrine" has been elaborated by the Supreme Court over the years, it has imposed a practical necessity on the Congress to be clear about the agencies' decision-criteria, and, for the agencies, the need to offer a full technical justification for their actions within specified criteria.

The EPA provides a good example of this system. Its mandate from Congress gives it a huge scope of authority to manage environmental conditions in virtually all physical media and all industries. But in order to take any action, EPA must demonstrate convincingly with the best available evidence what the magnitude of environmental threat is and that whatever ameliorative policies it designs are indeed viable. It follows logically from this mission that the EPA is staffed largely with environmental professionals who see themselves as highly committed to technically correct decision-making.

MECHANISMS FOR INTEGRATING TECHNICAL EXPERTISE

Because U.S. science and technology policy is highly decentralized, the mechanisms for acquiring and utilizing technical expertise are many and diverse. Each branch of government has developed mechanisms to suit its own Constitutional purposes and unique institutional needs. Each agency is different; and often, particular policy problems demand specific, unique means of enlisting the technical community. The tendency toward decentralization is only intensified by the fact that the U.S. has no Department of Science or any single recognized authoritative governmental locus for technical information. And since each branch of the government is Constitutionally independent of the others, there is also an imperative to develop independent technical competencies.

Congressional Mechanisms

Since very few members of Congress have a technical background – and since all are very busy dealing with a very wide range of issues – the membership tends to rely heavily on others for technical expertise. Going beyond the individual case, the Congress as an institution has recognized that it needs competent, non-biased, long-term institutional capabilities to provide it with technical expertise. Many such mechanisms have evolved over time. The following – each briefly described – are the major tools Congress has at its disposal .

Congressional Staff – Staff in the U.S. Congress can be attached either to a member (personal staff) or to a standing committee (committee staff). Personal staff, naturally, suit the needs of the member and have no job security if the member leaves. While personal staff tend to be more political than technical, some members of Congress are noteworthy in their enthusiasm for recruiting technical experts, thus allowing them to specialize more easily in particular areas of legislation.

The committee staff in the Congress is large, far outnumbering members. Since Congressional committees have limited, specialized jurisdictions, the committee staff also tends to become specialized. Furthermore, since many staffers

have worked in the Congress for many years, and are highly committed to a particular policy area, they provide an importance source of historical continuity and expertise for the institution as a whole. It seems safe to say that no other legislative body in the world has such a capability.

Committee Processes -- The U.S. Congress is organized into committees with jurisdiction over particular policy areas. Since legislative proposals introduced into either the House or Senate are almost always "referred" to a committee for further deliberation, the committees function as the major site for inputs of technical expertise to the legislative process. It is thus routine for legislation to emerge from committee more technically sound than when it went in.

The major mechanism Congressional committees use for soliciting technical input is the hearing process. Hearings are generally public, and are deliberately designed by the staff to elicit a wide range of views about the value of the legislation and to encourage as many inputs of data and technical advice as possible. In fact, it is easy for interested members of the public (including corporations, NGOs, trade associations and individuals) to present their views and expertise in the context of such committee hearings. It is worth noting that committee hearings occur at many points in the Congressional policy process, including drafting legislation, appropriating funds, conducting oversight of agency operations, and investigating abuses.

Congressional Agencies – In response to the need for high-quality technical input to a wide range of decisions – and in recognition of the need for a counterweight to policy proposals proffered by the Executive Branch – Congress has established a number of independent agencies which provide it with technical expertise. Three of these – the CRS (Congressional Research Service of the Library of Congress), the CBO (Congressional Budget Office) and the GAO (General Accounting Office) -- are currently in existence. A fourth, the Office of Technology Assessment, was disbanded in 1995 after some twenty years. All are consciously designed to be non-partisan and dedicated to analyses of high quality and scrupulous integrity.

While the CBO, GAO and CRS all have significant technical capability and concern for science and technology – in budgets, program evaluation, and in general knowledge, respectively – the OTA had a unique niche in the U.S. government as the only agency specifically devoted to analysis of the role of technology in policy and society. Its demise in 1995 was the result of a partisan battle in which conservative Republicans emerged successfull.

