

REPORT OF THE 10TH RIKEN ADVISORY COUNCIL (RAC)
16 December 2016

Chair: Prof. Sir Colin Blakemore
Vice-chair: Prof. Howard Alper
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EXECUTIVE SUMMARY

The 10th meeting of the RIKEN Advisory Council (RAC) was convened on 13–16 December, 2016 at the InterContinental Tokyo Bay Hotel.

RIKEN President Hiroshi Matsumoto opened the meeting, introducing his vision for the Institute as it prepares to enter its second century. We congratulate RIKEN on its recognition as a Designated National Research and Development Institute, which gives RIKEN new responsibilities and opportunities in its contribution to Japanese science and technology, for the benefit of society. President Matsumoto's plans focus on identifying new ways to ensure that RIKEN's traditional strengths in fundamental scientific research are responsive to, and best serve the needs of the Japanese people and the world. This strategic vision for the future calls for greater interdisciplinary collaboration within the Institute and with universities and industry partners, and seeks to harness RIKEN's excellent research capabilities and infrastructure to give rise to new outcomes, including technical innovation, of value to Japan and Japanese society. We fully support President Matsumoto's plan for the start of RIKEN's next 100 years, which will focus its talents and resources on important societal and global issues. Execution of this ambitious plan will require careful attention to the formulation and implementation of strategy, and, most of all, will be subject to adequate financial resources.

President Matsumoto asked RAC for its opinions and recommendations, under the following terms of reference.

TERMS OF REFERENCE

1. The 10th RAC is asked to evaluate RIKEN's response to the recommendations made by the 9th RAC.
2. The 10th RAC is asked to address the directions RIKEN should take on research and development strategy under its fourth mid- to long-term plan.
3. Under the RIKEN Initiative for Scientific Excellence put forth by the new president, we place special emphasis on the five strategies shown below. The 10th RAC is asked to evaluate whether activities for these strategies are progressing adequately. We also ask for recommendations on any new tasks to be implemented.
 - Pioneer a research management model for maximizing research and development results
 - Lead the world in achieving new research and development results through scientific excellence
 - Become a hub for science and technology innovation
 - Serve as a focal point for global brain circulation

- Foster world-class leaders in scientific research
4. While our research activities are directed at solving problems that confront society, we believe there are still areas that we have yet to address. We ask for recommendations on new areas of research that RIKEN should undertake or targets we should strive for.

SUMMARY OF FINDINGS

As RIKEN prepares to celebrate the 100th anniversary of its foundation in 2017, we are delighted to see that its scientists continue to generate research results of the highest international caliber. The naming of new element 113, nihonium, which was first synthesized by RIKEN scientists, represents a signal achievement for Japanese science and is a testament to RIKEN's continuing strength in fundamental research. Across the Institute, RIKEN laboratories continue to produce findings that are widely recognized, published in the world's most respected academic journals, and highly cited by the international scientific community. RIKEN is seen worldwide as a symbol of Japan's achievements in science and technology. We look forward to a new century of RIKEN science.

TOR 1: The 10th RAC is asked to evaluate RIKEN's response to the recommendations made by the 9th RAC.

The Advisory Council was pleased with RIKEN's response to the Recommendations made at the 9th RAC Meeting in 2014, which we recognize came at a time of transition for the Institute, and in the face of significant changes in the funding and governance of scientific research within Japan. RIKEN has been making important strides in balancing basic discovery with innovation and in encouraging interdisciplinary research that takes advantage of its human and technological resources. We were favorably impressed with the efforts made in the past two years to increase and facilitate translational approaches, as well as the new emphasis on collaboration with universities and industry. This is seen both in the biomedically oriented research, driven by several of the strategic centers in the life sciences, and in new technology development efforts led by groups working in physics, chemistry and the material sciences.

RIKEN is now pursuing new plans for greater administrative efficiency and for increased recruitment of global scientific talent. We encourage the Institute to redouble its efforts to streamline its administration, to foster diversity and particularly gender equity at all career levels, within both research and administrative divisions, and to continue to work toward a fully international work environment.

Unlike in previous years, the 10th RAC was directed in its Terms of Reference to focus primarily on President Matsumoto's vision for the future of the Institute and the strategic plans to implement that vision, and to make comments and recommendations on new research directions. We did nonetheless receive presentations from the directors of all of the RIKEN strategic research centers, and we wish to comment, if only briefly, on the quality and importance of the work done by RIKEN scientists working at the various centers and in Independent Laboratories in the past two years.

