Strengthening Scientific Governance in an Era of Change

Report of the 5th RIKEN Advisory Council (RAC) to the President of RIKEN,
The Institute of Physical and Chemical Research

I. INTRODUCTION

Since the last RAC meeting in 2000, the RIKEN organization has been on a remarkable growth trajectory with several new centers having been set-up. These new centers and activities have added considerably to the scientific credibility, domestic as well as international visibility of the RIKEN organization. RAC has no doubt that RIKEN today is among the top research organizations worldwide. While applauding these achievements, there is no reason for complacency.

The enormous growth over the past decade has dramatically changed the RIKEN organization and poses a number of important management challenges. First, while initially founded as a research institute specializing in physics and chemistry, RIKEN has broadened its activities over the past few decades to encompass a broader range of disciplines. The majority of research activities are now in life sciences and biomedicine, and thus **RIKEN today is among the largest life science research organizations in the world.** This fact has immediate implications for RIKEN's position within the Japanese public sector research system and needs to be reflected in the organization's management approach. Secondly, the vast majority of RIKEN staff members are now employed on the basis of annually renewable contracts rather than tenured positions. If RIKEN is to achieve its explicitly stated goal of a stable rate of staff turnover, a considerable number of scientists will continuously enter and leave the organization. The stream of young people leaving the organization will become an increasingly crucial contribution by RIKEN to science and technology in Japan. RIKEN must ensure that these young scientists receive the best training available and adequate support for their careers after leaving the organization. Finally, over the past few years Japan's research system has undergone a number of significant changes that fundamentally affect the environment in which RIKEN operates. The organization's full attention is needed to deal with these issues.

The RIKEN Advisory Council (RAC), with its recommendations seeks to assist RIKEN and its management to deal with these issues in order to achieve the

highest possible standards of excellence both in research and management.

II. THE 5th RAC MEETING

The 5th RAC meeting was held from June 7–9, 2004 in Wako and Tokyo. The meeting was attended by all members of RAC with the exception of the chair of the Plant Sciences Advisory Council (PCAC), Dr. Shang Fa Yang, who was replaced by the vice-chair of the PCAC, Dr. Fumihiko Sato. The Terms of Reference of the 5th RAC were given by RIKEN's director, Dr. Ryoji Noyori, in his opening remarks.

Terms of Reference – 5th RIKEN Advisory Council Meeting

1. To review measures taken to implement the recommendations of the 4th RAC meeting in 2000.
2. To assess measures taken to implement the Noyori Initiative.
3. To evaluate activities at the various laboratories, research institutes, and centers and to review advisory council reports.

During the first day of the meeting, the RAC members heard presentations by RIKEN Executive Directors on changes in Japan's science policy that have affected RIKEN over the past few years as well as RIKEN's response to the 4th RAC recommendations. President Ryoji Noyori then presented his vision of the future of RIKEN as well as his analysis of the most urgent issues that RIKEN is facing presently. Presentations were followed by discussion and brief in-camera sessions by RAC members. Discussions followed with two sub-groups, one dealing with RIKEN's response to the 4th RAC and the second focused on the Noyori Declaration. The second day of the meeting consisted of presentations by the directors of the various RIKEN centers and institutes as well as the Frontier Research System. A summary of the results of the most recent advisory council meeting was presented by each advisory council's chairperson. In each case presentations were followed by discussion and concluded with a closed question and answer session with presenting directors. Finally an in-camera discussion by RAC members was held to identify key issues that emerged from each session.

In addition to the presentations, the following materials were received by RAC:

- the RIKEN White Paper
- white papers prepared for the meetings of the various Advisory Councils
- reports by the Advisory Councils
- PR materials and, where available, annual reports of the various centers and institutes

A first draft outline of the report was developed during a working dinner, followed by an extensive writing and discussion session on the morning and early afternoon of the third day of the RAC meeting. At the end of the meeting, the report highlights were presented to RIKEN's President and senior management group by the chairman of RAC, Dr. Henry Friesen.

III. SETTING THE STAGE: RIKEN IN A NEW ENVIRONMENT

RAC noted with satisfaction the striking growth and dynamic development that RIKEN has experienced over the past few years. In this section we briefly analyze the factors that sparked the dynamism of the RIKEN organization and provide an analysis of the changing environment for RIKEN.

The Evolution of Japanese Science and Technology Policy

Japan's science and technology policy over the past few years has undergone a number of important evolutionary changes that are likely to impact research organizations, such as RIKEN, for years to come. We had already noted in the 4th RAC report the merger of the Science and Technology Agency (STA) and the Ministry for Education, Culture, and Sports (Monbusho). In retrospect, it is clear that the merger has opened up many opportunities for RIKEN. Prime examples are the Protein 3000 and Genome Network programs, which fund both research at RIKEN and at various universities in a coordinated fashion. With the merger of the two Ministries and the government's administrative reform, the Council for Science and Technology Policy (CSTP) was reconstituted within the prime minister's office. In this rearrangement, CSTP has an advisory, rather than an operational role. However, the link to the prime minister's office and the fact that the council now has its own internal staff, have considerably strengthened the council's position, compared to its predecessor, the Council for Science and Technology.

Further, CSTP has also strengthened its oversight and evaluation function and the ranking of new funding proposals by CSTP has become an increasingly important factor in the budget process. Prioritizing areas of science and technology has been a major goal in the first and second Basic Plan for Science and Technology. The CSTP has reinforced the importance of priority setting and announced four priority areas–life sciences, the environment, information technology, and nanotechnology. From the perspective of RIKEN, an important opportunity surfaced with the surge in non–competitive funding that became available on a project–by– project basis. While the amount of research supported through competitive funding arrangements has grown considerably over the past decade, the past few years have also seen a considerable growth in non–competitive funding for large–scale programs with defined terms (usually five years). CSTP has played a crucial role in identifying these project areas. The Millennium Project launched by the late prime minister Obuchi is a prime example of non–competitive funding and there have been various other programs launched in recent years.