Commissioned Studies – Congress often commissions and funds special studies of a particular policy area or technical problem. It does this in recognition of the need

to gain technical expertise before making decisions, or to promote political consensus. In the case of major national issues – like competitiveness or social security – bipartisan Congressional "commissions" have been convened. More frequently, Congress will request a more focused investigation by the National Academy complex, either for use by itself or a by a particular agency. For example, EPA has frequently benefited from Academy studies to determine the state of the art of pollution control technology.

Informal Channels – Members of Congress and the professional staff tend to be masters of the networking process. They thus routinely take advantage of informal contact with technical experts throughout the US and the world. Informal discussion with Administration officials is a *sine qua non* of program design; industrial expertise is easily available, both through lobbyists and through direct contact with companies; and academic experts enjoy high respect and visibility. Such informal contacts often yield important witnesses and submissions of technical information in committee hearings and the compilation of a legislative history.

Mechanisms for the President in the Executive Office (EOP)

Throughout U.S. history, neither the Presidents nor his top Cabinet officers have tended to have a technical background.[1] Some Presidents, though not technical experts, have shown a high regard for science and the technical community and have therefore welcomed science advice in policy-making. Almost always, the principal route to the President has been through a personal relationship to his Science Advisor -- Kennedy's to Jerome Wiesner offers an example. More recently, President Clinton's willingness to rely on Vice President Gore for oversight of science and technology – where his track record was distinguished – represents a unique mechanism for integrating technical expertise. The main point to be made is that whether, to what degree, and how technical expertise and technical experts have input to the highest levels of national decision-making is highly dependent on the orientation of the President.

Although certainly any President is well within his rights to structure science advice as best suits his needs, there have been several mechanisms developed over the last few decades to regularize and institutionalize science advice to the President. These include the following.

Office of Science and Technology Policy (OSTP) – OSTP was established by legislation in 1976 as a means of ensuring institutional continuity in science advice to the President and involving Congress in the process to a certain degree. OSTP is part of the EOP,

[1] Herbert Hoover (1929-32) was an exception, both as President and Secretary of Commerce, as was President Carter (1976-80).

and its director can also be seen as the Science Advisor to the President. OSTP also has an administrative coordination responsibility in the area of science and technology policy, and has several subgroups that correspond to different technical areas.

PCAST and NSTC – the President's Council of Advisors on Science and Technology (PCAST) was established in 1990. Headed by the Director of OSTP, PCAST is generally seen as a way of enlisting advice for the President from illustrious members of the academic/technical community. Under other names, the PCAST mechanism extends back to the Truman-Eisenhower era.

The National Science and Technology Council (NSTC) contrasts with PCAST by providing advice and coordination to the President from inside the government. NSTC was established in 1993. Besides its official membership at the highest levels (President, Vice President, OSTP, Cabinet and Agency Heads), an important function of the NSTC is to mount or coordinate technical initiatives at a lower level. For example, under the auspices of its Subcommittee on Technology, the NSTC has convened a large group of technical officials from various agencies of the government with the mandate of pushing forward a National Nanotechnology Initiative (NNI). While this group thus has a programmatic function, its breadth and flexibility ensure a wide exchange of technical information within the Administration that is extremely valuable.

Office of Management and Budget (OMB) – The OMB, widely considered one of the powerful agencies in Washington, creates a budgetary and policy analysis capability for the President. The staff of OMB thus performs a significant amount of technical analysis and program evaluation. OMB can be caught between the competing demands of serving a President's policy agenda and providing sound technical expertise in analysis. For example, its Office of Information and Regulatory Analysis has become controversial for its critical reviews environmental agencies' analyses justifying new regulations, leading to claims from the Union of Concern Scientists and others that the use of technical expertise is being compromised for political purposes.

Judicial Mechanisms

Based on the English common-law model, the principles that guide decision-making in U.S. courts emphasize "precedent" (i.e. historical continuity, in which current decision follow ancient ones to the extent possible). The educational system that prepares lawyers and judges for their judicial roles emphasizes broad schooling in logic, communication and history without any requirement for technical study. And the use of ordinary citizens, without regard to education, as juries in all kinds of trials is widespread. None of these features is calculated to develop a

judiciary where technical expertise assumes a large role.

Concern over the discordance between long legal tradition and a modern technology-based society has been widespread in the U.S., both inside and outside the judicial system. Particularly during the 1970s, as large numbers of highly technical suits came into the courts (many dealing with environmental and health issues), the call arose for special "science" courts to deal with technical matters. By and large, these proposals have died out, leaving the federal patent court as the only judicial venue where technical expertise is solidly institutionalized.

