RAND, IIASA, and the Conduct of Systems Analysis

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Section 1

Introduction

During the fifty years from the beginning of World War II to the end of the Cold War, the two previously unrelated fields of science and government operations and policy were forced together in a series of ever more intimate liaisons. What began as convenient cohabitation under the pressure of global combat – analysis of military operations – eventually matured to a somewhat rocky marriage of common interests –analysis of national and international policy issues.

I have been privileged to participate in research and management positions over 25 of those years at two of the principal organizations at which the relationship developed – The RAND Corporation in Santa Monica, California and Washington, DC and the International Institute for Applied Systems Analysis (IIASA) in Laxenburg, Austria. In this paper, I shall describe from that inside perspective the evolution of systems (and policy) analysis at these two research organizations and, in particular, indicate what I perceived to be the lessons of RAND's success and how they were used to help to shape the organization and operations of IIASA.

Before turning specifically to RAND and IIASA, I will describe the most general features of the evolution of the relationship between science and government operations and policy as represented by the development of operations analysis, systems analysis, and policy analysis, and -- through cooperation among nations -- of international systems and policy analysis. My intent is not to be comprehensive, but rather to provide the context within which RAND and IIASA developed and to which they significantly contributed.

After that background, I shall describe the development of RAND and the lessons of its experience during its first 25 years (1948-73). Then, turning to IIASA, I shall cover its development, the application of RAND's lessons to IIASA, and the new lessons that were learned in meeting the unique conditions of the Institute's international context.

Section 2

Operations, Systems, and Policy Analysis

Their Evolution and Applications

Operations Analysis : 1940s and WWII

Operations Analysis (or Operations Research, as it is now more commonly called in the United States) arose out of necessity and opportunity during World War II. The necessity was the need to design effective operational procedures for the use of the new technologies of detection and destruction that rapidly entered the military throughout the war, without the time for conventional testing and field exercises. The opportunity was the availability to the military of scientists who could apply their analytical skills and tools to the rapid and efficient design and testing of operational procedures. The scientists came from a number of disciplines: physics, engineering, mathematics and statistics, even biology. What they brought to the problems of operations analysis (and design) were both the general analytical and experimental approaches of the physical and biological sciences and the specific tools of mathematics, experimental design, and statistics that enabled them to find best or even optimal procedures without the necessity for costly and time consuming field exercises.

They achieved significant successes, recognized by the military, in designing the practices for operating the new radar detection and defense systems during the Battle of Britain and in designing the antisubmarine search procedures used during the Battle of the Atlantic. These successes were followed by many other similarly effective applications to both combat and support operations.

For the most part, the operations analysts had to take the properties of the military systems they were working with as fixed. Their focus was on how best to operate that system -- whether a radar or sonar system, an aircraft, or a ship – to achieve the best military effect.

Systems Analysis: 1950s and the Cold War

The success of scientists and engineers in improving military operations (and in the design of new classes of weapons) during World War II led military leaders to seek new ways to have continued access to scientific and technological contributions during the Post-War era. As a result, a number of new institutions were established that enabled the military to employ or

contract with teams of scientists and engineers to assist in the design and implementation of new weapons systems.

Operations research became a permanent part of all the services and, as many of its practitioners returned to civilian life, found application to business and civilian government operations.

In peacetime, however, new opportunities arose for the application of scientific and technological talents to the improvement of military systems. For whereas during wartime, the analysts had to take most of the system – particularly its hardware – as fixed; in the postwar era, some were given the opportunity to apply their analytical tools to the specification of the system itself. For example, they were able to participate in the specification of the desirable performance for satellite reconnaissance systems, bomber basing systems, ballistic missile weapon and silo systems, air defense systems, and many others. As their responsibilities broadened, new disciplines had to be engaged, particularly the economic and political sciences and the behavioral and social sciences. For now an appreciation of the likely capabilities and responses of potential enemies and allies had to be incorporated in the design of offensive and defensive systems, as did an understanding of the capabilities of our own forces in their deployment and operation.

The new field that developed from these activities was named "Systems Analysis" because it extended the scope of analytical attention from the operations of fixed systems to the specification of the systems themselves. What remained "fixed" for the most part to systems analysts were the governmental policies that the systems supported. (The phrase "for the most part" is significant here, for while system analysts took the government's Containment Policy against the Soviet Union as given, their analyses played a critical role in designing the policies that supported it – deterrence through a survivable second strike capacity – and in designing arms control policies.)

Policy Analysis: 1960s and The Great Society

The perceived success of national defense systems analysis during the 1950s and 1960s led to a large number of efforts to apply it to civilian systems, especially in the United States. Two elements of the practice that had developed in applications to military systems were prominent in those efforts: the "Systems Approach," which was interpreted as the desire to incorporate in the design of a civilian project all those interrelated elements that affected its performance; and the use of analytical tools and mathematical models to evaluate the performance of a civilian system before its deployment.

Many of the initial efforts failed. The reasons were numerous, among them:

1. the performance of many critical civilian systems is more highly dependent on the uncontrollable behavior of human and social subsystems than are military systems;

2. the state of social and behavioral science was not adequate to support an analytical design approach;

3. the models developed were too highly dependent upon unverifiable assumptions; and

4. Experience in military systems did not equip systems analysts to deal realistically with civilian systems.

Perhaps the most important reason was that while there was a national policy consensus on the goals of the military and, for the most part, on the objectives of its systems. No such policy consensus was available for most civilian systems. Indeed, the desirability of and appropriate performance of civilian systems – whether for public safety, health care, education, transportation, or housing – are the very stuff of political dispute. Consequently, systems analyses often became weapons or victims of those disputes.

To bring a more realistic sense of the context and content of these analytical tools to their use in civilian setting, scientists and practitioners from the subject domains were recruited. Thus, lawyers, health practitioners and public health specialists, educational researchers, sociologists, political scientists, and other social scientists who had engaged with policy problems more pragmatically joined with systems specialists. The resultant set of approaches and interests began to be called "Policy Analysis," emphasizing its concern with the full range of policy choices – not simply physical system design – relevant to the design or improvement of a civilian system. The design of public policies became the focus of analytical attention, in conjunction with systems and operational design where relevant.

New tools, drawn from economics and social science in particular, were added to the repertoire of the policy analyst. Regression analysis of multivariable data sets, design of experiments, and survey research became the basic tools in the policy analyst's kit.

These tools were applied to policies in health care – the design and experimental testing of health insurance systems; housing – analysis of rent control and the design of a housing allowance system; education – design and experimental testing of voucher systems. They also provided the methods required for more sophisticated design of public systems for transportation, water supply, and communications. Operations analysis tools were extensively deployed to improve the operational design of public systems for emergency service – police, fire, and ambulance – and sanitation.