RIKEN's New Status: A Window of Opportunity

Another important development that has affected RIKEN is the reorganization of national research centers and national universities as Independent Administrative Institutions (IAI). While the full implications from the new IAI status remain to be seen, the transition from the status of a Special Government Corporation to an IAI is an important historic conjunction for RIKEN. The underlying rationale for this reform was to provide government research institutes and universities with a strongly independent, corporate status and more flexibility with respect to budget authority and personnel policies. We believe that this new status as an Independent Administrative Institution (IAI) constitutes an important window of opportunity for RIKEN. For those familiar with RIKEN's history or the recent changes with respect to government funded organization, this assertion may seem paradoxical or misguided. Certainly, RIKEN has lost some of the privileged status it enjoyed earlier, as compared with government research institutes or national universities. Still, we believe it is important for RIKEN to look at its new status in a positive way. There remains much uncertainty about IAIs and, in many ways, the rules are not yet set – rather than responding to requests from its funding agency, RIKEN must seize upon this opportunity to actively shape the

rules within the new environment. Also, we believe that the similarity in status and legal grounding of the "new" national universities and RIKEN will provide new opportunities for future strategic synergies. This said, in the past, RIKEN's status as a special government corporation was a clear advantage when compared to other research organizations; now RIKEN has become one of many IAIs. **We believe RIKEN must continually try to re-invent itself in order to differentiate itself from others.**

The Changing Portrait of RIKEN

Following the creation of the Brain Science Institute (BSI), the past decade has brought enormous opportunities for RIKEN and RIKEN has done extremely well in capturing them. At the time of the 4th RAC meeting the decision to create three new centers within RIKEN, namely the Center for Developmental Biology (CDB), the Single Nucleotide Polymorphism Research Center (SRC), and the Plant Sciences Center (PSC) had already been taken. Since then, three new research centers, the BioResource Center (BRC), the Research Center for Allergy and Immunology (RCAI) and Advanced Center for Computing and Communications (ACCC), have been established either in response to government policies or at the initiative of RIKEN. The addition of six new centers and expanded sites has changed the overall portrait of RIKEN. Not only has the total budget increased considerably, perhaps more importantly the portfolio of activities funded by RIKEN has now clearly shifted from its historic focus on physics and chemistry to a much greater emphasis on life sciences and even biomedical research.

This expansion and changing scientific focus raises fundamental issues about governance and management. RAC has noted that some of the new centers have brought considerable entrepreneurship to RIKEN. But, also, there appears to be a tendency within the new centers to see themselves as less interconnected with the RIKEN organization. A more scattered geographic distribution of these centers across Japan further adds to the increasing complexity of managing the organization. Geographic distance from the main campus in Wako certainly reinforces the tendency toward independence. This raises fundamental issues about effective governance and management practises. Is it time for RIKEN to consider a fundamental overhaul of its management structure in the direction of a more loosely organized federation of research institutes, such as the Max Planck

Society? It is well beyond the mandate of RAC to consider recommending such far-reaching changes, yet we would like RIKEN to explore whether valuable lessons could be gleaned and applied to RIKEN by examining alternative models of managing large research institutions in other countries.

RAC has noted some efforts to implement structural changes, especially in the case of the Institute Laboratories which at the Wako site have been reorganized within the Discovery Research Institute. While organizational change often meets with resistance, especially when there is a history attached to the structures, it is essential that in the face of massive growth, that form should follow function; it is an evolutionary principle that ensures species survival. Those who fail to adapt risk being on display in museums. Complicating the structural organizational challenge is the existence of several different employment mechanisms. In order to guarantee efficient and effective corporate governance, solutions must be found that allow for a smooth integration of different organizational structures and multiple employment patterns.

Management Styles: Striking the Right Balance

As we will argue in this report, the various internal and external changes that affect RIKEN suggest a reassessment of the organization's management approach; in particular the right balance between a "collegial" and a "managerial" style of leadership and management should be achieved. Especially, we recommend that RIKEN should consider strengthening the role of the president and of directors of institutes and centers and of the overall governance regime of the organization **(in order to reinforce the fact that management approaches have to embrace and reinforce the broader scientific vision of the organization, we have introduced the term "scientific governance" to describe the governance structure at the RIKEN organization).** In our report, we urge RIKEN to ensure that the President has all the authority and support he needs to implement his vision of the organization, which he has tabled and we have termed the Noyori Doctrine. We urge RIKEN to assess the balance between managerial and collegial approaches to governance at the various levels of the administration. It is important to note here that collegial and managerial styles of leadership have always coexisted at RIKEN. From the very beginning, RIKEN had delegated considerable authority to chief scientists, thus stressing scientific leadership and

a managerial mode of governance. By contrast, the Chief Scientists Assembly (CSA) is an exemplary case of a collegial approach to management and decision making. Given the tremendous increase in funding over the past few years, a more managerial approach to governance and strong leadership by RIKEN's president and the various directors of research institutes and centers seems inevitable. At the same time, we advocate that more freedom is given to research fellows and research scientists.

Leadership must not be confused with centralized administration. Neither are we advocating a shift from decentralized or democratic decision making toward centralized decision making. In fact, such a shift could be problematic for the future of RIKEN and of its various institutes and centers. RIKEN has grown tremendously in size and we believe that decision making should increasingly occur at the appropriate level, rather than in a centralized fashion. Also, we have seen great entrepreneurship at many of the new centers and many efforts to strengthen RIKEN's position as a world leading research organization. The leadership of RIKEN would be well advised to take note of these efforts. The co-existence of efficient leadership and mechanisms for collegial or bottom-up decision making is a hallmark of any successful organization and this is especially true in the case of scientific governance. But, finding the right balance between these approaches is not easy. It is important to observe here that accountability and oversight are crucial when operating in managerial mode of decision making and we specifically advocate that RIKEN's oversight functions be strengthened.

In summary, the President and Executive Director of RIKEN set overarching institutional goals and objectives within which the Directors of Research Institutes and Centres set scientific objectives, involving collegial discussions. Management objectives also must be set locally to deliver the R&D strategy and results across RIKEN's many and diverse organisations, and performance and accountability measures must be set to common standards and well communicated to all staff.

IV. ASSESING THE RESPONSE TO THE 4th RAC RECOMMENDATIONS (Objective 1)

The following is an overall assessment of RIKEN's response to the recommendations of the 4th RAC report. The RAC is pleased with the progress

that has been made. Yet, there are a number of issues that remain to be addressed. Also, in some cases, RIKEN's response has differed significantly from the original intention of the recommendations.

Successes

An important recommendation in the 4th RAC was to urge RIKEN to implement a dynamic research system and recruit top level international scientists. RAC has noted with great satisfaction that many of the new research centers have been able to recruit scientific talent of the highest caliber to lead research activity at the various RIKEN centers. While additional measures will be necessary to increase the number of world-class non-Japanese scientists working at RIKEN, the successful recruitment of first class scientists in such large numbers has provided a solid foundation for RIKEN's future success.

We particularly applaud the decision to appoint Dr. Ryoji Noyori, a Nobel Laureate, to the position of President of RIKEN. With his declaration on the future of RIKEN, the new president has already captured in many ways the spirit of our main recommendation in the 4th RAC report where we urged in Recommendation #1 that RIKEN should undertake on an urgent basis a specific project with the purpose of defining a vision, mission, mandate, strategy, and identity of RIKEN. The Noyori Declaration is the right start towards that goal. To ensure that the key elements of the declaration become a shared view and passion for all RIKEN personnel, it is critical that all members of RIKEN have an opportunity to debate, discuss and ultimately embrace the institution's priorities.