The quality of RIKEN science remains at a world-class level, as reflected not only by conventional metrics concerning the numbers of publications and citations, but by the uniformly enthusiastic evaluations by the centers' individual Advisory Councils. These Advisory Councils, composed of leading scientists from around the world, provide RIKEN with authoritative assessments of the standing of its centers. Those assessments were full of praise for the strength and influence of RIKEN's science, despite the difficult financial situation and the demands of institutional change.

With its strength across a wide range of scientific disciplines, and its world-leading technical infrastructure, RIKEN provides not only rich opportunities for cross-disciplinary working, but also an environment in which to identify and nurture opportunities for translational research, aimed at producing innovations in health care, and new developments in technology.

In many instances, the technology platforms and infrastructure available within the Institute are among the best in the world. Researchers at RIKEN centers routinely publish findings in the most prestigious journals and their publications are frequently among the most highly cited reports in their respective fields. RIKEN's Independent Laboratories and chief scientists are also recognized at the international level for pursuing highly creative and successful programs in diverse areas of fundamental science.

TOR 2: The 10th RAC is asked to address the directions RIKEN should take on research and development strategy under its fourth mid- to long-term plan.

RIKEN requested the 10th RAC to evaluate and provide recommendations on the new directions in research and development it intends to explore as it enters its fourth institutional planning period. We note that for the first time, this period now extends up to seven years, as part of President Matsumoto's initiative to allow RIKEN scientists to pursue more challenging work, with longer horizons. The RAC focused broadly on plans for centers working in the life sciences, and in other areas of science, while recognizing the growing importance of new projects that cut across disciplinary borders and new groupings of centers to facilitate the delivery of broad strategic goals.

Strategy for life science centers

RIKEN-wide projects

RAC agrees that the RIKEN-wide programs in important areas such as data science, artificial intelligence, epigenetics, understanding and simulating single cells, and research on ageing are positive initiatives that provide avenues for synergistic cooperation between centers. The principle of providing internal competitive funding opportunities to supplement core support for centers and research teams is also a good one, which we hope will incentivize RIKEN scientists and will help them to respond quickly and effectively to new research opportunities. These changes should also contribute to RIKEN's plans to facilitate the translation of fundamental research towards practical application.

Translational research

Translational research in biomedicine, around the world, faces complex organizational and regulatory challenges, and it is often very costly. Bringing a major new drug to market typically costs \$1 billion - \$2 billion and often takes 10-15 years.

The translational pipeline springs from high-quality fundamental research, but it requires structured relationships with hospitals and medical schools, and usually with industry too. Initiating and nurturing translational effort is an important part of RIKEN's strategic plans, actively managed by the RIKEN leadership.

To develop its contribution to biomedical translation we recommend that RIKEN consider the appointment of a dedicated Director of Clinical Translation. This individual would, preferably, have clinical experience, as well as experience of working with or within the Japanese biomedical development system. This Director would be responsible for helping RIKEN researchers to identify opportunities for translation; advising RIKEN on the establishment of in-house translational capabilities where appropriate; and most importantly, building strong relationships with hospitals, medical schools and industry to enable pre-clinical and clinical translational collaborations. An additional role would be in promoting career development for younger scientists and physicians with an interest in coordinating clinical translation efforts, an area of increasing demand within Japan.

It is now widely recognized, around the world, that successful and cost-efficient biomedical translation depends on scientific collaboration and technical support that extends far beyond traditional pre-clinical and clinical science. The basic biological science that underpins translation needs access to advanced techniques for analyzing and imaging cellular and molecular processes. It depends on interaction between biologists, chemists, physicists and engineers.

Integrating basic biological knowledge about disease processes with clinical evidence demands strength in genomics, metabolomics and gene-environment interaction. Such work is heavily dependent on bioinformatics and computational analysis. In other words, successful translation towards medical application cannot be done in isolation from the physical and computational sciences, including informatics.