If judicial institutions have changed little as a result, the judicial sensitivity to technical expertise has enlarged considerably. Judges and litigants now routinely employ the following mechanisms, among others, to introduce technical expertise into judicial proceedings:

Judicial notice – the ability of judges to accept scientific facts and technical data that is well recognized

Expert Witnesses – lawyers and judges are increasingly rely on technically trained experts in complex cases involving science and technology (e.g. medical malpractice). Some experts base their entire professional activity in such testimony. Although judicial doctrine does not allow an expert to "decide," it is widely recognized that technical experts are highly influential

Special Masters – Technically trained "masters" are often used by judges, especially in the Federal court system, to interpret technical data and aid them in their decisions. The use of masters tends to find judicial conservatives and liberals somewhat at odds, as traditionalists generally are less accepting of such non-legal input.

Technical Arbitrators – the push to reduce legal costs, as much as respect for technical expertise, has removed many technical law suits from the courts and put them into the hands of technically trained arbitrators, expert in a particular field. Businesses, in particular, have eagerly embraced arbirtration for its speed and efficiency.

The "State of the Art" doctrine – in law suits focused on behavioral assessment ("tort" cases), the courts have increasingly come to rely on the state of the technical art as a measure of liability. If, for example, a company has failed to install the latest safety devices or failed to utilize state of the art testing, then liability for damage caused to society or individuals is likely to be the legal result. The development of the "state of the art" doctrine shows the judicial system both continuing to rely on ancient notions of what constitutes "fault" and modern measures of appropriate care based on technical expertise.

Administrative Agency Mechanisms

As mentioned previously, the basic rationale for the establishment of administrative agencies is their capability to integrate technical data and expertise into public policy decisions. One could therefore say that the rise and dominance of administrative agencies in the U.S. government alone demonstrates the importance accorded to technical expertise. Beyond this, there are a number of specific mechanisms utilized by administrative agencies to integrate expertise in the policy process, described below.

The Administrative Procedure Act (APA) -- the APA was enacted shortly after World War II as a mechanism to regularize the decision-making of the many administrative agencies that had recently been established. Some of its most important provisions relate to the use of technical expertise. For example, whenever an agency promulgates a "rule," it must justify its actions based on the "best available evidence," compiled and published in an adequate public "record" – an approach which mimics the scientific method. Both to ensure an open decision process and to solicit inputs of technical expertise, the APA mandates public hearings and requires agencies to consider any important data submitted to it. Lastly, the APA allows any party "affected" by government regulations to challenge the regulation in court. Court doctrine has evolved over time into a powerful motivation for searching technical analysis on the part of both the agencies and their challengers.

Agency Staff – the technical quality of the staff of administrative agencies is one of their most important means of integrating technical expertise. Technical expertise is thus a well-recognized determinant of hiring and career paths. Beyond this, there is an ethos in technical agencies that urges professionals to become increasingly expert and go ever deeper into the technical aspects of their work. It is not at all unusual for individuals to work for many years (possibly even an entire career) in a particular program or technical area. Such individuals enjoy respect as repositories of technical expertise and program continuity.

Advisory Boards – the U.S. government probably has thousands of advisory boards at any point in time, most of them in technically oriented agencies. Such groups are covered by the Federal Advisory Committee Act (FACA), which ensures the capability, integrity and independence of members in their deliberations. "Science Advisory Boards" (SAB) are the special type of advisory committee most related to the integration of technical expertise. These are usually filled with eminent scientists from outside the agency, who independently offer advice on important scientific questions. The EPA and the Food and Drug Administration both offer examples of powerful SAB's whose counsel is usually accepted by the agency.

Commissioned Research – Recognition of the limits of their own technical expertise – both staff

capability and time – often compels agencies to commission external research on important technical questions. The National Academies and their National Research Council form one of the prime resources for agencies, as for the Congress. In addition, all agencies employ a large number of consultants – both firms and individuals – to gather technical data, analyze it, and present policy options. It is important to recognize that consultants may not make policy decisions, but their analysis is nevertheless often persuasive.