Unfinished Business

We had further suggested in Recommendation #1b that RIKEN should establish, nurture and maintain an on-going scientific priorities committee with internal representatives and external advisors. In response to this recommendation, the Research Priority Committee was established in 2004 and, in April 2004, the Policy Division was established as the secretariat of the Research Priority Committee. While we are pleased to see that RIKEN is starting to address this issue, many questions remain as to the status of this committee, and its

relationship with the Chief Scientists Assembly (CSA). The role and mandate of this committee must be more clearly defined, especially in the light of President Noyori's reference to establishing his own Advisory Committee and the existence of priority committees at other parts of the RIKEN organization, such as the Frontier Research System. Clearly there should be only one Priority Committee that has the president's full support and that **represents, as we had recommended, the whole of RIKEN, rather than only a particular part of the organization.**

We are pleased to see that RIKEN has strengthened the Institute Laboratories (ILs) in order to further promote bottom-up, curiosity-driven research. In response to Recommendation #1c RIKEN has reorganized the ILs into the Discovery Research Institute (DRI) and the Harima Institute. A number of questions and inconsistencies remain, however. At the DRI and the Harima Institute, the Chief Scientists Assembly (CSA) functions as an informal governance body. However, while at the DRI the Chief Scientist Assembly selects the director (who is then formally appointed by the RIKEN president) no such proceedure exists at the Harima Institute where the director was selected by RIKEN management. All staff at the DRI and the Harima Institute remain permanent employees and fixed term staff or competitive funding mechanisms have not been introduced yet.

In recommendation #1f of the 4th RAC it was suggested to fundamentally re-examine the Frontier Research System (FRS). While some efforts have been made over the past four years to re-position FRS, some of the same issues identified in the 4th Report remain. Most importantly the role and responsibility of the FRS within the overall RIKEN organization needs to be clarified. If FRS is to benefit the entire RIKEN organization, priority setting and decision making has to be transparent and linked to an overall vision of future of RIKEN. What are the "frontiers" that the FRS is looking at? In this context it is worthwhile to state that RAC does not consider experiments in research management per se as a suitable goal for FRS.

Much has been done to strengthen the relationship between RIKEN research and the university system (Recommendation #4) through joint appointments, affiliate graduate schools, or exchange programs. Yet many issues remain to be

addressed. The fact that RIKEN regulations do not allow payment of stipends to graduate students is especially unfortunate. Also, RIKEN has enormous potential to develop educational programs, both for students and for post-graduate fellows.

We are satisfied with the fact that the importance of intellectual property protection and management of commercialization effort is increasingly recognized at RIKEN, as recommended in the 4th RAC report (Recommendation #4a). Yet, despite an increase in the number of issued patents and several spin-off companies, activities in this regard are well below the benchmark for comparable research organizations worldwide. Especially in light of the Noyori Declaration, entrepreneurship and collaboration with industry must be enhanced and promoted.

V. IMPLEMENTING THE NOYORI DECLARATION (Objective 2)

The Noyori Initiative, a high-level strategic management vision formulated by RIKEN's new president, Prof. Ryoji Noyori, has guided us in our deliberations. While the five objectives of the initiative may seem self-explanatory, they provide a powerful and highly suitable framework to discuss many of the issues that RIKEN is facing today.

The Noyori Declaration

1. To increase the visibility of RIKEN.
2. Maintaining RIKEN's outstanding history of achievements in science and technology.
3. RIKEN that motivates researchers.
4. To increase contributions to society and humankind.
5. RIKEN that contributes to culture.

1. Building a Scientific Vision

RAC Recommendation 1: Build a Strong Scientific Vision for the Future of RIKEN

Based on the content of the Noyori Declaration, RIKEN should attempt to build a strategic vision of the RIKEN organization through a broad and inclusive process that draws input from all parts of the RIKEN organization.

Over the past few years the RIKEN organization has enormously expanded. While this expansion was often opportunistic, with RIKEN responding to new opportunities provided by changing government priorities for science funding, it has enormously benefited the organization and has further increased the quality of RIKEN science. With the Noyori Initiative, the RIKEN president has developed a value laden statement to guide RIKEN in its future. The Noyori Doctrine can also be read as a strategic framework for organizational development of RIKEN over the next few years and to manage the transition from a phase of rapid expansion toward more modest growth. The members felt that it was now time for RIKEN to develop a scientific vision of how to integrate the various units of the organization in a positive and fruitful way, and without undue restriction on the operating flexibility of institutes and centers. Building such a vision was a main recommendation of the 4th RAC report. **While perhaps unintentional, the Noyori Doctrine captures in many ways the spirit of this recommendation.**

RAC Recommendation 1a: Revisit the Scientific Governance Structure of RIKEN through an Open and Accountable Process

RIKEN should undertake a broad re-assessment of the organizations scientific governance structure through an open and accountable process with inputs from all parts of the RIKEN organization.

Despite the enormous growth in size, **RIKEN's governance regime and administrative structure remains essentially unchanged.** RIKEN should attempt to revisit the scientific governance approach of the organization, based on a clear scientific vision of RIKEN's present and future role. This should be done through a broad, open, and accountable process with contributions from all parts of the RIKEN organization. Such a process might lead to far-reaching reorganization of RIKEN's management and administration and RAC believes that RIKEN should not hesitate to introduce fundamental reforms, if deemed necessary. However, it is

beyond the mandate of the RAC to spell-out or prescribe such reforms.

It was recognized that RIKEN manages a variety of very different constituent enterprises, including large-scale facilities, and that this diversity should be reflected in RIKEN's management approach. In his opening address, Dr. Noyori has mentioned the positioning of the three research systems at RIKEN – namely DRI, FRS, and the new institutes and centers– as an urgent issue that needs to be addressed. RAC believes that the way that RIKEN has positioned the Discovery Research Institute, the Frontier System, and the various research centers is problematic, and somewhat removed from the reality of RIKEN with its many new institutes and centers. The positioning of the three organizational approaches – namely, the positioning of basic and goal-oriented research at the DRI and the centers respectively, with the Frontier Research System connecting the two systems, appears artificial and a reflection of the history of the organization, or of definitions imposed by the government budget, rather than the type of research undertaken within the various parts of the organization. While the ILs are focused on curiosity-driven basic research, activities also include a fair amount of more applied research or research in the engineering sciences. By contrast, some of the new centers, and notably the Center for Developmental Biology (CDB) and the Research Center for Allergy and Immunology (RCAI) were positioned as mission-oriented or goal-oriented Institutes, when in fact research activities are addressing very basic questions in which curiosity fuels the route of scientific inquiry. The RAC urges consistency and precision in the use of language. The definition of mission-oriented or goal-oriented needs further clarification and organizational mission must not be confused with mission oriented research.

RAC Recommendation 1b: Develop a Long-term Plan for the Support of Basic Research Activities at RIKEN

For the highest level of scientific achievements, continuity and a long-term perspective are required. As part of its scientific vision, the time horizon of the various activities, and notably of the centers funded through the Millennium Project and other limited-term allocations, must be reexamined. At the same time, RIKEN must develop mechanisms to terminate activities that do not measure up.