Any national funding process that administratively limits such interdisciplinary interaction may preclude the most innovative clinical translational programs. We note that through its capacities across many fields of fundamental science, infrastructure and technological resources, RIKEN is positioned to make important contributions in such interdisciplinary translational efforts, especially at the earlier stages of the translational process. We strongly recommend that RIKEN strives to establish robust connectivity with clinical environments, as well as to secure the financial resources to enable it to make its full contribution to biomedical translation.

Strategy for physical, material and mathematical science centers

(RIKEN has adopted the term “non-life” science for all areas of the natural sciences other the biological or life sciences, but “non-life” science is not used internationally. We suggest that RIKEN should consider the use of terminology that would be more widely recognized.)

As a general observation, we were impressed by the high quality of research and prospects for each of the centers working in physical, chemical, material, and computer/computational sciences. President Matsumoto shows a clear understanding of and appreciation for RIKEN's century-long history in the physical sciences, which we are confident will guide him in maintaining RIKEN's position in the forefront of

international science, as long as RIKEN has the financial support needed to maintain its leadership in science.

RIKEN's synchrotron, X-ray free electron laser imaging, and supercomputing facilities are all ranked as either the best or among the best in the world in their respective fields. In addition to conducting its own original research at the boundaries of knowledge, each of these centers performs an invaluable service to the scientific community within and outside of Japan. In winning the naming rights to element 113, nihonium, RIKEN's accelerator physics program gained international renown. Funding of its plans for expansion should be seriously and sympathetically considered, within funding constraints. Operational support for beam time in the current accelerator remains an important issue and we hope that additional funding can be secured to allow this facility to operate even more efficiently.

Highly interdisciplinary work by RIKEN centers in advanced photonics and emergent materials is also highly regarded and is generating wide impact. We suggest that further creative interactions within and between centers and independent laboratories should continue to be promoted, as should collaborative efforts with other groups in universities and industry research programs. One means of cultivating such cooperation may be to increase further the number of joint appointments at universities for RIKEN scientists. We saw many examples of the success of the joint appointment scheme, not only for promoting collaboration in research, but also for integrating RIKEN more closely with the university system in Japan.

Data science research, with its focus on the mining and analysis of large data sets, represents an important and timely new investment for RIKEN. New developments in information, computer/computational and mathematical research are already bearing fruit. The expanded program in theoretical and mathematical sciences shows real potential for bridging existing scientific fields and giving rise to new avenues of understanding of physical phenomena and information. We particularly commend RIKEN for its rapid and well-coordinated organization of an exciting new center working in advanced intelligence research and development, which will be a hub for this important national research initiative in Japan. This is an excellent example of the way in which RIKEN can move rapidly to establish new areas of research, of benefit to the country and to interdisciplinary research within RIKEN, provided it has the additional financial support needed for such initiatives.

We note that the translation of discoveries in the physical, chemical, materials and information sciences into new technologies is an important component of RIKEN's new strategic plans. These efforts to bridge fundamental and applied science should be carried forward within the paradigm of matching research "seeds" to scientific and social "needs," which might best be coordinated across the whole of RIKEN, for example by the Cluster for Industry Partnerships.

TOR 3: Under the RIKEN Initiative for Scientific Excellence put forth by the new president, we place special emphasis on the five strategies shown below. The 10th RAC is asked to evaluate whether activities for these strategies are progressing adequately. We also ask for recommendations on any new tasks to be implemented.

The RAC applauds President Matsumoto's strategic plans for the reform and reinforcement of RIKEN's scientific activities, as articulated in the RIKEN Initiative for Scientific Excellence (RISE). Further work is needed to clarify the nature of the clustering of centers and the provision of support by technical platforms, and to set clear, distinctive goals for these clusters. But impressive advances have already been made in the first year of this bold new vision, and we look forward to its continued progress in the new mid- to long-term plan. We address the specific items of the Initiative below.

1. Pioneer a research management model for maximizing research and development results

We recognize that aligning RIKEN's employment practices with the recently amended national labor law is an important and unavoidable undertaking. Nevertheless, any change in the proportions of indefinite and fixed-term employees must be undertaken in a judicious manner, to ensure that the changes deliver maximum benefits both to RIKEN and its staff, which will enhance prospects to recruit and retain high quality personnel. This process should include international benchmarking to serve as a reference for placing RIKEN within an international context.

The new emphasis on translation, engineering and addressing societal needs is an important expansion of RIKEN's activity. The proposal to introduce the new position of "innovation designer" shows promise as a means of extending RIKEN's capacity in these areas as well as an important human resource development activity within Japan.