Policy analysts could and did address policies that systems and operations analysts would take as fixed. But their domain was restricted to the general political, social and cultural assumptions of a single nation. In the United States, for example, they could take the commitment to democracy and a market economy as given.

International Systems (and Policy) Analysis: 1970s and Détente

Operations research had spread worldwide during the postwar years, gaining adoption in the military and business sectors of most developed nations, but nowhere else as broadly and successfully as in the United States. As the digital computer found wider use in defense and commerce, the methods of operations research became more mathematical and computational, leading to the development of large computer models for the simulation and, in many cases, solution of complex operational problems in military and business operations. Because of its wide lead in the adoption of the computer, the United States led in this arena as well. Furthermore, in the Sixties, the McNamara years in the Defense Department were characterized – initially to great public acclaim – by the widespread adoption of quantitative analysis of national security problems throughout the Pentagon under the heading of "Systems Analysis." The apparent success of these analytical tools of management in relatively well-specified and quantifiable areas caught the attention of modernizing government officials in many nations, leading them to believe that these "scientific" tools could be used to solve complex governmental problems.

In addition to the attempts to apply the "systems approach" to civilian problems noted above, this belief gave rise in the late Sixties to efforts to apply these tools to problems of international scope. These efforts took a number of forms. The best publicized was the

series of studies of the global future based on "Global Models" initiated by the international Club of Rome, but pursued as well by organizations in the United States, Germany, Japan, and Argentina. Another result of this belief was the proposal and eventual establishment of an international institute -- the International Institute for Applied Systems Analysis (IIASA) -- intended to apply the methods of systems analysis to "common problems of the developed nations." The initial impetus for the creation of IIASA was the desire to build a bridge over the Cold War divide between East and West. It was hoped that the quantitative and "objective" methods of systems and policy analysis would enable scientists from both ideological camps to work together to solve public policy problems that they had in common.

Although there have been specific systems or policy analyses sponsored or conducted by various intergovernmental or non-governmental international bodies, only at IIASA did there develop the range of activities and continuity of effort required to establish a style of "International Policy and Systems Analysis." To some extent the practices of policy and systems analysis as they had developed in the United States (especially) were transferred to IIASA. However, to the interdisciplinary nature of the teams required to carry out those analyses, IIASA added a requirement for internationality. Each analytical team represented not only the mixture of disciplines required to deal with the system or policy, but also scientists from an appropriate sample of the sponsoring nations. Although social scientists were prominent in their participation and leadership in policy and systems analyses in the United States, they were less well represented -- except for economists and demographers-- in the international studies at IIASA. For, whereas in any single nation, analysts could assume a national consensus on the political and economic system, at IIASA – which members from both sides of the East-West divide sponsored – no such consensus cut across its participants. Nor were the standards of social science the same on both sides of that divide. However, ecologists and environmental scientists assumed a prominent role in many IIASA studies.

In the post-Cold War era, IIASA's role has changed and it has shifted its focus to the overall question of global change. According to its Agenda for the Third Decade:

> *IIASA's primary goal will be to develop the means to assess the interactions between human development and the environment. ... Strategies to mitigate or adapt to global environmental change must be formulated at both global and regional levels. ... Global change includes both economic and environmental change. ... The formerly centrally planned economies have begun complex transitions to political pluralism, market economies, and participation in the global trading system. ... Analysts at IIASA will focus on several critical issues facing these countries. (Agenda for the Third Decade, pp. 5,7,8,9)*

The Future

As mankind prepares to enter the Twenty-first century AD, the once youthful activities of operations, systems, and policy analysis have matured. Although each has had substantial successes, they have also encountered the limits of their applicability, and the ambition and promise of their early years has moderated to a more realistic appreciation of the role that they can play in the complex human and social interplay of forces that shape public policy decisions. The best way to insure that they achieve their full potential is to apply the same critical analysis to their own institutions and practices as analysts apply to government. In the remainder of this paper, I shall try to draw the lessons from RAND and IIASA's experiences that bear on the design of future independent analysis organizations.

Section 3

The RAND Corporation

Its Founding and Early Years

The Beginning: Project RAND at Douglas Aircraft, 1946

As World War II drew to a close, a group of scientists and engineers who had played advisory roles to the military, as well as senior military leaders who had gained respect for their contributions to the understanding and improvement of military operations, sought a way to maintain the relationship during peacetime. Both the civilian and the military participants agreed that in order to obtain the maximum benefit for the military (and the nation), the civilian scientists had to be outside the military and to be as free as possible from the normal procurement practices. As one of the civilians characterized their view:

> *"I believe we set a precedent in recognizing that we cannot do intelligent, long-range, strategic planning without taking into consideration our scientific and technological resources and their future development, nor can we give proper direction to research and technological development without its leadership having some concept of our strategic plans." (Dr. Edward L. Bowles in 1946 letter to General H. H. Arnold. Quoted in Scott, 1966.)*

A direct result of their deliberations was the establishment of Project RAND[1] in March 1946 under the sponsorship of Gen. H. H. "Hap" Arnold, Chief of the Army Air Force. To keep it away from the traditional procurement bureaucracies, he also established a special high-level office – Deputy Chief of Air Staff for Research and Development, whose first incumbent, General Curtis LeMay used his authority to insure that the Project had and maintained its independence. Under LeMay's guidance, Project RAND received a "broad and permissive" (Scott, 1966) statement of work to conduct a program of research on "intercontinental warfare, other than surface, with the object of advising the Army Air Forces on devices and techniques."

Perhaps the most fore-sighted, unusual, and valuable element of Project RAND's establishment was General Arnold's allocation to it of $10 million left over from his research budget as a result of the War's conclusion in 1945. These funds were to be expended over several years and had no specific objectives beyond the general statement of work. These

[1] RAND was intended as an acronym for "research and development," although in later years it was waggishly, and more accurately, interpreted as "research and no development."

conditions of "endowed independence" enabled Project RAND to experiment widely in its early years without suffering unduly for its failures.

A number of the civilians who participated in the discussions leading to Project RAND were engineers and executives of the Douglas Aircraft Company. With their enthusiastic support, the Project was housed administratively and physically within Douglas' headquarters in Santa Monica, California. Not incidentally, the location 3000 miles from the Pentagon -- before the era of the jet airliner, fax, and e-mail – was another means of assuring Project RAND's ability to think broadly without being drawn in to the short term and often narrow day-to-day interests of its client organization.