The past five years have seen the creation of several new centers at RIKEN.

Through the Millennium Project the SNPs Research Center (SRC), the Plant Sciences Center (PSC), the Bioresource Center (BRC), and the Center for Developmental Biology (CDB) were created and, more recently, the Research Center for Immunology and Allergy (RCAI) was established. All of these centers have been extraordinarily successful, and in their relatively short existence have established themselves as premier institutions in their respective fields. This success exemplifies the wisdom and energy of those leaders within the government and RIKEN who had the insight to seize the opportunity to create these new activities in the most promising fields of contemporary research, and to recruit the most distinguished and effective leaders as directors for each of the centers. This success should be the source of great satisfaction to all those concerned. But, it also creates considerable responsibility for the leadership of RIKEN.

Having created these Centers of Excellence and having accumulated an extraordinary array of resources (human and physical) the question of their long–term future can no longer be avoided. Each of the subjects represented by the Centers is complex and far reaching, and requires sustained effort for substantial progress – to describe them as mission oriented merely implying a finite life span is unfortunate. At the same time, each of these subjects carry great promise for potential applications in medicine, biotechnology, or food security and safety. Some of these applications may emerge only slowly and at considerable cost, but the potential rewards are very high. It is essential for the future strength of RIKEN and its continued leadership in scientific progress in Japan and in the world that each of these Centers continue. Indeed, there seems to be no rational basis for distinguishing these centers from other entities at RIKEN in terms of longevity, especially as it is the judgment of the RAC that the Centers are among the most successful, forward looking, and effective research units within the entire organization. We therefore recommend emphatically that the continued operations of these Centers be assured, and a revised charter be generated for these Centers, as part of a long–term research strategy, thus providing a firm basis for long term planning in personnel policies and research operations.

At the same time, however, RIKEN **must find appropriate mechanisms to terminate activities that have run their course or that have not lived up to initial**

expectations.

2. Implementing the Vision and Strengthening Scientific Governance

RAC Recommendation 2: Strengthen the Role of RIKEN's President
RIKEN should strengthen the position of the RIKEN president and ensure that the president has adequate support and all the resources he needs, including flexible funding at his disposal, to implement his vision of the future of the RIKEN organization.

One of the strongest assets of RIKEN in its effort to develop a strong public identity is the visibility, prestige and charisma of the president himself. We thus strongly urge the president to take an active personal role in publicizing the mission of RIKEN, both within the institute and to the larger public. The president's leadership is also vital to creating and sustaining a climate of scientific excellence in which RIKEN will strive and thrive. The president needs adequate support, all necessary authority, and flexible funding at his disposal to accomplish this task.

RAC Recommendation 2a: Set-up an External Advisory Board Reporting to the President
To enhance accountability, RIKEN should constitute an external board, somewhat similar to an external board of directors at public corporations, that advises the president on an on-going basis on all issues of strategy, management, and operation.

In order to help the president to implement his scientific and management vision, the RAC believes that RIKEN and its president would be well served by creating an external Advisory Board, somewhat similar to an External Board of Directors at a large corporation. While RAC recognizes that RIKEN's status does not foresee an external Board of Directors, we believe such a group could be created informally, if the president wishes to do so. The RAC encourages the president to create such an independent advisory group, which we call the Board of RIKEN.

The role of the Board of RIKEN would be to advise the President on all matters of long-term strategy, mission and mandate, scientific leadership and vision, as well as management and organization.

RAC could conceive of two approaches to create such a board

1. The president has the option to create an entirely new Board. In this case, due consideration should be given to representatives from industry, leaders in scientific fields presently not represented within RIKEN, and members at large.

2. By contrast, a sub-group of the RAC could function, at least initially, as the core – or the launch pad – of such an advisory group.

It should be noted that the Board of RIKEN has a different function from the Research Advisory Council. While, in some sense, RAC is the present Board of RIKEN, its present function is evaluative. By contrast, the Board of RIKEN would have broader terms of reference that includes offering advice on strategy, but also includes more direct involvement in important management issues and decisions. In order to be effective, such a board would need to convene at least 3-4 times per year.

RAC Recommendation 2b: Strengthen the Position of Center and Institute Directors

RIKEN should strengthen the position of center and institute directors through a variety of measures. In particular, we suggest small management support teams should be set up in each center. They would be appointed by the center director to help to streamline the interface with the overall RIKEN administration. Further, we urge RIKEN to re-direct a portion of management overhead to be used at the discretion of center or institute directors. Finally, entrepreneurship by center directors should be rewarded.

In our major recommendation, we have advocated strengthening the position of the RIKEN president and to provide the president with all the support needed to implement his vision of the organization. In a similar vein, we believe RIKEN would

be well served by strengthening the position of center and institute directors while, at the same time, increasing efforts to ensure that the activities of the various RIKEN centers and institutes are well aligned with the overall scientific vision of the organization and take full advantage of the various facilities and opportunities provided by RIKEN.

RIKEN's administration was originally set up to best serve a large number of Institute Laboratories and individual scientific teams with widely varying interests, rather than more structured organizations, such as research centers. In order to best serve the various research centers and institutes, RIKEN should consider establishing small ″management teams″ with 2–3 staff selected by, and directly reporting to the director of each center or institute. An important goal of these ″management teams″ would be to streamline the interface between centers and institutes and the various RIKEN administrative services. Further, wherever possible we advocate that administrative decision making processes be simplified or delegated to center directors. In order to strengthen the position of center and institute directors, and increase flexibility, we further advocate that a certain fraction of the overhead on the research funds of each center or institute that is allocated for administrative use is redirected to centers in the form of unrestricted discretionary funding available for center directors.

Finally, some of the centers have shown considerable entrepreneurship and have been successful in obtaining outside funding through a variety of sources. This kind of entrepreneurship must be encouraged and rewarded. If success in the acquisition of external funding is achieved, reductions in base budget would send the wrong message and, in fact, create a perverse incentive to obtaining external funding.

3. Invigorating Strategic Relationships and Programs

RAC Recommendation 3: Increase Efforts to Build Strategic Relationships
RIKEN should make continuous efforts to build and strengthen strategic relationships. Especially, RIKEN should develop a framework to cultivate relationships with research organizations, with hospitals, both in Japan and abroad.

Science is increasingly done in a cooperative fashion, especially in the field of biology and biomedicine. Further, opportunities to build strategic relationships are increasing as many research organizations worldwide are recognizing the importance of fostering a network of global collaborations. Within this climate, RIKEN should reassess its efforts to build relationships with research organization in Japan, neighboring Asian Countries, and internationally. While RIKEN is not a funding body, RIKEN might consider setting-up special programs to support collaborations between RIKEN scientists and external partners. Strategic relationships should be built in a bottom-up fashion that enhances scientific developments rather than meeting an administrative goal.