2. Lead the world in achieving new research and development results through scientific excellence

RIKEN is internationally recognized for its dedication to pursuing ground-breaking research, which is likely, in the long run, to lead to new discoveries and inventions. Indices of scholarly output, technology and infrastructure services, and the production of intellectual property all show RIKEN to compare favorably with other leading institutes around the world. Technological innovations developed by the Institute should be exploited for the benefit of innovation and commercialization, consistent with President Matsumoto's new vision for RIKEN's social role.

3. Become a hub for science and technology innovation

RIKEN should accelerate its efforts to pursue partnerships with Japan's universities. It also serves as a science and technology hub for collaboration with industry, which advances the development of innovation emanating from its fundamental research. We encourage RIKEN to continue to develop capacity in its engagement with both the academic and industry research communities, through R&D partnerships, infrastructure services, and arrangements for the development of its intellectual property. This should include efforts to extend its strong international partnerships to include industry as well as academia.

4. Serve as a focal point for global brain circulation

RIKEN has built and continues to enhance its world-class research environment, which meets the highest global standards. It has made some progress in the attraction of attracting outstanding researchers from other countries, but it would benefit from

greater effort to recruit internationally, especially female scientists. Expanding its collaborations with researchers and institutions in other countries will further enable development of new ideas for mutual benefit. These actions contribute meaningfully to global brain circulation, and to RIKEN's own human resource development.

5. Foster world-class leaders in scientific research

RIKEN is now in the process of designing and implementing an employment system with more opportunities for career development and long-term security for key staff. These programs include internationally competitive sustainable funding, and attractive career paths for talented young researchers, which will allow them to develop into world-class leaders. Several RIKEN centers operate training programs for young scientists, and the Institute's fellowship and trainee programs have been successful at bringing in early career researchers from across Japan and around the world. However, further effort is needed to achieve levels of international involvement comparable with those in similar institutions elsewhere in the world.

TOR 4: While our research activities are directed at solving problems that confront society, we believe there are still areas that we have yet to address. We ask for recommendations on new areas of research that RIKEN should undertake or targets we should strive for.

In the life sciences, RIKEN has been very successful in many areas of basic research, including molecular biology, immunology, and neuroscience. The efficient transfer of this knowledge and the resulting scientific output to the benefit of the society could lead to highly innovative clinical programs and ultimately to innovative medical products. All such activity will ultimately contribute to the realization of "Society 5.0," as proposed under the 5th Science and Technology Basic Plan of the Japanese Government.

Analyses of RIKEN's research performance clearly show that while its output in these key areas is excellent, it remains strongly focused on fundamental research, with comparatively less activity in biomedical translation and innovation. Similar trends are seen in the gap between RIKEN's excellent scholarly productivity in physics, chemistry, and material science and its innovation in engineering and applied technology development.

As RIKEN does not have the resources and infrastructure to conduct clinical studies and/or pre-clinical drug development independently, it must reach out to partners in academia and industry and form strategic alliances in order to fully capitalize on its capabilities in key areas of the basic life sciences and transform them into innovations. We suggest that these objectives should be advanced through strategic partnerships with leading academic institutions in the area of biomedical R&D, such as Kyoto University, University of Tokyo, Osaka University, Keio University, Stanford, and Harvard. This will afford RIKEN scientists with access to disease knowledge, and support the effective establishment of joint research laboratories in research hospitals (see Annex 1).

Comprehensive strategic partnerships with pharmaceutical and biotechnology firms will also be key to the success of RIKEN's biomedical translational objectives. RIKEN should examine successful international models, such as the Novartis-Scripps

collaborative institute, the newly established “imCORE” (immunotherapy Centers of Research Excellence) developed in partnership with Roche, or the “International Immuno-Oncology Network” in cooperation with Bristol-Myers Squibb. Such translational development-oriented joint programs provide access to both pre-clinical and clinical development of potential new drugs and other biomedical technologies. Importantly, such strategic partnerships will be significantly less resource-intensive for RIKEN than establishing and conducting all of these activities internally. Such an approach to translational science could ultimately lead to high-quality and innovative joint clinical research programs, increasing RIKEN’s profile in biomedical R&D and delivering benefits to society. An analogous approach could be explored for the translation (in a broad sense, “engineering”) of RIKEN’s physics, chemistry, material science and computational/information science into innovation.