Interagency Contacts – "Interagency Taskforces" are a staple of U.S. government practice. Although in many instances the purpose of an interagency taskforce is to coordinate programs, they also serve a powerful communication and information dissemination function within the technical community. Sometimes, "initiatives" to support the development of new technology are mounted as interagency groups, as is the case in the National Nanotechnology Initiative, mentioned above.

It should also be emphasized that informal interagency contacts – as well as contacts with technical colleagues outside the government – are an expected aspect of technical professional life in the U.S. The ethos in the technical community is very much one of openness to information exchange, and agency rivalries rarely impede it.

MAJOR PROVIDERS OF TECHNICAL EXPERTISE

The U.S. science and technology policy arena is often spoken of as a "community." This suggests that there exist a large number and range of institutions and individuals that participate in policy-making, going far beyond the confines of formal decision-making in government agencies. The same phrase is used to describe the same phenomenon in other related policy communities – environmental, defense, health, etc. The point to be made is that policy making in the U.S. relies heavily on a broad community as the source of its technical expertise, and that communication inside the community is relatively easy and frank.

Although there are many providers of technical expertise that could be mentioned, the following are certainly some of the major players.

"The National Academy"

From its chartering during the Civil War (1860s) as a source of science advice to the Nation, the National Academy of Sciences (NAS) has developed into a complex that includes a National Academy of Engineering and an Institute of Medicine. Perhaps most importantly for policy purposes, the Academies support a National Research Council (NRC), whose staff, numbering in the hundreds, performs studies on technical policy issues. These may be commissioned by the Congress, particular agencies, or others. A unique advantage of the NRC approach is its ability to enlist the best talent from the technical community as study participants.

Such people serve without pay and in an independent professional capacity.

Independent "Think Tanks

A large community of independent policy research institutes in the U.S. contribute highly proficient and focused technical expertise to virtually every important policy decision. Many of the "think tanks" got their start as government-funded institutions – the Rand Corporation offers one such example. Others, such as the Brookings Institution, are more in the nature of a foundation.

While think tanks are certainly known to lean toward a certain part of the political spectrum – the American Enterprise Institute, for example, is seen as tending toward the right – they nevertheless are independent institutions with a strong ethos of integrity in the technical and policy work they undertake.

"Issue NGOs"

Within the the two decades, non-governmental organizations (NGOs) devoted to particular issues have proliferated in the U.S. – and worldwide. Though such organizations are typically devoted to a particular cause, they are often also important providers of technical information and expertise. One of many examples in this respect is the World Resources Institute, which though clearly an "environmental" organization, also publishes the most important international compendium of technical environmental data, World Resources Report, in combination with the UN and the World Bank.

Universities

It would be hard to overstate the importance of university researchers in the provision of technical expertise to the U.S. public policy process. A few dozen leading universities are categorized as "major research universities," and all directly receive government funds for research and participate in the process by which decisions about science and technology are made. Many such universities have policy research centers or departments that function much like independent think tanks. And individual professors by the thousands serve on advisory boards, conduct policy-relevant research, participate in studies and offer advice in the Congressional process.

Industrial Firms and Associations

The community of technology-oriented firms in the U.S. is also an important provider of technical expertise and perspective in the policy process. As mentioned above, the APA guarantees the openness of agency decision-making to the firms who are affected, a right which they routinely pursue.

Industrial and trade associations are a permanent fixture of Washington, D.C. These groups keep abreast of every important policy issue affecting their members and routinely provide data and make their views know to Congress, the agencies, and the Administration.

Technical Professional Societies

A large number of technical professionals in the U.S. belong to professional societies. The largest of these is the IEEE, which has electrical and electronic engineers as its members. While the basic mission of professional societies is to promote their members' interests, many are committed to the public policy process as well, and see themselves as important providers of technical expertise. Their input may take the form of publications, seminars, studies, and fellowships.

CURRENT POLICY ISSUES IN THE U.S.