Special consideration should be given to relationships with research hospitals and organizations involved in clinical research programs. Strong ties with hospitals are essential for a successful translational research strategy at RIKEN. These interactions are becoming more urgent as the health sciences are now such a large part of RIKEN's research portfolio.

RAC Recommendation 3a: Enlarge the Scope of Internal Strategic Programs

RIKEN should enlarge the scope of its strategic programs through a dedicated funding mechanism that provides small-scale funding for collaborations involving two or more members from different RIKEN organizations. Further, RIKEN should build the administrative infrastructure to support such a funding program.

To introduce mechanisms that encourage the creation of collaborative research arrangements between the various institute and centers at RIKEN has been a major recommendation in previous RAC reports – and a continuing concern cited by President Noyori in his opening speech. RAC recognizes that various efforts have been launched over the past few years and applauds the introduction of the Strategic Research Program. However, the relatively large size of grants distributed through this program means that only a small number of projects can be supported. In order to further promote the integration of the various parts of the RIKEN organization, we believe a more modestly sized grants program that supports a much larger number of grants would also be helpful. The call for proposals for such a program should be open to all scientists at RIKEN.

Applications should be reviewed in a fair, and transparent peer review process.

4. Empowering Graduate Students and Post-Doctoral Fellows

RAC Recommendation 4: Develop Programs to Increase the Quality of Post-doctoral Staff and Graduate Students Working at RIKEN

RIKEN should develop further programs to enable the hiring of the best post-doctoral fellows and graduate students and to support post-doctoral fellows and graduate students through internal training programs and programs for career development.

Over the past few years, RIKEN has successfully hired a number of world class scientists and we congratulate RIKEN on this achievement. It was less clear how well RIKEN is doing in hiring the best post-doctoral fellows, technicians, or graduate students to work at the institute. Post-doctoral fellows and graduate students are crucial to the RIKEN organization. RAC suggests that at the various RIKEN campuses one or more dedicated persons should coordinate the post-doctoral fellows' and graduate students' programs. These individuals would also include assistance in the provision of affordable housing especially for non-Japanese personnel. Further, the various RIKEN centers and institutes should develop in-house training programs especially targeting graduate students and post-doctoral fellows.

RAC Recommendation 4a: Create a Pre-doctoral Fellowship Program to Support Graduate Students Working at RIKEN

RIKEN should create a program to adequately support graduate students through pre-doctoral fellowships to be awarded in an open competition.

RAC is concerned that RIKEN presently does not allow the use of RIKEN funds for providing graduate students with a stipend. Ways and means should be found to ease such restrictions. It would be desirable to create a suitable number of pre-doctoral fellowship positions to be awarded through a competitive process open to students from Japan or abroad.

RAC Recommendation 4b: Provide Support to All Staff Seeking Employment after their RIKEN Contract Ends

RIKEN should develop a program to assist all staff whose contract has been discontinued to find future employment. Further, RIKEN should track the employment status of former RIKEN employees, and in particular of post-doctoral fellows and doctoral fellows.

The number of limited-term contracts at RIKEN has increased enormously over the past few years. The limitation to employ certain categories of staff longer than 5 years means that, over the next few years, a large number of people will leave various RIKEN centers. We strongly advocate that RIKEN create a service to assist post-doctoral fellows, students, and technicians in finding employment positions after their RIKEN contracts end. Also, RIKEN should put in place a system to track the employment situation of post-doctoral fellows, students, and technicians that have worked at RIKEN.

5. Fostering Translational Research

RAC Recommendation 5: Re-assess RIKEN's Technology Transfer Regime

We urge RIKEN to reassess its technology transfer regime and its efforts to foster collaborations between RIKEN scientists and industry researchers. Technology transfer efforts should over time achieve success levels that are comparable with those of other outstanding research institutions around the world.

The RAC felt that RIKEN should give the highest priority to a fundamental overhaul of the organization's technology transfer system and its interaction with industry and the health care system. Despite some improvements over the past few years, the present level of funding generated through interactions with industry as well as licensing activities are low for an organization of the size and breadth of RIKEN. The RAC firmly believes that this is not in any sense a function of the character of the research activities undertaken within RIKEN but, rather, has to be seen as a continuing challenge to the administration and management of RIKEN as they try to grapple with the change in cultural thinking about this issue. Further, in the present environment of increasingly open competition, a failure to

relate research activities within RIKEN to the development of commercial products and social benefits, such as health, will send the wrong message to the various audiences of RIKEN – from policymakers in governments to the general public. Most significantly one of the key Noyori declarations stresses the importance of science being seen by the public as contributing a healthy return on the dollars invested by governments.

RAC Recommendation 5a: Develop a Strategic Framework to Support Translational Research

RIKEN should develop a long-term strategic plan for translational research. Since considerable experience in the medical sector is necessary to develop such a plan, it is suggested to entrust the directors of those centers that are already involved in translational research with developing such a plan. Given the substantial risks involved in translational research, we urge considerable care be exercised in developing such an approach.

It is important to state that technology transfer activities at RIKEN should no longer simply target industry. Rather, given the greater prominence of life sciences investments at RIKEN and the application potential of a number of activities at the various research centers, the focus of technology transfer at RIKEN should now include the translation of basic insights into therapeutic applications. RAC recognized that translational research activities are difficult, time-consuming, expensive, and often unsuccessful. The risks of translational research are substantial and considerable damage could be done to the RIKEN organization through translational research activities that are implemented in a half-hearted or unprofessional fashion. We do not believe that RIKEN should create internal facilities to implement translational research, rather we suggest to implement translational research activities through strong partnerships with university hospitals and other clinical research facilities. Already some centers, notably the Research Center for Allergy and Immunology (RCAI), have started translational research activities in cooperation with hospitals and universities and these activities should be taken into account when designing a translational research strategy at RIKEN.

6. Positioning RIKEN as a World Leader

RAC Recommendation 6: Increase the Number of Foreign Scientists Working at RIKEN

RIKEN must continue its efforts to hire world-class foreign scientists. An adequate support system for all foreign scientists working at the various RIKEN campuses should be created and all efforts to assist foreign scientists and their families to integrate into the community should be encouraged. All relevant documents should be made available in English.

The progress in research that has been made at RIKEN over the past few years, and especially within some of the new centers, positions RIKEN amongst the leading research organizations worldwide. However, the number of foreign scientists working at RIKEN is still modest and there appears to have been little change over the past few years. While RAC recognizes the difficulty of attracting world-class scientists to work in Japan, it is clear that RIKEN must continue its efforts in this direction.

At centers funded through the Millennium project it is especially difficult to hire foreign scientists, due to the fact that only limited term contracts can be offered. High quality scientists are unlikely to come to Japan if all they are offered is a one-year contract and RIKEN should contemplate the possibility of 3-5-year employment contracts for foreign scientists or stable funding for laboratories lead by foreign scientists. Finally, several of the new centers have made efforts, often using their own funding, to build special support programs for foreign scientists in Japan. At the Center for Developmental Biology (CDB) a program has been started to make all important and relevant administrative documents available in English. Other campuses including RIKEN's headquarters should consider following this model. The Research Center for Allergy and Immunology (RCAI) has created an innovative funding scheme to support research collaborations. Again, this might be an approach that could be replicated at other RIKEN centers.