The initial study undertaken by the fledgling organization demonstrated its ability to think beyond the narrow and short term, although it was done at the request of the Air Force. It was documented in Project RAND's first report in May 1946, "Preliminary Design of an Experimental World-Circling Spaceship." Although this was primarily a hardware report, containing little of the political-strategic analysis or even economic-cost considerations that would typify later RAND studies, it did contain the following sentences, whose prescience was demonstrated upon the launch of Sputnik eleven years later:

> *"The achievement of the satellite craft by the United States would inflame the imagination of mankind, and would probably produce repercussions in the world comparable to the explosion of the Atomic Bomb. ... To visualize the impact on the world, one can imagine the consternation and admiration that would be felt here if the U.S. were to discover suddenly that some other nation had already put up a successful satellite." (Quoted by R. Cargill Hall,* Congressional Record, *vol. 109, October 7, 1963, A6279.)*

It was not long before the leadership of Project RAND, of Douglas Aircraft, and of the Air Force came to the realization that the location of an objective long-term research organization privy to Air Force plans within one of the airplane companies competing for Air Force contracts was not a good idea. In addition to the appearance of possible conflict of interest, the management style and culture of engineering organizations is in sharp contrast to the more academic style that RAND required to attract and retain first class research staff.

The RAND Corporation, not-for-profit, 1948

The resolution of the problem was to establish in March 1948 a separate not-for-profit corporation, The RAND Corporation, chartered "to further and promote scientific, educational, and charitable purposes, all for the public welfare and security of the United States of America." In November of that year, the Air Force transferred its contract from Douglas to the new organization, which had moved to another site in Santa Monica.

Frank Collbohm, a Douglas executive who had been named Director of Project RAND after a number of notable outside scientists had declined the position, was appointed President of The RAND Corporation.

An important Air Force policy statement was issued during the transition from Douglas to independent not-for-profit research organization. It provided the basic framework within which RAND-Air Force relations developed. It asserted that:

> "RAND is a background research organization – not a development project."
>
> "Project RAND will continue to have maximum freedom for planning its work schedules and research program."

RAND benefited from that policy and used it to maintain its independence. In particular, it retained the freedom to initiate its own studies and to make its own problem identification. It also held onto the right to refuse to do studies that it did not feel equipped to perform or that would be inconsistent with its mission. By establishing these principles early and vigorously defending them, it built strong momentum that deflected the inevitable efforts to curtail its independence. (Scott, 1966, p.79)

With its new independence, RAND entered a period of high creativity and productivity. Social scientists were added to the original staff of physical scientists, engineers, and mathematicians. The first systems analyses were carried out on the next generation bomber aircraft[2] and on the design of an air defense system for the continental United States. In addition to those studies, targeted specifically at the requirements of the Air Force, there were research activities that made major contributions to a wide range of disciplines.

In 1967, Frank Collbohm retired as President of RAND and was succeeded by Harry Rowen. One of Rowen's first initiatives was to seek to diversify RAND's clients both within the defense community and into the civilian agencies of government. The result of his initiatives was a rapid growth in domestic business, including the establishment of a New York City RAND Institute that worked for the administration of Mayor John Lindsay.

It would go beyond the purpose of this paper to describe the full range of RAND's accomplishments through the 70s. However, a simple listing will give a sense of the diverse contributions that RAND made both to the scientific world and to its clients.

Disciplinary Successes

Among the fields to which RAND scientists contributed in a substantial way during its first 25 years are the following:

1. Mathematics: Non-linear and dynamic programming, game theory, network theory
2. Economics: program budgeting, design of social experiments, research and development management
3. Computer Science: artificial intelligence, user interface design, survivable networks, computer graphics
4. Social Studies and International Studies: Soviet and Chinese studies, deterrence, arms control
5. Management and System Sciences: cost analysis for public programs, public systems analysis, design of logistics systems
6. Engineering: remotely piloted vehicles, spacecraft and shuttle design

System / Policy Analyses

Among the subjects on which RAND performed successful systems or policy analyses during its first years were the following:

[2] Ed Paxson, who carried out this study, coined the term "systems analysis" in that context. (Digby, 1988)

1. National Security

   - Design for an earth-circling spacecraft (1946)
   - Deterrence and its refinements (early 1950s onward)
   - Nuclear weapons security and design of weapons and warheads.
   - Role of remotely piloted vehicles in combat.
   - Air defense system design and implementation.

2. Domestic Research

   - Housing studies: abandonment and rent control in New York City, housing allowance experiment
   - Health care studies: hospital effectiveness, health insurance experiments
   - Education: educational use of the computer, design of the National Institute of Education
   - New York City: police, fire, ambulance, and housing studies

Personal Note

My beliefs about RAND were developed during an 18-year association, from 1956 to 1974. In the summer of 1956, I was selected to initiate a new summer program for graduate students at RAND. After returning in a similar capacity in 1957 and 1958, I was appointed a full time member of the research staff in October 1960. After participating for several years in National Security studies, I initiated work in computer science, designing and implementing the Relational Data File, an early relational data base system. In 1967, the new president, Harry Rowen, named me head of a new department, System Sciences, which had as its responsibility the development of systems analysts and the recruitment of the professional specialists in fields such as medicine and law who would be needed as RAND expanded into the domestic arena. During that time, I oversaw a wide range of studies in the domestic arena and personally undertook a number of studies that concerned education. I was appointed, additionally, to co-leadership of the Education Program. After moving back to Washington to participate actively in design of the National Institute of Education, I was given responsibility for the Washington Office Domestic Program. I also became Deputy Vice President of Domestic Programs for RAND.

In 1974 I left RAND on a one-year sabbatical to IIASA; it extended to a seven-year leave of absence. When I left for IIASA, I took with me my understanding of the lessons of RAND's first 25 years and attempted to adapt them to that new international Institute[3]*. What were those lessons?*

[3] I had documented my understanding of those lessons in a RAND Corporation paper published in 1969. (Levien,1969)

RAND's Success

From the late 40s through the early 60s, a number of institutions in addition to RAND were established by agencies of the military to provide operational and systems analysis support. Among them were the Operations Research Office and, later, the Research Analysis Corporation that were set up by the Army; the Center for Naval Analysis established by the Navy; the Weapon Systems Evaluation Group and the Institute for Defense Analysis created to serve the Office of the Secretary of Defense; and ANSER, formed by the Air Force to provide the short term support that RAND could not. Although most of these organizations served their sponsors effectively, none achieved the prominence or widespread success that RAND did. Why? What factors in RAND's design and operations accounted for its accomplishments?

Recognition of Requirements for First Class Systems Analysis

The leadership of RAND recognized that first-class systems analysis in support of government required four conditions:

1. ***Interdisciplinary teams comprising excellent disciplinary specialists participating under the integrative leadership of a talented leader.*** Three points are significant about this condition. *Interdisciplinary teams* are required by realistic systems and policy problems because of all the factors – physical, organizational, and human – that influence their design and performance. Those teams must comprise *first-rate disciplinary specialists* because they often confront issues that lie on the frontier of single disciplines or at the intersection of several. *Talented integrative leadership* is essential to both formulate and manage the analysis and to interrelate effectively with each of the disciplinary specialists. Individuals with such skills are extremely rare; RAND attracted or developed many, although never enough of them.