The appropriate use of technical expertise in public policy decisions is an issue of perennial concern in the U.S. It recurs constantly in new forms, and can of course never be fully resolved. This said, there are several current issues of debate in the science and technology policy community that deserve particular mention:

Integrity of science advice

This issue, which has been raised to a new level of salience during the Bush Administration, raises the question of whether science advice is being ignored or perverted by current politics. A fuller discussion of the issue is contained in Issue No. 3 of Perspectives on Technology Policy.[2]

"*Good Science"*

This debate, whose terminology was coined by right-wing critics of environmental regulation, revolves around the issue of how scientifically certain policy-makers must be before they take regulatory actions. The advocates of "good science" generally urge waiting and more research; those on the other side generally urge action before risks that are reasonably demonstrated have turned into irreversible harm. The debate about the scientific basis of global warming is the best example of this issue

Advisory mechanisms for science advice

Throughout the last four years of the Bush Administration, there has been concern over the role of the White House science policy apparatus. Part of the concern focuses on the question of scientific integrity, as indicated above. Another aspect is the larger question of whether the scientific community is being adequately represented and heeded in national policy, and whether the advisory mechanisms are appropriately constructed.

Public capabilities for technology policy analysis

With the demise of OTA in 1995, the governmental capability for

[2] Perspectives on Technology Policy, Number 3, September 2004. Prepared by Technology Policy International for NEDO-DC.

technology policy analysis was significantly diminished. There continues to be discussion in Congress and elsewhere of the need for an OTA-like capability to enhance the integration of technical expertise into policy-making. While a plenitude of private organizations do function in this realm, the question is whether the country also needs more public capability

CONTRASTS BETWEEN THE U.S. AND JAPAN

Japan and the U.S. have access to much the same base of technical expertise and information, and their levels of technical attainment are at essential parity. Their policy processes, however, differ radically. Although both countries' respect for and use of technical expertise in the policy process is high, there are a number of sharp contrasts in how, where and to what effect technical expertise is integrated into the policy process. Some of these contrasts are discussed below.

1) Perhaps the most striking contrast between Japan and the U.S. can be found in the legislative branch. Because Japan has a parliamentary system of government, the ministries are headed by members of the majority party in the Diet. They therefore can function as a kind of technical staff to the Diet. This relationship helps explains the almost total absence of technical staff working for Diet members. Because in the U.S. system the Congress is independent, it has been forced to build its own capability for acquiring technical expertise. In this respect it is perhaps unique among world legislative bodies, and it certainly possesses the most extensive technical staff capability.

2) The assumptions built into the civil service system in the U.S. and Japan also condition the mechanisms through which technical expertise is acquired and utilized. U.S. technical civil servants are often specialists, and they typically build their careers by long service that deepens their expertise in a particular policy arena. Japanese civil servants, in contrast, are frequently generalists, often trained in law, who are routinely rotated to different positions every few years. The result is that the U.S. tends to produce technical experts with relatively small exposure to the larger context of their agency, and Japan produces professionals of considerable breadth of experience but not technical depth. A corollary to this situation arises from the contrasting personnel practices in each country: whereas in Japan, agency personnel tend to be extremely well acquainted with virtually all members of their own institution, cross-

ministry connections are relatively weak. In the U.S., technical civil servants can be as committed to their technical field as to their agency, thus making widespread external contacts the norm.

3) For many reasons, the degree of centralization and control differ widely in the U.S. and Japanese government. In the U.S., the many competing viewpoints and centers of power often seem to make it impossible to reach consensus. And issues reopen even after a decision has been taken. In Japan, the search for consensus may often seem elusive and opaque, taking place largely out of the public consciousness. But once a technical consensus is reached, its implementation is usually sure.

4) Science advice at the highest levels of government differs significantly in the U.S. and Japan, though less so today than in the past. The establishment in Japan of a Prime Minster's Council for Science and Technology roughly parallels some of the advisory mechanisms that the U.S. President has long employed. But whereas the U.S. system has always struggled with the issues of coordination and evaluation of technical programs, the Japanese policy apparatus is now attempting to apply technical expertise increasingly to this issue.

5) The degree of interest in and integration into the network of international science and technology policy is significantly greater in Japan than the U.S.

6) The degree of open debate about science and technology policy issues is much greater and more intense in the U.S. than in Japan, at least at the level of national policy-making.

7) The question of "independence" of technical expertise plays out differently in the two countries. In Japan, expertise is often seen as something to be acquired by an institution, and it is therefore natural that the institution should control its use. In the U.S., expertise often is seen as an matter of individual professional capability, whose control should be exercised only by the individual who possesses the capability. The "independent" centers of technical expertise so characteristic of the U.S. situation – universities, the National Academies, think tanks, NGOs – do not have close counterparts in Japan.