extend outside the lab. I serve on several government panels, and I'm active in the professional society. I vote in every election. I. . . ."

"Joe, do you know Grant Swinger?"

"From California?"

"Well, yes and no. He's on the faculty at California, but this year he's on leave to the Pentagon."

"Oh, then he's at the Pentagon now?"

"No, he actually took a leave from the Pentagon to return to his old place in California as a visiting professor, but for the time being he's back at the Pentagon as a consultant. Anyway, he's as busy as the rest of us—far busier, in fact—but he's managing to find time to attend the conference, and he's going to deliver an opening paper that's going to make a sensation. He's going to call for the establishment of a fully automated international data retrieval center tying together the Library of Congress, the National Archives, the British Museum, and nine other major libraries around the world. And all of this is going to be electronically tied to an automated compilation service of major daily newspapers and scientific journals. Joe, with this setup, you'll be able to push a button and find anything, from how many times second base was stolen on Tuesdays in 1937 to what's going on in protein synthesis. Joe, this will be the answer, and once we lay out the stuff for the world's decision makers to get the broad picture, we'll find a lot of things falling into place. Let's face it, right now we're working in the dark. We're sailing without a chart or a rudder, and sometimes I think we're sailing without a boat. We don't even know if we're asking the right question when we ask if we're asking the right question. When you sit down and think about how little we know, it's a miracle that the whole thing hasn't blown up. Man has been lucky, Joe, but let's not ride our luck."

"I suppose we've had a good deal of luck, Larry, but still . . ."

"And look, Joe, don't forget that we're not just tying this conference to the information explosion. That's an important part of it, and we'll have several panels going at it tooth and nail, hammer and tongs. But we want to look at this thing in a broad context, with the proper perspectives, and with all the necessary inputs. What we want to do is nothing less than to begin getting some definitions and extrapolations toward the development of data for a definitive analytical approach toward the junctions, as well as the conjunctions, of science and society. Oh, I know it's years away, and maybe we'll never achieve it. I frankly tend toward the pessimistic. I might as well admit it. But we've got to make a start, and before it's too late."

"Larry, it's discouraging to hear that you're so gloomy about the prospects and I'd like to help, but I do have the feeling that I'd better stick close to the home base. We've got some pretty exciting stuff running in the lab, and I'd like to stay . . ."

"Joe, let your graduate students watch the pot boil. Last time I saw you you told me you have a pretty good bunch."

"Well, Larry, that's a little bit difficult at this time. You see, they all got grants and they're off at a conference in Mongolia for the month. I couldn't very well turn them down."

"Then turn it over to your lab technician."

"He's very good and I guess he could handle things by himself for a while, but he's at a symposium on the Laboratory Technician and International Relations."

"Then let your secretary run the place. Give her the number for the fire department and tell her to keep her eyes open."

"She's a bright girl, and I suppose that might work out, but she's at a workshop on the Secretarial Sciences in East-West Relations. Listen, Larry, I'm the only one here and there's a call on another line. Good luck with the conference, and let me know how things work out."

"Joe, I still think you're taking a narrow view of your responsibilities."

—D. S. GREENBERG

RAND: After Nearly Two Decades of Success, R&D Nonprofit Faces New Tasks, New Rivals

The RAND Corporation sees its major task as "recommending preferred instrumentalities and techniques" to its clients, including its chief patron, the Air Force, and this task has grown more difficult over the nearly two decades of RAND's existence.

In the era of American nuclear monopoly that immediately followed World War II, RAND was likely to be working on some demanding but reasonably straightforward problem, such as what kind of bomber to build next. The typical RAND study today, however, often requires estimates of the intentions or probable reactions of both the unfriendly and the friendly. And the degree of political and economic analysis is much greater than in the early days, when choices of hardware were mainly involved.

The broadened scope of research has required a building of the RAND staff, on the original base of engineers and physical scientists, to include psychologists, economists, and social scientists (*Science*, 29 May). And RAND's response to the challenge of diversified research has led it into zones of controversy.

Perhaps the strongest single influence on RAND's image, still an indistinct one as far as the general public is concerned, was the attention given in the early 1960's to a book—*On Thermonuclear War*—by a former RAND staff member, Herman Kahn. The book is an exhaustive examination of deterrent strategy in the framework of a discussion of nuclear war between the United States and the Soviet Union. Kahn, while he concentrated on analysis, did make some recommendations, notably that a medium-sized civil defense program be initiated.

Kahn's book might not have achieved the notice it did had the threat of a "missile gap" not become a matter of dispute during the 1960 campaign. In addition, John Fitzgerald Kennedy was a great reader, and Kahn had a place along with such authors as Neustadt, Galbraith, and Rostow on the New Frontier list of required reading.