2. ***A broad scope of work to enable the analysis to follow the problem where it lead.*** It was commonplace at RAND for a problem as perceived by the client to turn out to be the result of an entirely separate issue. Often the major success of a RAND study was identification of the nature of the true problem. The terms of the Project RAND contract with the Air Force enabled this kind of redefinition. In later years, when RAND was forced to compete for work in response to client-defined problem statements, it found its ability to identify the real problem severely restricted. I believe that the creativity characteristic of RAND's early successes was reduced as a consequence.

3. ***Sufficient continuity of the relationship with the government client to permit the analysts to develop deep understanding of the client's organization and responsibilities and for mutual trust to develop.*** The RAND - Air Force relationship, though occasionally strained, functioned extremely well by enabling RAND analysts over time to develop a deep knowledge of Air Force operations, often better than that possessed by the Air Force incumbent who had recently been rotated into his position. Reciprocally, through the discretion of its activities and the value it delivered, RAND built a strong relationship of mutual trust with the Air Force.

4. ***Enough independence from the client agency to be able to avoid succumbing to pressure to produce the answers desired by one or another faction within the client organization.*** Because of the terms of its establishment and the tradition that they established, RAND was able to protect its independence. However, challenges always arose and it was a primary responsibility of the President, Frank Collbohm,

to patrol RAND's independence boundaries and assure that they were never breached. It was a responsibility that he took extremely seriously and at which he rarely failed.

In contrast, none of the other institutions were able to achieve these four conditions. Most organized and conducted their studies according to problem or functional structures and with specialized teams lacking broad interdisciplinary representation. None of them was able to attract the large number of highly qualified disciplinary specialists with strong links to excellent university departments that characterized RAND. All were highly dependent upon one, controlling client, and they often had narrow, short-term oriented scopes of work.

Part of the reason that RAND was able to succeed lay in the nature of its charter, statement of work, funding arrangements, and initial relationship with its client. Another portion might be ascribed to good fortune in the talents and character of its leadership and professional staff. But a significant part was due to the way that RAND was organized and managed so as to enable high quality systems and policy analysis to be carried out.

Balancing Academic Research and Systems Analysis

RAND's "secret" to achieving high quality interdisciplinary systems analysis lay in the way in which its organization and management balanced disciplinary excellence with systems analysis through a matrix organization in which one dimension was disciplinary departments and the other, problem-focused programs.

In the early years, departments were the only organizational unit, with problem-oriented research teams established on an ad hoc basis, drawing their members from several departments. In the late Sixties, the matrix was formalized by establishing a program structure. The programs became an especially important means for obtaining and managing grants and contracts as RAND took on a wider range of clients.

Disciplinary Departments

The departments were for the most part defined by discipline – economics, physics, engineering, computer science, mathematics, and social sciences; although there were some exceptions – logistics, cost analysis, and systems operations during the early sixties. By good fortune, and design, most of the disciplinary departments established close relationships with the leading university departments in the corresponding discipline.

One means that was very effectively used was to establish consulting relationships with leading academics, who would spend the summer months at RAND. In the Sixties, RAND's roster of consultants numbered over 500; among them Henry Kissinger, Kenneth Arrow, and Herbert Simon. Another mechanism was RAND's policy of encouraging publication of its work in respected peer-reviewed academic journals and books. Often, a young academic could publish more as a result of a stay at RAND than would have been possible at a university with its teaching and committee obligations.

As a result, RAND was recognized as an academically respectable place for a talented young researcher to go after obtaining his or her Ph.D. from a leading university. They retained the ability to return to academia from RAND, often with benefit to their careers. Consequently, RAND was able to attract the first-class disciplinary talent that is a critical element of leading edge interdisciplinary research.

Problem-oriented Projects and Programs

The projects were defined by specific topics of concern to the Air Force or, more generally, the national security of the United States, such as bomber basing, next generation aircraft

requirements, or air defense system design. Programs were clusters of projects addressing an area of concern, such as strategic or tactical systems, logistics, weapon systems research and development, or command and control systems. The most effective programs were those that established a deep understanding of an area of Air Force interest and were able to anticipate future issues before they became an operational concern.

Generally, the effective programs were linked closely to real problems in association with the responsible organizations and the decision-makers who faced them. That often entailed considerable travel and time in the field for the analysts. Through that close association the program teams developed a realistic understanding of what recommendations would be implementable with beneficial effect in the client organization.

If the departments had their constituencies in the disciplines, whose standards of academic rigor were naturally applied within RAND to any work in which the department's members participated; the projects and programs had their constituencies in the client agencies, whose standards of practical benefit and implementability were directly applied to the results of the project and program work.

RAND's management's skill lay in balancing the demands of those two constituencies so as to achieve work that met the different, and important, standards of each.

Incentive Systems and Quality Control

To achieve that balance required the implementation of a set of standards and rewards – an incentive system – different from both the purely academic and the purely bureaucratic.

One element was RAND's essential job security, not tenure achieved through publications, but rather an implicit continuity based on continued good performance in any of the various activities that RAND required – disciplinary excellence, analytical excellence, project leadership, other forms of management, client relationship management, and so on. No one, even those from academic backgrounds, felt pressure at RAND to publish. Good performance in the task at hand was, however, critical.

It was possible for a first class disciplinary specialist to establish a career distinct in its path and stages from the traditional academic path, but to retain linkages so that at some future time transition to a tenured academic position could occur easily. Similarly, many of the problem-oriented specialists established careers distinct from those of the traditional governmental employee, but through their demonstrated expertise were appointed to high governmental positions. A significant number of RAND alumni assumed high level positions in federal agencies, among them Charles Hitch and, Alain Enthoven, who brought program budgeting and systems analysis to McNamara'a Pentagon, and James Schlesinger and Fred Ikle, who occupied high positions during Nixon's presidency.

Operationally, RAND instituted and implemented a system of rigorous internal and external reviews prior to the communication of any of its results. Even in areas of national security, where public peer review was not possible, RAND insisted on tough critiques by internal experts and consultants with appropriate clearance.

Criticality of President's Vision

Perhaps most important to the initial and continuing success of RAND was the clear vision of its President, Frank Collbohm. His sense of what was right or wrong for RAND was precise, enabling him to serve as the "inertial guidance" for the organization, keeping it focused on the tasks for which it was created, protecting its independence and high standards, and deflecting efforts to take it into areas for which it was not suited. He took as his responsibility maintaining the support and respect of its clients. But he appeared to place an

even greater priority on providing the context for the conduct of excellent work by the staff. Though many staff members achieved national and international prominence for the work they did at RAND, Collbohm left the limelight to them. The world came to associate RAND with Herman Kahn, Albert Wohlstetter, Charles Hitch, Alain Enthoven, or George Dantzig; but few outside of RAND and its clients knew the name of its founding president.