In both areas, especially in light of the current budgetary situation in Japan, we caution that any major new initiative to develop resources or technologies should be contingent on securing adequate funds. Allocation of funds to new activities should not be at the expense of RIKEN’s core competence in fundamental research, which is its most valuable asset, as well as the greatest source of the social benefits it delivers.

In the context of both the life sciences and the physical sciences, the new concept of an “Innovation Designer” position could play a crucial role in transforming RIKEN’s research output into new medicines and technologies. At present, people with the skills and experience to match the profile for such positions are rare in Japan. Thus, RIKEN may initially seek to recruit talented individuals on an international level, while at the same time developing its own capacity and cultivating human resources internally to expand the pool of innovation designers in the near- to mid-term. Success in this undertaking will have important indirect benefits for Japan’s scientific community, through the development of critical human capital to fill a national demand for individuals with this skill set.

KEY RECOMMENDATIONS

1. Organizational reforms

Reorganization of life sciences centers

We welcome President Matsumoto's initiative to reduce barriers to internal collaboration, promote translational research and collaboration, create uniform standards for employment and review, and foster a shared sense of institutional identity among RIKEN scientists. In assessing RIKEN's plans for new organizational initiatives in the life sciences, we first sought to articulate a number of guiding principles that will be key to their success.

Any merged or newly designated center should have a distinctive and long-term biological research mission, aligned with the RIKEN's overall strategic directions. Each center should contribute technology platforms, which will be open to use by all RIKEN scientists, thus contributing to a virtual life-science technologies platform. Over time, this could assist with rationalization of platforms. RIKEN should take advantage of the flexibility for PIs to move between centers, to create the most coherent groupings consistent with their own research interests and changing scientific currents.

It is extremely important that the names of the centers should expressly declare the major scientific focus, to maximize international visibility and facilitate the recruitment and retention of researchers. A center's name is one of the most visible and effective tools for institutional branding. Each center should develop a mission statement to be defined through consultation with the research staff and RIKEN executives. This mission statement should be expressed in clear language in order to facilitate broad awareness and understanding within and outside of the organization.

Pioneering Research Cluster

RIKEN has a long tradition of enabling independent scientists to pursue highly innovative research (the Chief Scientist scheme). The new plan proposes to extend this concept in the form of a "Pioneering Research Cluster" for independent researchers in all disciplines, and to provide opportunities for interaction, beyond the designated Centers. This is a promising idea, but it will require careful planning and management to make it effective.

We recognize the value of supporting excellent independent scientists to pursue new areas of research for the future. However, given the need for such researchers in the life sciences to be part of an appropriate scientific community, with access to needed scientific support, this would usually be best achieved by such independent researchers being hosted within centers that can provide the appropriate environment and mentorship for the research. Such an arrangement will require the agreement between the center, researcher and RIKEN executive during the process of recruitment and employment.

2. Strategic plans for realizing RIKEN's future vision

The RAC was impressed with the clarity of the President's new vision for the Institute and we support the efforts by the RIKEN leadership and administration to implement these designs. We also note that RIKEN is a large, complex organization with a long history of successful programs in diverse areas of basic science and infrastructure development; any institutional reforms must take care to preserve the Institute's core strengths. In undertaking a project of this complexity and scope, RIKEN may benefit from conducting benchmarking exercises to determine its current standing *vis-a-vis* comparable institutions around the world. Examination of specific examples of successful organizational direction-setting by other international research institutions may also serve as a valuable reference and guide.

We encourage RIKEN to develop a comprehensive strategy on the basis of a substantial analysis of its strengths, weaknesses, opportunities and threats. While every institution is unique, learning from the experience of other organizations can increase the efficiency with which RIKEN implements its own objectives, suggest models of positive change, and help RIKEN avoid potential pitfalls.

In addition to learning from the experience of other organizations, RIKEN should take fuller advantage of an under-utilized resource – the perspectives and energy of younger research staff. Internal mechanisms for strategy setting and implementation should include greater participation from early career PIs, since they represent the future of the organization and may often bring unique perspectives to discussions about the future of their fields, and of scientific research and development in general. As detailed below, women and non-Japanese scientists and staff should also be involved more actively in discussion and implementation of institutional strategies and reforms. Changes may be needed in the nature of the administrative process, to enable young researchers to be involved in strategic planning without compromising their research capability, and their contribution to such work should be recognized and rewarded.