What perhaps was newest for the general reader about the book was Kahn's claim that it represented the "adoption of the Systems Analysis point of view—the use of quantitative analysis where possible, and the setting up of a clear line of demarcation showing where quantitative analysis was not found relevant in whole or in part."

In the climate of the times, however, public discussion centered not on Kahn's methodology but on the subject matter and on the scholarly apparatus and dispassionate tone of the book, which some found blood-chilling. The controversy over *On Thermonuclear War*, therefore, had as a focus not the point where fact ended and value judgment began—a subject which interested professional critics, including many in RAND—but the question of whether the very discussion of the subject brought nuclear Armageddon nearer.

In some quarters, because Kahn had worked for RAND and RAND worked

Building of RAND Corporation, Santa Monica, California.

for the Air Force, it was taken for granted that the book represented a special line of RAND realpolitik and reflected Air Force doctrine. Kahn, RAND, and the Air Force would all deny it.

On the interesting question of the influence of RAND on particular policy decisions, there seem to be plenty of differing opinions both within RAND and within the Air Force. For an outsider, approaching the question is like peeling leaves endlessly off an artichoke without coming to the heart.

Certainly, on the one hand, RAND "inputs" (engineering jargon still flavors RAND terminology) have been significant, especially because of a continuous, close relationship with the Air Force over the years. On the other hand, plenty of RAND recommendations have been modified or rejected, and RAND has never written a "war plan."

On the RAND side, although the research corporation has not been without its volunteer Machiavellis, most of the researchers appear to conceive of their task as technical consulting. If the RAND role is not clear-cut, this is in part because RAND now works on so many different kinds of problems, whereas in the early days its major contributions were in feasibility studies on weapons and air defense systems.

RAND studies contributed to the gearing up of the intercontinental ballistic missile (ICBM) program early in the 1950's, although the advice of committees headed by John von Neumann were probably more influential, and the activities of the Russians provided weighty considerations as well.

RAND scientists figured prominently in solutions of two key preliminary problems—development of thermonuclear warheads small enough to make ICBM's practicable and design of nose cones which could withstand reentry into the atmosphere.

Broad-gauge studies headed by Albert Wohlstetter at RAND in the early '50's on alternative policies in basing nuclear bombers contributed a good deal to the discussion of the implications of a "second strike" policy for the United States and probably hastened the program of hardened sites for missiles and the quest for other means to protect American missiles.

In the late 1950's the RAND staff was active in studying the wide implications of arms control agreements. RAND physicists, for example, were instrumental in providing the theoretical underpinnings to proof that a "decoupling" technique for underground nuclear tests would make accurate detection and identification of such explosions difficult.

A Changing Context

RAND, however, has not been exclusively concerned with the nuclear arms and missile rivalry between the United States and the Soviet Union. Its work has changed as the context of the cold war has been changed by events such as the war in Korea and the growth of the power of Communist China; postcolonial troubles in Africa, the Middle East, and elsewhere; the Castro revolution in Cuba and the ferment in Latin America; and Sino-Soviet wrangling and strains in both the Eastern and Western alliances.

For the Air Force, recent years have brought some changes which affected RAND. Creation of a civilian space agency has limited the Air Force to a much narrower role in space than it would like. The ICBM program is maturing, and the manned bomber is being bidden a farewell, albeit lingering. The Air Force's status as first and foremost among the services, maintained through most of the postwar period, has been infringed, first as the Navy developed its Polaris weapons system and called attention to the import of antisubmarine warfare and then as strategic interest broadened to include not only wars of annihilation but wars of attrition, particularly in the underdeveloped parts of the world.

In the Air Force, Tactical Air Force stock is booming the way the Strategic Air Command's has for most of the postwar period. For RAND, the problems of limited warfare and antiguerrilla tactics have a new urgency, and political and economic considerations are even more important in the new sphere. The Air Force encourages such activity because it wants to stay in the mainstream of events. RAND researchers appear to be responding with the theoretician's zest for new problems.

The workability of the Air Force-RAND alliance depends, of course, on the capacity of the military to evaluate and use RAND research. The contact point is an office at Air Staff level in the Office of the Chief of Staff for Research and Development, in the Pentagon. RAND's reports and memos are distributed not only to appropriate Air Force elements but also to other services and branches of the government and industry on a "need to know" basis. The Air Force depends

on its own people to assess the RAND work. It does not bring in outside consultants to sit in judgment. This has meant a buildup within the Air Force of a group of specialists which, while not creating a mirror image of RAND, provides a much stronger research and evaluation competence for the Air Force than it had 10 or 15 years ago. The upgrading has been accomplished not only through the hiring of civilians but through making advanced technical training and graduate education a normal part of an Air Force officer's career.