Section 4

The International Institute for Applied Systems Analysis (IIASA)

The Founding and Early Years

In December 1966, then-President Lyndon Johnson proposed the establishment of an international center to work on the common problems of the industrialized nations and to serve, thereby, as a "bridge between East and West." He asked his former National Security Advisor, McGeorge Bundy, who had become President of the Ford Foundation, to explore the interest of other nations in joining in this venture.

In the spring of 1967, Bundy traveled to Moscow, where he met with Jermen Gvishiani, Deputy Chairman of the State Committee on Science and Technology of the USSR Council of Ministers. The reaction of the Soviet Union was positive, and Gvishiani joined Bundy in the negotiations that then began.

The path was neither direct nor easy, however, and 51/2 years elapsed before the successful conclusion of the discussions. During that period the participation expanded to include Sir Solly Zuckerman of the Cabinet Office, UK, who became convener of the meetings; Philip Handler, President of the National Academy of Sciences, USA, who took over the negotiations from Bundy in 1969; Aurelio Pecci of Italy, who helped to move the negotiations along at several key points; and Pierre Aigrain of the General Delegation for Scientific and Technical Research, France. (Zuckerman, a primatologist, had played a significant role in operations analysis in Britain during World War II.)

By the time of the Charter signing at the Royal Society in London on October 4, 1972, leading scientific organizations from 12 nations[4], including the Academies of Sciences of the USA and USSR, had committed themselves to the establishment and support of IIASA. They summed up their reasons for the Institute's creation in the Preamble to the Charter:

[4] They were: the United States, the Soviet Union, the United Kingdom, France, Italy, the Federal Republic of Germany, Japan, Canada, the German Democratic Republic, Poland, Czechoslovakia, and Bulgaria.

> *Convinced that science and technology, if wisely directed, can benefit all mankind. Believing that international cooperation between national institutions promotes cooperation between nations and so the economic and social progress of peoples …*

The negotiators reached four agreements that provided a solid basis for the Institute's development during its early years:

Nongovernmental Status. Perhaps the most important agreement was the Charter provision that IIASA, although international, would be nongovernmental. This means that its members are representative scientific institutions from each nation and not the governments themselves. By this means, the Institute has been insulated from the undesirable intrusion of international political differences: *being nongovernmental, it could be nonpolitical.*

Applied Systems Analysis: By selecting "applied systems analysis" for the Institute's name, the founders had in mind that the Institute would apply to societal problems of international concern the concepts, theories, and methods of management that had been developing at the frontier between science and policy under the names of operations, systems, and policy analysis. *However, the name was sufficiently general and ambiguous to leave the Institute considerable flexibility in its choice of problems and analytical approaches.*

Austrian Location: The founders accepted the generous offer of the Austrian government to locate the Institute at Schloss Laxenburg, the former Hapsburg hunting palace 16 kilometers south of Vienna. Austria's and Vienna's situation on the very border between East and West and close to the geographic center of gravity of IIASA's adhering organizations made it an especially appropriate location**.**

Financial Arrangements: Several features of the financial arrangements were noteworthy. First, the scientific bodies from the United States and the Soviet Union, which had taken the lead in the Institute's establishment, would pay the largest amounts, *and these would be equal*. (In no other international organization did the US and USSR make equal contributions.) Second, each of the other scientific bodies would contribute smaller, but also equal amounts – 15% of the contributions of the US and USSR. Third, at a time when Eastern European currencies were not freely traded, all contributions would be in *freely exchangeable currencies*. They also established the principle of equity among IIASA's members in that all of them (except the two largest) made the same contribution, regardless of their wealth, and could expect, therefore, to participate equally in the Institute's activities. Finally, the founders adopted a financial appendix that fixed the level of contributions for the first three years and specified the maximum rate at which they could increase in the following three years. This agreement enabled the Institute – like The RAND Corporation – to operate with reasonably secure funding in its early, developmental years.

Howard Raiffa, a professor at the Harvard Business School, who had been an advisor to Philip Handler during the negotiations, was appointed the first Director of IIASA, and set about establishing its operations during 1973. Through a series of planning conferences and travels to the member organizations, Raiffa was able to develop an initial research program and recruit an international staff of researchers and research managers. Raiffa's professional prestige, as a distinguished statistician and decision theorist, combined with his personal charm and the attraction of participation in building a new international research organization enabled him to attract a first rate staff (including a future Nobel laureate.)

Raiffa's initial idea was to include in the research program only those topics that gained the support of all the member organizations. One round of travels, however, convinced him that the result of that policy would be "the empty set." There was no single topic that every sponsor thought was appropriate for the Institute. Consequently, he adopted a "portfolio" approach, whose intent was to include a sufficient range of topics that every sponsor would find enough to justify support of the Institute, even though they might not support every topic. The result was a program that included studies of energy, ecology, water resources, technology, regional development, and methodology.

Personal Note

Early in 1967, McGeorge Bundy had sent one of his associates to The RAND Corporation to gather ideas for the then-proposed International Center for the Systematic Analysis of the Common Problems of Advanced Societies. After participating in the meetings, I had co-authored with Sidney Winter, a draft proposal for such an Institute based on RAND's experience and the ideas developed during the discussions. (Levien and Winter, 1967) That draft document was used in the early stages of the five-year negotiations. As a result, I maintained an interest in their progress and met several times with Raiffa when he visited RAND in the course of the negotiations.

In 1974, Raiffa invited me to come to the Institute on a sabbatical from RAND to initiate a project to create a Handbook of Applied Systems Analysis, which was of particular interest to several of the member countries where practical experience with operations and systems analysis was small or nonexistent. I arrived in August of 1974, a year after the Institute began active research.

Because Raiffa had taken on the Directorship during a two-year sabbatical from Harvard, he had to return to Harvard in time for the 1975 academic year. He proposed to the Council that I be named the next director and I was selected. I served two three-year terms, from the fall of 1975 through November 1981.

Although I have remained actively engaged with IIASA through the US Committee for the Institute, I shall report here only on the period during which I was its director, for the influence of my RAND background and my learning about what was required for IIASA to succeed was greatest during that period.