RAC Recommendation 6a: Increase the Number of Japanese Woman Scientists in Leading Positions at RIKEN

RIKEN must continue to make efforts to increase the number of woman scientists in team and group leader positions as well as within the higher levels of management.

Diversity is a hall-mark of world-class scientific organizations. While the number of woman scientists in group leader positions has increased over the past few years, RIKEN is still lagging far behind the top institutions in the world in the employment of woman scientists. However, RAC has also noted that several of the woman scientists in group leader positions are foreigners. Efforts must now be made to increase the number of woman Japanese scientists in group and team leader positions as well as the top management of RIKEN. This is crucial if RIKEN aspires to become a truly international organization. Further, efforts should be made to increase the number of woman staff in middle or higher management positions within the RIKEN administration.

7. Achieving Best Practices in Management and Administration

RAC Recommendation 7: Implement Best Practices in Management and Administrative Services

RIKEN should develop appropriate measures to enforce the highest levels of professionalism within the RIKEN administration and design benchmarks for specific administrative services. A sub-group within RAC should be created to evaluate management functions and administrative services at RIKEN.

RIKEN should aim at the highest possible standard not only in science, but also with respect to the various services provided by the RIKEN administration – including such areas as public relations or technology transfer. In order to become a world-class research organization, the highest levels of professionalism in services and management are crucial and should be enforced. The quality of many of these services varied and are far from uniform at the various RIKEN sites. In order to guarantee leadership in management and administration, in addition to scientific leadership, RIKEN might consider developing objective benchmarks for specific administrative services. It is important to stress here that the goal of the administration is to serve RIKEN's research enterprise and this fact must be taken into account when developing benchmarks for administrative services. Senior managers within the administration should undergo a regular evaluation process and administrative services should not be exempt from future RAC reviews. It is suggested that a sub-group within RAC be created to evaluate management functions and administrative services at RIKEN.

RAC Recommendation 7a: Develop a Coherent Long-term Personnel Management Strategy

In conjunction with its overall scientific strategy and vision, and based on a clear approach to scientific governance and management, RIKEN must develop a long-term personnel management approach that is coherent and convincing, rather than simply the product of history or a function of government funding policy.

The suggested link of research activities with certain types of employment contracts-with long-term contracts at DRI and short-term contracts at the centers-seem especially problematic. This said, RIKEN's diverse employment system should be seen as an asset, rather than a problem. However, RIKEN must now develop a long-term plan and a coherent approach towards personnel management for all parts of the RIKEN organization.

RAC Recommendation 7b: Develop Best Practices for the Management of Large Facilities and Resource Collections

RIKEN should continuously review its management of large-scale facilities and control associated costs. Further, wherever possible, RIKEN should attempt to increase the quality of service at its large-scale facilities or resource collections.

The RIKEN portfolio of activities contains a considerable number of large facilities, including notably SPring-8. RAC is concerned that managing these facilities may impose an increasing burden on the RIKEN organization, both in terms of budget and opportunity cost. Further, RIKEN should not become a service organization. Alternatively, the argument can be made that the experience gained when using large-scale facilities for research by an organization ensures that the same high standards are maintained when the same equipment is used for "service." We suggest RIKEN continuously review its service activities to ensure quality, while at the same time ensuring that service activities do not impinge on RIKEN's core research mission.

VI. ASSESSING RESEARCH ACTIVITIES AT RIKEN INSTITUTES AND CENTERS (Objective 3)

RAC has carefully reviewed the Advisory Council reports from the various RIKEN Institutes and Centers. The following summaries represent the consensus view of all RAC members, rather than individual Advisory Councils, and thus may differ in certain points from the latter.

Institute Laboratories (ILs)

The review of the ILAC report to RAC shows that, faithful to the historical tradition of RIKEN, there is world-leading and highly innovative science being done by dedicated and respected chief scientists in RIKEN. However, as the organization and structure of RIKEN has changed to embrace more focused research programs in the new institutes and centers, RAC believes that the role of the Institute Laboratories and the CSA at RIKEN needs to be clarified.

Especially given the objectives and directions conveyed in the Noyori Doctrine, we encourage RIKEN to consider adjusting the structure and focus of the ILs to achieve greater synergies and coherence. Whilst not wishing to be prescriptive we recommend that President Noyori consider various possibilities, including some of the following:

- Where appropriate, and in agreement with the medium to long-term plans of the Research Priority Committee, groupings of ILs into loose "faculties" might be considered for the pursuit of scientific activities. These "faculties" could then form the nuclei for new scientific developments.
- Where the programs of the chief scientists are directly relevant to those of an Institute or Center, the role of these ILs should be clarified. This especially applies to those Chief Scientists who have joint appointments at RIKEN Institutes or Centers.
- University partnerships should be further encouraged, in which, the academic freedom and intellectual distinction of chief scientists and their laboratories can find full expression.

We believe that some of the above changes might contribute to the recognition of the quality of research and the value of the ILs for the entire RIKEN organization. It should be the foremost goal for the ILs to provide an interdisciplinary, curiosity-driven foundation from which new scientific initiatives for RIKEN and

Japan will grow.

Frontier Research System (FRS)

Notwithstanding the excellence of research by a number of groups within the FRS, RAC believes that the mission of FRS should be re-visited by the RIKEN President and top management in order to respond to changes in the research environment which have taken place over the past few years. What is the meaning of "Frontier" today? What are the emerging "frontiers" in science and research? What are the "frontiers" at RIKEN?

RAC suggest that the mission of FRS be:

- Opening novel, challenging inter-disciplinary research fields by combining unique strengths from the various disciplines at RIKEN
- Implement innovative approaches to fund and manage interdisciplinary research programs

Historically, FRS has played an important role in introducing time-limited research projects and limited-term positions in the Japanese research system. Further, FRS has played an important role in encouraging young scientists to enter new research fields. Together with excellent program leaders, these remain important pillars of the FRS. However, RAC feels that FRS has increasingly turned into a framework of convenience where various activities that have not found a home elsewhere are placed or become a home for programs that have run their course. This is unfortunate and compromises the innovative nature and high quality of research at the FRS. In order to strengthen the FRS, higher quality management and strong leadership in the selection of priority research programs and research subjects will be necessary. Also, the selection process of research groups and teams should be made more transparent along with the new mission of the FRS. Furthermore, when research programs become successful and beyond the incubator mode, the activities and staff should migrate to the most appropriate center or institute, within RIKEN or elsewhere, given overall research priorities at RIKEN. Besides the mid-term review, it is recommended that a check point should be established for the purpose of judging if the research subjects are appropriately chosen.