RIKEN's new status as a Designated National Research and Development Institute is a significant achievement. However, the new responsibilities that this brings cannot be realized without appropriate funding. The RAC is surprised and alarmed by the continuous decline in the operational budget of RIKEN over more than 10 years. It is remarkable that RIKEN scientists have managed to maintain the volume and quality of their scientific outputs despite this substantial reduction in funds, and despite the stress and uncertainty that this creates. But such increases in efficiency cannot continue indefinitely. It is unrealistic to expect RIKEN to take on substantial new responsibilities without additional financial support. RAC is deeply concerned that increased demand without new resources will damage the quality of RIKEN's remarkable basic research, which is a national treasure for Japan.

We urge RIKEN to focus its efforts on making a compelling case for increased support to enable it to fulfil its opportunities and responsibilities to contribute to Japanese science and technology, for the benefit of society.

3. Human resources policies

Changes in Japan's labor laws are set to have a major impact on how RIKEN manages its human resources throughout the employment cycle. Implementing President Matsumoto's bold vision to transition from a workforce in which 90% of

are on fixed-term contracts, to one in which as many as 40% will have indefinite employment terms (resembling academic tenure) will have far-reaching impacts throughout the organization. Providing job security for RIKEN's best-performing scientists is a worthy goal, and the 10-year limit for fixed-term employments contract imposed under the amended law has lent a new sense of urgency to this undertaking.

We caution, however, that such fundamental reforms need to be implemented with an eye to long-term institutional effects. Committing to employ nearly half of all researchers on indefinite contracts may constrain RIKEN's ability to launch new initiatives and to respond to changes in government research priorities and budget availability. Care must be taken to ensure that providing longer-term security to its best scientists today does not limit its options for attracting and retaining the best scientists in the future, especially female researchers. This is particularly important given the pressure on public budgets and the trend toward reduced discretionary funding. We emphasize that even indefinite contracts must include provisions for regular review and evaluation, with options to reduce resources and, ultimately, to terminate contracts in cases of inadequate performance.

Retaining strong administrative support for scientists is also a central challenge, and RIKEN clearly recognizes the value of these internal services. However, as noted by previous Advisory Councils, we are concerned that the proportion of administrative staff at RIKEN is much higher than the norm in other countries (typically 5-8% of salary costs). We urge RIKEN to conduct a benchmarking review, and to set targets for its future expenditure on administration. The amended labor contract law requires the Institute to make difficult decisions about staff retention and turnover, but we caution that any decision to retain the great majority of administrative staff on indefinite contracts may significantly reduce the Institute's options to rebalance and adapt to changing conditions and new scientific goals in the future.

4. Promoting gender equity

Finding ways to recruit and provide attractive career pathways for women in both research and administrative capacities is critically important to the RIKEN organization. This is true not only as a matter of conforming with Japan's national policies and international trends, but is essential to ensure the Institute's competitiveness as well. While we acknowledge its efforts in establishing diversity programs, and its goal to increase the percentage of women in management positions by 2018, a much stronger effort is required to achieve a fundamental change in gender balance. Increasing the number of women in highly visible leadership roles can have significant positive impacts on the overall performance and on the perceptions of younger generations about the career opportunities available to them.

The goal of having at least 12% of administrative management positions filled by women by 2018 is a solid beginning, but there needs to be even greater commitment to hiring a larger proportion of women as scientific leaders. Setting concrete numerical targets for employment of female research leaders is imperative in order to make this a clear institutional priority. We note the success that the Center for Emergent Matter Science has had in attracting new research program leaders through women-only recruitment initiatives. RIKEN may also benefit from reference to international programs, such as Athena-SWAN in the UK, which have had notable

success in redressing gender imbalances in research and academia. Such measures on a broader scale will enable RIKEN achieve its equity goals.