RAND Experience Applied to IIASA

Howard Raiffa had established a project structure for IIASA, forming more than ten distinct projects, each staffed by teams of specialists who for one reason or another were available to come to IIASA on relatively short notice during the first year. In this he was responding to the practical imperative of getting the Institute off to a quick start and to the early achievement of some significant result. Despite the short notice, he was able to attract some first rate Western scientists – the mathematician George Dantzig, the future Nobel laureate in economics Tjalling Koopmans, the Canadian ecologist C. S. Holling, and the West German nuclear engineer Wolf Haefele among them. In some cases, researchers who had worked together came as a group. In others, specialists in a common subject area arrived from different countries and were clustered together in a project.

Inevitably, there was a wide range of talent and experience among the initial recruits. Those from the East had often been chosen more on the basis of their political reliability and personal contacts than because of their professional capabilities. Those from the West were often better scientists, but not many of them had had experience with systems or policy

research, had worked on or led interdisciplinary teams, or had participated in international studies.

I saw my task as taking the successful rapid start that Raiffa had given the Institute and building under it the solid foundation on which it could grow and prosper. In doing so, I naturally drew upon what I believed were the lessons of the twenty plus years of RAND's experience, recognizing that IIASA's situation was in many key respects different from RAND's. Not least, despite the obvious intent of its founders, the scientific organizations that were given the responsibility for its formal management were often more interested in the purely scientific nature of the research than in its relevance to international public policy issues. This led to tension over the criteria of "excellence" in identifying first-class researchers for the Institute and, eventually, in assessment of the quality of its results.

Matrix Structure

I had no doubt that the goal of IIASA was to accomplish on an international scale the kind of excellent systems and policy analysis that RAND had performed in the United States. To do so, I strongly believed that it had to achieve the same kind of balance between disciplinary excellence and policy effectiveness that characterized RAND at its best. Thus, I set out to emulate the matrix structure of RAND with disciplinary and program dimensions.

Discipline-oriented Research Areas

However, while RAND had a professional staff of over 500, IIASA's scientific staff never exceeded about 100 during my tenure. Nevertheless, it included a wide range of disciplines: engineers, physicists, ecologists, water resource specialists, demographers, economists, computer scientists, operations researchers, physicians, regional planners, among them. Had I instituted a traditional academic disciplinary organization, the result would have been a large number of departments with a small number of researchers in each. So, in their stead, I established four *Research Areas,* each of which encompassed a group of related disciplines:

1. ***Resources and Environment***, which housed the ecologists, environmental scientists, and water resource specialists.

2. ***Human Settlements and Services***, which comprised demographers, regional planners, and health care specialists.

3. ***Management and Technology***, which included some engineers, physicists, management researchers, and science policy specialists.

4. ***System and Decision Sciences***, which contained both computer scientists and the methodologists from mathematics, operations research, and economics.

Each of these Research Areas managed a small number of applied research projects staffed primarily with its own members, although a good number engaged staff from other areas part time. These projects were easier to design and staff because they were close to the topics that the researchers had dealt with at their home institutions, which were generally neither interdisciplinary, nor very applied. The challenge to their leaders was to integrate the staff who came from different nations with somewhat different research styles and to identify and succeed in analyzing a sufficiently interesting practical problem[5].

[5] It turned out that, for the most part, it was easier for an American engineer and a Russian engineer to understand each other than for an American engineer and an American economist to communicate.

Policy-oriented Research Programs

To accomplish the more difficult and potentially more significant systems and policy studies, I established cross-cutting *Research Programs*. The Energy project that had been initiated under Raiffa's directorship became the first Program. Its leader, Wolf Haefele, had lead West Germany's breeder reactor program. He was thoroughly familiar with nuclear energy and had substantial research leadership experience. Furthermore, he had a deep interest in a problem of profound global importance: *How would the energy needs of a growing global population that was also progressing economically be met over the next half century?* Fifty years was the relevant time frame for such a study because of the long time constant of change in the global energy supply and distribution infrastructure. My intent was that Haefele would have a small core staff, but that most of the Energy Program's staff would be drawn – as they were at RAND – from the Research Areas. Although a certain amount of that happened, Haefele's management style required complete commitment from his core team, which grew to be substantially larger than had been intended. Furthermore, his team though interdisciplinary, did not always comprise disciplinary specialists who met the standards of the Research Areas. The work that resulted, *Energy in a Finite World*, was a substantial intellectual and managerial accomplishment, which received a mixed reception despite its having been subject to intense pre-publication review. On the one hand, there was high praise from many associated with the traditional energy sector in many nations. On the other hand, there was sharp criticism from critics of traditional energy policy and from methodologists who discerned flaws in its analytical practices. Nevertheless, the Energy Program stands as a major result of IIASA's early years; it established a focus on global energy issues that has continued at IIASA to the present time, building upon and refining the base that the Energy Program established. Not least, that base included an international network of collaborating institutions that shared in its common development.

A few years after the beginning of the Energy Program, the Institute established a second program -- on Food and Agriculture. It was lead initially by a Hungarian economist, Ferenc Rabar, and then by an Indian economist, Kirit Parikh. It too focused on the ability of global resources to meet the expanding needs of a growing and developing population. Not surprisingly, given the disciplinary background of its leaders, the Food and Agriculture Program used an economic framework, examining the consequences of achieving supply and demand balance through the linked systems of global production and trade. Key to its conduct was the recruitment of a group of collaborating institutes in each of the key nations who had responsibility for analyzing their national systems. IIASA assumed responsibility for analyzing their global linkages through the trading system. The results of the Food and Agriculture Program appeared in a variety of forms. Perhaps its greatest success was the creation of an international community of institutions, cutting across political boundaries, who shared a common understanding of the issues and facts of global food supply.

Both of these programs had successes and weaknesses that reflected the personal interests and skills of their leaders. Aside from RAND, there were essentially no places at which one could learn how to be the leader of a large, interdisciplinary policy research study; and even at RAND the primary way to learn was through experience.[6] No courses were in existence, although there were several RAND books that comprised most of the extant literature.[7] Consequently, everyone had to learn on-the-job. At IIASA there were the additional difficulties of dealing with a staff that was not only interdisciplinary, but also international; and with having at least a dozen "clients," each with somewhat different interests and policy

[6] Since the early 70s, RAND has run The RAND Graduate Institute whose goal is to train policy and systems analysts to the Ph.D. level.

[7] See: McKean, 1958; Hitch and McKean, 1960; Novick, 1966, Fisher, 1971, and Quade, 1975.

environments.[8] Consequently, it was remarkable that large policy studies were designed, managed, and completed at all; let alone that they succeeded in influencing the policies of a great many national and international bodies.

Importance of Quality Control and Communications

A second aspect of RAND's experience that I sought to transfer to IIASA was an appreciation of the importance of communication and the need to bring work to a high level, both in its content and in its presentation, before exposing it to outside audiences, whether scientific or policy.