If the top RIKEN management decides to continue FRS, even in its present form, the unique features of the FRS should be maintained, that is, opening up novel and challenging research areas that are not covered by any other research organization including universities. The implementation of the Integrated Collaboration Programs (ICRP) within FRS is questionable, as are some of the programs chosen. In particular, the V-CAD software development program does not seem to fit the unique features of the FRS. Similarly, the Nanoscience Research Program (NRP), despite the high quality of research within some of the groups, does not seem to correspond to the definition of an interdisciplinary research program.

Further, more efforts should be made to publicize FRS research activities more effectively and beyond the scientific community. RIKEN management should re-visit rules governing relationships with industry and universities. In particular, clear rules for joint appointments of university professors or industry scientists seem necessary.

Finally, FRS should pay more attention to encouraging young scientists to become independent mature scientists during their term at the organization. It is recommended to continue to recruit more women scientists, and to implement educational programs to strengthen the skills of young scientists. The educational program should not be limited to research capability but also have a broader mandate to include other general skills such as fostering creative thinking, articulating and solving problems, public presentations and communication skills. FRS should track young scientists' careers after their experience in the FRS to see if they move to stable, higher-level positions. Post employment feedback should be sought to try to improve the experience of individuals in the FRS program. RIKEN should also establish and implement a fair and continuous review system of young scientists to encourage and enhance their career development.

Brain Science Institute (BSI)

The RIKEN BSI Advisory Council met in April of 2004 with the new Director, Dr. Shun-ichi Amari, and members of BSI. In the opinion of the RAC, RIKEN BSI has rapidly achieved world-wide stature and visibility. The quality of the faculty is high, the facilities are excellent, the summer training program attracts students world-wide and there are strong international collaborations. RAC especially

commended the high quality of recent appointments, the appointment of women laboratory heads and unit leaders, and the appointment of outstanding young scientists as Group Directors. As its period of growth ends and its budget reaches steady state, the ability of RIKEN to recruit new scientists and to respond to new scientific opportunities will depend critically upon its ability to uphold the highest scientific standards.

Among the RAC's recommendations are: 1) that the Director should work with BSI investigators to develop a strategic plan establishing priorities for the future; 2) that special efforts be made to promote collaboration and cooperation, including awarding grants on a competitive basis specifically for collaborative projects across laboratories and sections: and 3) continuing efforts to improve the experience of post-doctoral fellows at RIKEN BSI. The question of graduate students deserves special attention as it may be relevant for other Centers and Institutes at RIKEN.

RIKEN BSI should encourage and expand its opportunities for graduate students. Perhaps the best solution would be to strengthen ties with universities. Appointments for RIKEN investigators as guest faculty members on the university side and research assistant fellowships for students on RIKEN side will be very helpful in encouraging students to carry out thesis research at BSI. BSI research members constitute a unique faculty of multidisciplinary backgrounds which is not available in any university in Japan. The benefit for RIKEN is the energy and intellectual vigor that graduate students bring and the increase in research collaboration that is fostered by graduate students among research faculty members. In addition we urge that the possibility of establishing a graduate program at RIKEN BSI sometime in the future should be considered.

Plant Science Center (PSC)

RAC was pleased with the progress of the PSC during the last 3 years and the implementation of suggestions and recommendations made by the Council during their 2003 on-site report. PSC is a world-class research institute. RAC strongly recommends that the PSC should be continued with increased support as a leading plant science center in Japan. The future of the PSC, however, remains the primary concern that has not been fully resolved. RAC encourages the RIKEN leadership to send a strong signal to the PSC faculty and staff that basic and

applied plant research in RIKEN will continue to be of high priority with a longer term commitment. Because of the fundamental nature of PSC research programs, RIKEN, as the premier research institution of Japan, can make significant contributions to focused national goals in the areas of food safety and security. PSC is also in a position to exploit plant diversity as a natural resource.

RAC believes that PSC researchers are highly competitive and can attract extramural funding. This would increase their visibility within the Japanese scientific community and enhance their competitive position. This recommendation, however, should not be used as an argument to reduce internal funding or substitute internal support with funding from outside sources.

RAC welcomes and supports the consolidation of all PSC research groups on the Yokohama campus as their proximity will facilitate interactions and the exchange of ideas. It is important however, that in this process all researchers have access to the infrastructure at the Yokohama campus in order to enhance their productivity. Currently some of the facilities are substandard including the chemical facility and the greenhouses. RAC strongly recommends to share training programs in bioinformatics, in which researchers from different programs can meet, exchange ideas and collaborate to develop tools for modeling biological processes. RAC is pleased that the PSC administration has responded positively and effectively to improve communication with the staff and among the scientists. Further mechanisms should be developed to facilitate interactions among the scientists and encourage their joint exploration of new research ideas and applications in plants.

Bioresource Center (BRC)

The BioResource Center is a major resource not only for RIKEN, but also for other research organizations in Japan and world-wide. This centre maintains, propagates, and delivers, a large variety of biological samples that are fully characterized and whose origins are documented, including the following:

- Mouse cells: transgenic strains, knock-out strains, recombinant inbred strains, wild-derived inbred strains, strains with chromosomal aberrations, other mutant and congenic strains
- Plant cells: a huge variety of seeds of Arabidopsis strains and of tobacco

clones

- Human cells
- DNAs from a wide variety of tumors or human, animal, and plant cells

The above samples are distributed world-wide. The entire catalogue is impressive and BRC's Internet site allows convenient on-line orders to be placed. These resources should be preserved, for the benefit of the scientific community in Japan and world-wide.

However, RAC is concerned about the financial position of the BRC, which appears fragile. We thus recommend that the business plan of BRC be revised urgently. At present, there is a very reasonable price structure, with charges at different levels for different organizations. It appears however that the charges for the resources are at times even below the cost of shipping. We recommend that the price structure be reviewed by comparison with costs at similar international institutions. Given the importance of its assets, financial stability is crucial for BRC. Further, we also recommend that the catalogue and availability of these resources be more effectively publicized throughout the world. A more coherent business plan and aggressive marketing activities will be needed to ensure the future of this formidable resource.

Genomic Sciences Center (GSC)

We are impressed with the accomplishments of this centre since the last RAC meeting. The amount and quality of data generated, and papers published are very impressive. They have definitely put the GSC on the map internationally. The former and present leadership is to be congratulated for these results. The future research plan proposed by the center is excellent and is fully endorsed by RAC. GSC has carried out extensive and comprehensive analysis of the basic building blocks of life (DNA, RNA, and proteins) over the past 5 years. In the coming 5 years, GSC will focus on the integration of these findings in order to understand living organisms as a molecular machine based on the information of the genome, transcriptome, proteome and metabolome of cells and organisms under-defined environmental conditions. This new approach should open up a new era for GSC in coming years.