We strongly recommend that all appointment and selection committees comprise a healthy balance of women and men, including, when necessary, individuals from outside RIKEN. We emphasize that hiring is not an end, but only the first step toward creating an environment in which women feel welcomed and supported at RIKEN. Mentorship by successful and experienced women is also critical in providing trusted advisors and models for success for younger recruits; when necessary, this should also involve individuals from outside the Institute. To provide additional models of success and guidance at the research center level, we strongly recommend that each Advisory Council include at least one female member. Support programs for family care, career development, better work environments, onsite child care, and the establishment of a Diversity Office are all welcome initiatives, but continued attention must be paid to transforming the Institute's culture at the highest levels and throughout the organization.

5. Attracting and supporting global talent

As one of the world's premiere basic research institutions, RIKEN is both a home to and a source of the highest level of international scientific talent, consistent with its goal of becoming a hub for global brain circulation. The Institute continues to make progress in attracting international research staff at many career stages, and we are informed that nearly 20% of the research staff comes from outside of Japan (although clarification is needed as to the fraction of students in this total). Given its international standing and its excellent resources and facilities, we believe that even greater numbers of the most talented scientists could be recruited to RIKEN. This would provide an excellent opportunity to recruit leading female researchers. Efforts should be made by all senior research leaders, center directors in particular, to proactively recruit young and mid-career scientists using their networks and through their participation in international conferences and other venues.

Support systems for foreign scientists in their lives within and outside of the Institute continue to play an important role in helping to smooth the transition to life in Japan. In support of these efforts, we reaffirm the recommendation of the 9th RAC that RIKEN make English its official language. While challenges will inevitably arise in communications, particularly with other branches of Japan's civil service, this transition is necessary to making RIKEN a truly international workplace. We note that institutions in many other countries, including Canada and much of the EU, have confronted and overcome similar challenges, and the Okinawa Institute of Science and Technology and the WPI Research Centers have set an important precedent for creating an English-speaking research and administrative environment within Japan.

6. Effective communications

Communications will become increasingly important as RIKEN moves forward in its mission to increase its visibility, public awareness of its research activities, and recognition for the social value it produces. RIKEN's internal communication specialists should regularly visit the centers and other research units to learn from the researchers about their latest significant results and other noteworthy developments. Researchers should be encouraged to explain clearly how and why their work has impacted and will impact their field, and society as a whole, and their work in

communication and public engagement should be acknowledged and rewarded. RIKEN might, for instance, consider establishing awards or prizes for researchers making a strong contribution in this area.

On at least an annual basis, communications staff should give presentations to directors, PIs and other researchers at the various RIKEN sites on the importance of communicating research and innovation successes, and explain the added value to the researchers and others. As part of orientation briefings to new researchers and others, communications staff should give presentations to sensitize new staff early in their careers to the benefits of communicating the results from their research to the media and to society as a whole. Arrangements should be made for researchers to be coached in preparation for interviews with TV, radio, newspapers and other media. In keeping with current trends in popular media and outreach, RIKEN should develop comprehensive strategies for communications using social media platforms. Scientists should be helped and encouraged to engage directly with the public through these media, and RIKEN should put in place policies to educate and support its scientists in such public engagement activities.