The requirement assumed additional importance and difficulty at IIASA because, although the founders had wisely decreed that the Institute would have only one working language and that would be English, most of the Institute's staff were not native English speakers. (It should be noted that the requirement of all staff members that they be competent in English was a significant impediment to recruitment from many countries.) Many have commented that "Broken English" is the international language of science; IIASA was a case in point. Furthermore, the standards of scientific quality were not uniform across all IIASA's member organizations or across all the research institutions from which IIASA's staff was drawn.

Consequently, I introduced two features of the RAND system.

The first was a high standard of external peer review of quality before any finished work of the Institute could be published.[9] The publication of the approved work was supported by a staff of editors who insured they achieved a high standard of exposition and language. The goal was that it should not be possible to distinguish the reports written by non-native speakers of English from those of the native speakers.

The second was a tough internal review of every presentation that was to be presented outside of the Institute before it could be released. These reviews covered both the content and the effectiveness of its presentation. There was a presentations coach who helped all scientists to perfect the organization and visual and oral communication of their results. The presentations coach also ran workshops for new scientists to help them polish their presentation techniques. That was especially important for scientists from Eastern Europe where, at that time, even overhead projectors were rare.

Role of the Director

I drew upon RAND as well for my model of the role of the Director of the Institute. I understood that my responsibilities were:

- to establish and communicate the direction of the Institute;
- to protect its independence, while preserving the support of the member organizations;
- to see to the provision of the necessary resources and appropriate context;
- to establish and assure the operation of effective quality controls; and

[8] The Handbook of Applied Systems Analysis was eventually published in three volumes under the independent editorship of Hugh Miser and Ed Quade, who had been associated with the project at IIASA until its termination in the early 80s. See Miser and Quade, 1985; Miser and Quade, 1988, and Miser, 1995.

[9] Outside reviewers were selected by research management and paid an honorarium for that effort.

- to get out of the way of the research staff.

Those were the roles that I strove to perform.

New Aspects of IIASA

Although the experience of RAND proved useful at IIASA, there were aspects of IIASA that were substantially different from RAND and required, therefore, substantially different approaches. Among them were the following:

International Problems

Although RAND dealt with problems that were international in nature, such as the relationship between the United States and the Soviet Union, it always did so from the perspective of a single national client – the United States. IIASA, however, dealt only with problems that were of interest to multiple national clients, sometimes with conflicting interests.

It proved useful to distinguish between two categories of such problems.

> The first category was "Global Problems" that spanned national boundaries and could only be solved by the actions of many nations acting together. The purpose of these studies was to establish a common basis of understanding of the nature of the problem and of approaches to its resolution that could be used in international negotiations and by international bodies. Both of the Programs, Energy and Food and Agriculture, fell into this grouping.
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> The second category was "Universal Problems" that existed within national boundaries and that single nations could act alone to resolve, but that all nations shared. Hence the purpose of studies of these problems was to identify approaches that could be applied in many, if not always all, nations. Most of the activities of the Research Areas fell into this grouping. Among them were studies of water quality and water demand management, large scale regional development projects, health care delivery, and population migration.

For the most part, the major difference introduced by this internationality was the requirement to account for the different interests and perspectives of the sponsor nations and to try to insure that the highest standards of apolitical neutrality were met.

Multiple Sponsors with Diverse Expectations

RAND was blessed with a single sponsor, the United States Air Force, during its formative years that understood well what it expected RAND to contribute. That sponsor also allowed RAND a few years in which to develop its capabilities. Neither of those conditions prevailed at IIASA. Instead, from its beginning IIASA needed to account for the varied interests of its multiple sponsors. Between 1972 and 1976, the number of national member organizations (NMO) grew from 12 to 17.[10] In some nations, the NMO was an existing scientific body, such as the National Academy of Sciences in the United States or the Royal Society in the United Kingdom. In others, it was an organization especially established to be the member, such as The French Association for the Development of Systems Analysis and The National Committee for Applied Systems Analysis and Management in Bulgaria. The composition of these ad hoc bodies reflected what each nation thought "applied systems analysis" might be,

[10] The new members were the Netherlands, Sweden, Finland, Hungary, and Austria.

as well as the local politics of science and technology policy. In several cases, particular disciplines – often control theory – gained dominant positions on the committees.

In most instances, the NMOs were able to insulate the Institute from direct government intervention. Nevertheless, the eventual source of funding in all cases was from government agencies. In the United States, the National Science Foundation was tasked with providing support. In the United Kingdom, it was the Ministry of the Environment. In many nations, it was the Ministry of Finance. Inevitably, the sources of funds would exert their right to see what they were getting for their money.

The result of this diversity of sponsorship was a diversity of expectations going beyond even the anticipated diversity of interest among different nations. For example, the United Kingdom's member, the Royal Society, viewed IIASA as a scientific research institute that ought to be judged primarily by its ability to add to the store of peer-reviewed science published in prestigious disciplinary journals. The Ministry of Finance in Bulgaria, however, was much more interested in practical results of immediate use to the Bulgarian economy. Almost every expectation between these extremes was present among one or another of the NMOs, and generally several different expectations were held by each NMO.

Although there were sponsoring organizations with individuals who were knowledgeable about some aspect of operations or systems analysis, there was no organization among the sponsors that had wide experience in or understanding of the practice of systems or policy analysis. Thus, IIASA had not only to learn to do systems analysis in an international setting; it also had to educate its sponsors in what it was striving to accomplish and convince them to modify their expectations appropriately. And while it was doing that, it had to shape its research portfolio so as to satisfy within reason the wide range of expectations that its sponsors continued to hold.

The responsibility for crafting a research program to satisfy these diverse wants fell in the first instance to the Director, with the assistance of the senior research leaders. As the most senior person associated with IIASA who had had significant experience in systems and policy analysis, I tried to move the Institute step-by-step toward activities that would meet the high standards that RAND had established, while at the same time holding at bay those who looked for more purely academic or more immediately operational research projects.

During the six years of my directorship, the financial support of the NMOs was at the maximum permitted by the charter, and the Institute's Council always approved the Research Plans. Nevertheless, there was continual criticism of the Institute for not achieving enough high-quality academic research or enough results of short-term relevance to solving practical problems.

Transient Staff

IIASA had no permanent research staff. Because most of its scientists came from countries other than Austria, most of them had to leave good positions in their home countries in order to spend time at IIASA. If IIASA had limited itself only to scientists who were willing to move themselves and their families permanently to Austria, it would have narrowed the candidate pool too much. Thus, a transient and constantly changing research staff became a way of life at IIASA. In that respect, it differed significantly from RAND, where long tenure was the norm, and from most high quality academic institutions.