In a multidisciplinary research center, there is always an ongoing struggle for better cooperation between the individual groups in order to leverage the resources in the most effective way. There is an opportunity to reassess this balance for the new director and to develop an updated, clearer vision for the future. Overall, new synergies between the groups within the GSC and other RIKEN institutes should be encouraged.

The key to the continuing success of GSC will be to ensure that young scientists are well educated to develop independent scientific programs and to use this experience as a basis for their careers within or outside of RIKEN. It is important to point out that GSC needs to update various pieces of equipment constantly, as newly-developed equipment often out-performs older ones. RAC believes it is appropriate that GSC continuously evaluate and prioritize its programs particularly in light of the rapidly changing developments that occur as the result of the evolution of genome sciences global effort.

SNP Research Center (SRC)

The SNP Research Center (SRC), which was created in 2000 with Millennium program funding, has rapidly evolved into one of the world's leading centers for genetic studies of common disease. The Center has created a number of novel technologies for high-throughput characterization of genetic variants (SNP genotyping). As reflected by the strong publication record, SRC scientists have been at the forefront of applications of SNP genotyping to identify susceptibility genes for common diseases or their complications, and to discover genetic factors involved in individual differences in therapeutic responses. The SRC plays a major role in the international consortium to develop new generation genetic mapping tools (the "HapMap" project), to which it is contributing 25% of the total effort. When completed in the next 2-3 years, these tools will greatly enhance the power of the Center's genetic mapping approach. Significant new insights into the genetic etiology of human disease with beneficial applications in health care can be expected to emerge in the medium to long-term from the Center's efforts.

The SRC provides support to outside research groups that are sponsored by the Ministry of Health, Labor and Welfare for genetic investigations of disease. The Center is collaborating with the Institute of Medical Sciences at University of Tokyo (IMSUT) and major hospitals in Japan in the "Personalized Medicine

Project″ which aims to collect DNA and plasma samples from 300,000 patients in 40 disease areas. The Centre also participates in the PharmaSNP Consortium, encompassing 42 Japanese pharmaceutical companies, to study genes involved in drug metabolism, and it has a number of collaborations with individual pharmaceutical partners to apply its results in the context of drug discovery.

In the near-term, the principal issue facing the SRC is to assure continuity of support at a level that will allow it to consolidate and to expand its studies within Japan and internationally, in line with the recommendations of the Scientific Advisory Board. This would involve an increase in the Center's SNP genotyping capacity, and recruitment or expansion of groups in a number of key areas such as statistical genetics and genetic epidemiology. In this respect, ethical aspects of SNP linkage analysis studies must be re-examined for their likely contribution to public health. Continuity of the Center's funding is a necessary condition for RIKEN to ensure its role in ambitious international or national programs such as the ″Personalized Medicine Project″, and to take a lead position nationally in supporting access to and diffusion of genetic technologies and methodologies to other academic groups within Japan. The SRC will also position RIKEN to take a lead role in education and training in genetics, and in formulation of policy on genetic studies in Japan and its alignment with policy in other countries.

Center For Developmental Biology (CDB)

Since its foundation in 2000 and completion of construction in 2002, the CDB has rapidly established itself as a premier institution in developmental biology and genetics with special emphasis on stem cell biology. CDB scientists have made substantial advances and published highly visible papers. Success must be credited to the leadership at CDB. It is noteworthy that CDB may be the largest institute or department entirely devoted to developmental biology worldwide, and already ranks among the best of its kind; its facilities and support are superb. A major asset is the CDB organizational structure, in which senior scientists (group directors) and junior scientists (team leaders) are entirely independent in conducting their research. As a result, morale among scientific staff is at a very high level, but with continuity of the program beyond five years a lingering concern. A rigorous system of quality review is in place, and if continuously applied may be expected to maintain the quality of the Center.

The most critical issue facing the CDB is long-term continuity. The complexity of animal development and the long-term prospects of application of developmental and regenerative biology to medicine make it imperative that the Center be given assurance of its continuation. That is critical in hiring and retaining high-quality staff and in planning research programs. Further, the administrative autonomy of the CDB within the RIKEN organization should be guarded as it has served the Center very well to date. Given continued support, the CDB should be in a position to expand its efforts at recruiting foreign and woman team leaders and possibly group directors.

Cooperation with universities to allow graduate students to come to the CDB should be pursued, probably by RIKEN as a whole. Efforts at translational research in the CDB should be supported, while keeping in mind that such work is long range and costly, but potentially most rewarding. In this regard it is most encouraging that the CDB is the centerpiece of substantial development on the Kobe Port Island. Translational research institutes in biomedical and information technology and a research hospital designed for clinical trials have been constructed, and over 60 biotech firms have rented laboratories or offices within the complex. These developments increase the likelihood that opportunities for medical or industrial applications that may emerge from CDB research will be seized and their promise will be explored.

Research Center for Allergy and Immunology (RCAI)

RCAI was officially founded in the spring of 2001. The core group of senior investigators was appointed in the autumn of the same year and most groups, teams and units have just finished setting up their laboratory at the center's new building in Yokohama. RCAI has recruited a highly qualified group of scientists who are international leaders in their fields and highly promising young investigators from well known laboratories in Japan and abroad. Their research achievements during 2002 – 2004 have already make RCAI into a frontline immunology research center. The proposed research summaries presented by group and team leaders include well-conceived projects with a high probability of success and a suitable mix of innovative high-risk initiatives. A mouse model with an amazingly robust human immune system has been developed at the Centre. This achievement is likely to have enormous potential.

The decision to provide young team leaders with great freedom and practical support through the center's core facilities is applauded. Outstanding central facilities provide RCAI scientists with important techniques without time-consuming replication of these skills within each laboratory. RCAI has attracted first-rate scientists to develop and manage these innovative center resources. With this support, several young investigators have already been able to significantly enhance their research performance since joining the center. RCAI has also established two programs that provide incentives for center investigators to engage in international collaborations and disease-oriented research.

Strong research programs in regulatory lymphocytes, immune regulation, immune tolerance, and related immunology research areas at RCAI will likely, in time, lead to important therapeutic innovations in allergic disease, auto-immunity, transplantation biology and immune surveillance. RAC appreciates the strong desire for the center to contribute to clinical innovation. However, for the present, RAC recommends a sharp focus on a limited number of pre-clinical studies and a carefully tailored approach to participation in early stage clinical research.

Specific recommendations include the following:

- Expand the RCAI "Research Collaboration Awards Program" which has already resulted in the initiation of well conceived projects that will bring in a number of highly regarded foreign investigators.
- The RCAI cohesive strategic plan includes an impressive set of innovative proposals, and staying on this course is highly encouraged.
- The director is encouraged to develop a canonical plan for future Center reviews. It is recommended that the research output of core research groups be evaluated after 4 to 5 years. For junior research teams, more frequent review of research activities, possibly within 2 to 3 years may be preferable.

In summary, RCAI has all the ingredients to become one of the pillars for keeping RIKEN in the global frontline of research organizations.