Relations between RAND and the Air Force have been variable, in accordance with personalities and the issues under discussion. Some people speculate that the departure of the present top echelon of the Air Force —men who were the youngest general officers of World War II—and their replacement by men who came to professional maturity in the aerospace age, will mean that the RAND approach will flourish even more strongly. Another view is that the classic difference between the white scarf boys and the bright staff officers, between the decisive commander and man of action on the one hand and the thinker and planner on the other, will continue to be important and that it is very hard to produce a hybrid. It is unclear, therefore, whether the rise to the top of a new breed of officer will alter RAND's role.

Cost Effectiveness Analysis

Although it is difficult to establish a cause-and-effect relation between RAND recommendations and Air Force policy, there is a realm in which RAND has had an observably strong influence: in budget making, program planning, and weapons selection.

The "cost-effectiveness" analysis has gained considerable notice during the regime of Defense Secretary Robert S. McNamara, being credited with dealing the coup de grace to such projects as the Skybolt missile and the nuclear-powered airplane and with curbing the Navy's aspirations for a nuclear-powered fleet. "Cost-effectiveness" means use of the tools of economic analysis to insure the optimum use of resources. Use of the term in this context is associated with Charles J. Hitch, Defense Department Assistant Secretary and comptroller, who is looked upon by some as the J. M. Keynes of defense economics.

Hitch was a RAND Corporation economist for several years, and he and his colleagues had in fact convinced the Air Force of the value of certain cost analysis methods, which had become regular Air Force procedures, well before McNamara and Hitch went to the Pentagon.

These cost analysis methods gave the Defense Department tools for making choices and imposing controls at a time when the development of weapons systems had grown vastly expensive. But it is not difficult to find critics at RAND today who warn that there are some factors that can't be reduced to the essentially quantitative terms of cost-effectiveness analysis.

As a footnote on the influence of RAND it is worth mentioning, as many people in government do, the significant number of people with experience at RAND who have moved into government posts (particularly in Defense) in which they do influence policy. The eastward flow at the beginning of the Kennedy administration in fact seems to have posed a major replacement problem for RAND for a time.

At the moment it is hard to foresee any major change in RAND's status or fortunes. The general climate in which the research organization has operated, however, is changing. Erosion of the Air Force position, further relaxation of tensions between the Soviet Union and the United States, or further economies in the defense budget could affect RAND in different ways through cutbacks in its funds.

Congress is suspicious of nonprofit organizations without educational functions. These suspicions have been reflected in a number of hearings over the years but have never escalated into sanctions.

RAND's services, furthermore, are no longer unique, as they were when the research organization and some other nonprofits were established.

Government agencies are trying to increase their competence in research. It is likely that in the future stronger efforts will be made to improve the ability of the government not only to evaluate contract research but to carry out R & D through changes such as those suggested 2 years ago in the Bell Report on government contracting for research and development. The report not only carried recommendations for raising salaries and improving the research environment in government but also suggested that creation of semi-independent government research institutes with the desirable attributes of the nonprofits be considered.

Universities these days are bolstering their organizations in areas of interdisciplinary research in which RAND has specialized and are welcoming research contracts to the campus with growing warmth. Industry is stronger in R & D and systems-analysis competence than it was a decade ago and is putting pressure on government to reexamine its relations with nonprofits on the grounds that their tax status gives them an unfair advantage.

At the same time, evolutionary forces have been working within RAND and other nonprofits. The most obvious trend has been toward doing a moderate amount of research which is nonmilitary in character although still in the cause of the "public welfare of the United States," as the RAND charter provides. RAND over the past several years has, for example, turned its special techniques on problems in water resources, transportation, and education. The Systems Development Corporation, a RAND offshoot, has employed its more specialized systems analysis competence on some projects in education.

RAND currently is undertaking research on Latin America, using corporate funds to finance it because its researchers are untried in the specific sort of work being undertaken. RAND also is performing research on contract for the Agency for International Development, a line of endeavor which gives RAND much greater political visibility than researching for the Air Force does.

RAND feels that it is necessary to diversify research even if this leads the corporation into controversial areas. To maintain the quality of its work, RAND must continue to attract good people, the argument goes, and the best people tend to go where the work is challenging and interesting and important.

The image of RAND as a university without students is one cherished by a good many people there. It remains to be seen how far RAND will diversify its research and whether or not the Air Force will, in time, consider such diversification a damaging diversion from RAND's work for the military and seek to do something drastic about it. It is fairly clear, however, that RAND is entering a period when competition is going to be stiffer.—JOHN WALSH