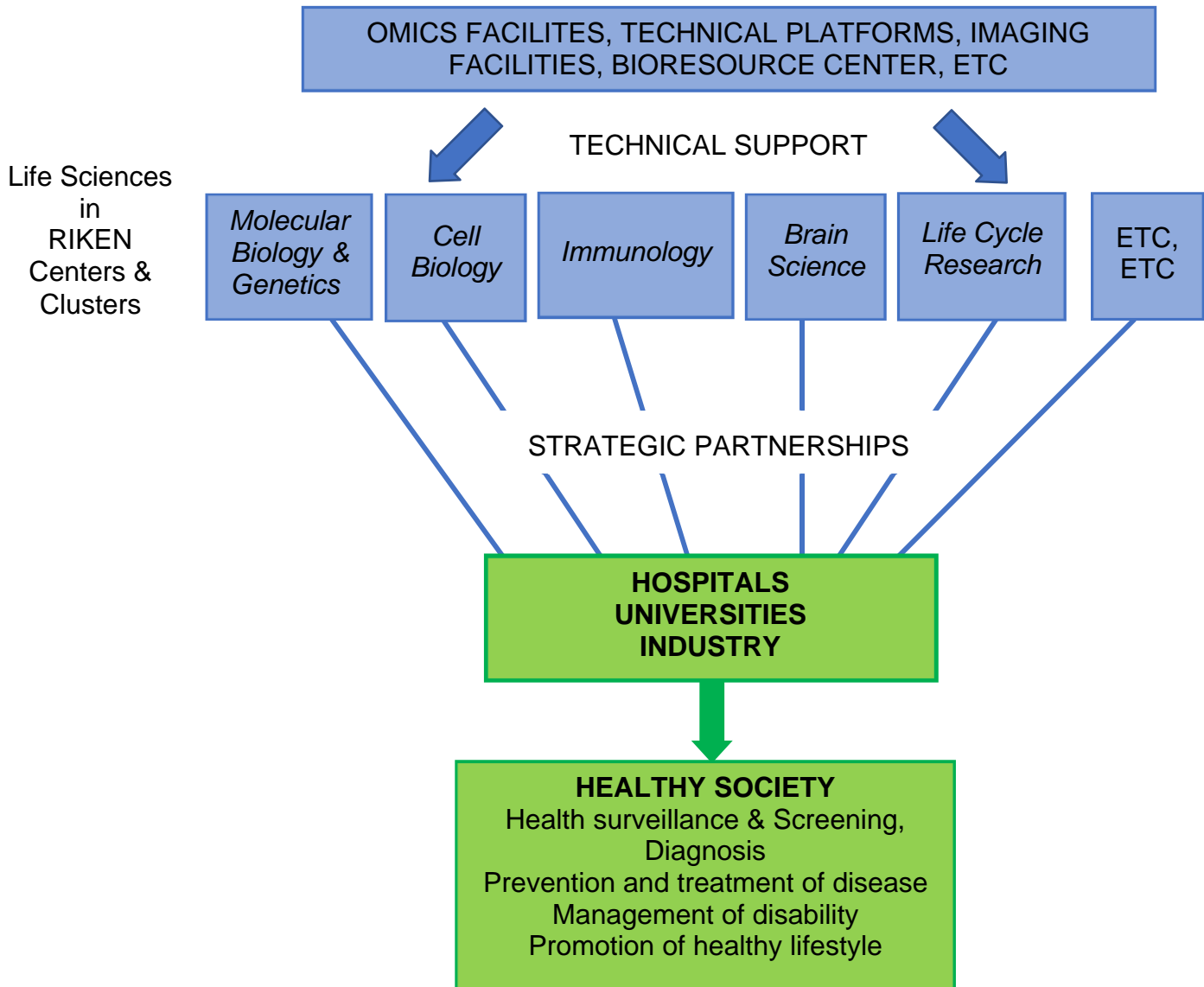
RIKEN should seek to further develop its mutual communications with relevant government ministries and agencies, to promote its mission and gain better insight into government agendas and constraints. Similarly, RIKEN should continue in its current efforts to explore and cultivate industry research interests and developmental objectives. With the ongoing transition to more competitive and project-specific funding of science and its own focus on increased interdisciplinary and translational R&D, RIKEN must be prepared to understand and negotiate with all potential sources of funding in both the public and private sectors.

7. Presentations to future RAC meetings

Although the members of RAC realize that their task is not to evaluate the performance of individual scientists and centers, they urge RIKEN to include a broad overview of the work of the centers, the technical platforms, chief scientists and the new Pioneering Research Cluster, in future presentations to RAC. We hope that this overview of RIKEN's work can include presentations by young researchers, including women, so as to give RAC a full impression of RIKEN's scientific work. In addition, RAC would appreciate clarification of the administrative and executive structure of the institute, including the role of the Science Council and other bodies.

ANNEX 1

A POSSIBLE MODEL FOR RIKEN'S CONTRIBUTION TO BIOMEDICAL TRANSLATION



This diagram illustrates the proposal that RIKEN's life science centers, supported by the BioResource Center and the technical platforms, should establish strategic partnerships with universities, hospitals and industry, to facilitate the translation of fundamental discovery into biomedical innovation. As described in the Report, RAC believes that close interaction between life science research and the physical sciences (chemistry and physics), mathematical and computational sciences, will be essential for future progress in research relevant to biomedical translation. RIKEN provides a strong environment for such interaction between the life sciences and other scientific disciplines. The RIKEN Cluster for Industry Partnerships, the proposed Innovation Designers, and the Director of Clinical Translation, recommended by RAC, should assist in the establishment of partnerships with universities, hospitals and industry.