The average length of stay of a researcher at IIASA stabilized during the 70s at about 2 years, but the distribution was wide, ranging from a few months to, at the time I left, 8 years. All scientists had fixed term, renewable contracts. During an average year in that period, there would be over 150 different researchers in residence, representing more than 20 countries and

an even larger number of disciplines, whose combined effort amounted to about 100 full time equivalents.

The transience of the scientific staff was a cause of concern to many observers more familiar with traditional university and governmental research operations. However, from my perspective, for several reasons, it was a great strength of the Institute:

1. Since the Director had full authority to hire and remove all employees, the fixed and short term nature of the researchers' contracts provided a graceful way to eliminate unproductive research staff. Especially in the early years, the political nature of some early appointments would have caused lasting difficulty, if it had not been easily possible to not renew them.

2. Good performers, however, could have their contracts renewed, if they were available to stay, as many were after they and their families had been established in Austria and they had grown productive at the Institute.

3. As a matter of policy, the senior research leaders were all expected to stay for longer than two years, providing the continuity that was needed to insure successful work.

4. The research leaders became adept at scheduling the flow of short and long-term appointments to satisfy the changing needs of their projects without creating long-term commitments to specialists required only at a specific point.

5. First-class researchers, who would never have given up their home positions, could spend short periods at the Institute and, as available, return for extended stays during sabbaticals or leaves.

6. The flow of alumni created a natural constituency and base of contributors around the world.

Collaborating Institutions

Although RAND did some sub-contracting during its early years, for the most part RAND operated alone, performing all its activities with its own staff and consultants. In contrast, IIASA came to rely heavily on networks of collaborating institutions around the world. These collaborations took many different forms, some minimal and others involving considerable closely coordinated work.

An example of close collaboration was the work done on population migration in each of IIASA's 17 countries. Using a common methodology and research protocol developed at IIASA, a research organization in each country analyzed interregional migration within its national boundaries. The results of these 17 studies, which were unique, were published by the Institute in a common format together with a cross-national comparison and summary. Similar collaboration underlay the models of food supply and demand that were a key component of the Food and Agriculture Program.

The network of collaborating institutions was essential and valuable for several reasons:

1. They enabled the work of the Institute to be conducted inside each of the member organization countries by researchers familiar with the specific character of that country and its government. Reciprocally, their knowledge of national situations was available to the researchers at the Institute.

2. They served as a reliable source of staff appointments to the Institute who were familiar with it and its work when they arrived and whose skills and capabilities

were known to the research leaders. This became the most valuable source of recruits for the Institute.

3. They became a constituency for the work of the Institute within their country and helped to build and retain its support.

4. They became the vehicles for disseminating and implementing results of the Institute's research within their own country.

National Balance in the Research Staff

As an international institute created to build bridges of trust across the East-West divide, IIASA has a primary requirement to insure that each of its research projects comprises representatives from several nations. And because one of the benefits of membership is the opportunity to have scientists in residence at the Institute, there is a requirement across all projects that there be a "reasonable" balance of representation from each of the member organization countries. "Reasonable" was interpreted to mean in rough proportion to the financial contributions from each nation, both through membership payments and, in several cases, supplemental contributions from other national organizations such as foundations, corporations, or government agencies. No remotely similar requirement was present at RAND.

In the early years, this requirement was a severe constraint, especially when combined with the need for English language capability and the tendency of the eastern countries to use political reliability as a primary criterion. Remarkably, over time the Institute developed enough familiarity with the relevant communities and institutions in its member organization countries to be able to select good people with a reasonable geographic balance. Over time, as well, the criteria were employed flexibly so that a country that was short of representation during a period, might be over represented for several years subsequently.

Dearth of Experience in Systems / Policy Analysis

In contrast to the problem of establishing a scientific research organization in a well-established field, the creation of IIASA – like the creation of RAND – could not draw upon an established community of practitioners and supporters. Thus, IIASA had to create through its own activities the practice of "international systems and policy analysis." In part, that has been accomplished through the adoption of experience from RAND and other organizations; but in large measure it has been formed by the experience of IIASA itself.

The problems that this lack of experience created in recruitment and in building and sustaining support from the member organizations have already been mentioned. A further problem, not yet mentioned, has been the transience of the individuals whose support of IIASA has been critical in each of the member organization nations. The founders – Bundy, Handler, Gvishiani, Zuckerman, Aigrain – provided a climate of support that enabled the Institute to learn and grow during its early years. They were followed by a generation of Council members whose appreciation of the Institute and what it could and could not do evolved with IIASA's development. But they too left and with them, often, the strong links to the funding bodies that assured the Institute's funding. Their understanding and government links have been essential to the continued viability of IIASA. A critical issue for the future of IIASA is its ability to build and maintain a strong constituency of customers and sponsors for its unique product – international systems and policy analysis – in each of the countries with NMOs.

Balance in the Research Agenda

RAND was under no obligation to provide an annual research agenda for approval by its sponsor. Beyond a broad statement of the areas in which it intended to work, its research program was within its own responsibility, subject of course to continued contacts with the Air Force. Generally, in the 60s, RAND aimed for about 1/3 work suggested by the Air Force, 1/3 initiated by RAND, and 1/3 of mutual concern.

IIASA, however, has to submit to its Council, and through the Council Members, the NMOs that they represent, a highly specific Research Plan for the following year, which receives critical review and suggestions from many of the NMOs. In the fall of the year, the Council approves the Research Plan for the following year, and the associated budget.

For all of the reasons described above, that plan has to reach a critical balance, reflecting the diverse expectations of the sponsors, the potential availability of appropriate research staff members, the interests and capabilities of available leaders, the need for national balance in staffing, and the appropriate trade-off between short and long term benefits. As a result, the crafting of the Research Plan is one of the most difficult and important tasks of the research leadership of the Institute.

The Research Plan, consequently, has served as the lightning rod for criticism of the Institute and efforts to shape it to the interests or needs of one or another of its constituencies. The diplomatic skills of the senior research leaders, the respectful understanding of the Council, and the tendency for comments to cancel each other, have enabled what could be an impossible task to be accomplished. And in its best form, the Research Plan has been a valuable – indeed essential – tool for recruiting and retaining both research staff and the research sponsors who fund the Institute's work.

IIASA Now and in the Future

The IIASA described above is the one that I was privileged to serve during the latter half of the 70s. Obviously, in the fifteen subsequent years it has undergone many changes, as it will continue to do as it enters the new century. However, much of what I described remains true in general, if not in specifics. Most importantly, IIASA remains the only truly international research institution performing international and interdisciplinary systems and policy analyses of global and universal issues. What it has learned in the 25 years of its existence is a valuable international asset. It warrants strong international support to insure that that asset continues to grow and that it achieves its considerable potential to contribute to the informed resolution of international policy problems.

Section 5

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