A DRAFT VISION DOCUMENT FOR INDIAN SCIENCE

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INDIAN NATIONAL SCIENCE ACADEMY
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FOREWORD

The Indian National Science Academy (INSA) celebrated its Platinum Jubilee in 2009. The Platinum Jubilee events were inaugurated at New Delhi by the Prime Minister Dr. Manmohan Singh on January 10, 2009 and the concluding session, opened by the President of India Smt. Pratibha Devisingh Patil and with participation by the Presidents and representatives of sister academies around the world and international scientific organisation, was held at Kolkata during 7-10 December, 2009. The year-long celebrations were marked by several scientific meetings and publications in addition to long term efforts such as establishing of a Science Policy Advisory Cell and initiation of an INSA archive.

Another initiative during the Platinum Jubilee Year was the commissioning of a group of comparatively young scientists to prepare a draft vision document for Indian science. I am grateful to this group, with LS Shashidhara as the Convener, for successfully undertaking this task. It is hoped that this document, presented here, would stimulate wide discussions and debate which would hopefully serve to further strengthening it.

M Vijayan
President
Indian National Science Academy

PREFACE

We are pleased to present draft of "A Vision Document for Indian Science", commissioned by the President, Indian National Science Academy, New Delhi as a special initiative of INSA in its Platinum Jubilee year.

The idea behind this document is that it should serve as a guide for Indian science policy in the short and intermediate term. At a broader level, it should provide scientists, educationalists, administrators and policy makers an idea of the issues, which confront Indian science today together with input from the scientific community, which clarifies how best they might be addressed in order to strengthen and consolidate the Indian scientific enterprise. It, of course, involves continuous referral to this document by all of us and ensure that it is used as baseline in all future policy decisions.

Authors of the first draft of this document represent a wide range of scientific and science-related backgrounds and come from a spectrum of different types of scientific institutions (see Annexure–I). Virtually all of the authors would be counted as "mid-career" scientists, with diverse institutional affiliations and fields of research and independent scientific careers which began in the early to late 1990's, thus straddling scientific generations across two transformational decades in India. This document represents our collective efforts towards evolving a set of objectives towards a vision for Indian science and what it could be.

While this draft was discussed, prepared and consolidated by a small group, it has been significantly improved through input from a large number of scientists from across the country, who share similar concerns regarding science in India. Going forward, it is vital that this draft document be further circulated and discussed in public forums, to aid in the wider acceptance of the final document, then only it would seen as truly representative of the views of the larger scientific community and other stakeholders.

LS Shashidhara
Convener
INSA Vision Group

INSA-VISION

Introduction

The vitality of a scientific community springs from many sources. One lies in its capacity to identify, attract and nurture gifted individuals and provide them support and space in which to develop. Another lies in its success in promoting a culture of science which places a premium on accomplishments, emphasizes scientific integrity and values the contribution of the teacher. A third source is its capacity to manage the interface between advances in basic and applied science, technological change and economic progress, while yet another lies in its ability to engage with the non-scientific public as well as policy makers, to carve a space for independent scientific input on a range of issues important to society.

While we may take some limited pride in what Indian science has accomplished so far given the challenges we have faced, there is much to be concerned about. We are far from achieving a vital, globally competitive scientific community of an adequate size, which engages with and is accountable to our society. For example, less than a quarter of those enrolled for degrees in science in India, a miniscule fraction of our population, go on to complete these degrees currently. Of those who do finish, a far smaller fraction will ultimately enter research.

In Indian science currently, a few islands of relative excellence and a small number of talented individuals stand out amidst a vast and unremarkable background. Indian institutions which support the scientific enterprise, ranging from large universities to research institutes, government laboratories and undergraduate colleges, share no common clearly articulated purpose. There are problems of the absence of scalability of individual efforts to meaningful levels, of plain misgovernance and uninspired leadership, an overall lack of democratic functioning as well as the withering away of academic independence in many of our institutions. These are exacerbated by a failure to recognize how deep-rooted these problems are, coupled with an overall reluctance to accept correction.

But there are also problems of a lack of imagination, a refusal to move with the times and the absence of a "larger picture". We believe that a lack of clarity concerning the development of a scientific enterprise that is rooted both in our unique situation as well as in our needs as a country is an equal contributor to the problems, which currently confront Indian science. The economic transformations of the past two decades have created a sense of opportunity and dynamism in our society, making this an appropriate time to consider and attempt to define a vision for science in India.

This document is an effort to evolve a set of collective objectives towards a vision for Indian science and what it could be. It is inevitable that we will echo ideas and themes that have formed part of similar vision documents in the past. A few new possibilities have been examined, some of which have not been addressed previously. Specifically, we all should work towards:

A vital, globally competitive Indian scientific community, engaged with and accountable to our society, which creates and nurtures new schools of thought while drawing on its own resources with a wider collaborative, interactive and inclusive environment.

This document follows a few basic themes. We begin by outlining our view of the desirable contours of a general landscape of science in India, based on our understanding as scientists of the intellectual requirements for high-quality scientific work and a well-informed, scientifically

literate society. Against this background, in the next section, we suggest possible transformative changes in the structure of scientific institutions in India. In the final section, we examine possible routes, centred around the individual scientist, towards our vision for Indian science.

1. The Space for Science

A plurality of scientific styles and disciplines, with the possibility of multi-disciplinary research, is an essential component of a functioning scientific community. The opposition of basic science vs. technology, pure vs. applied science, individual-based vs. team efforts, "relevant" vs. "blue-skies" research distracts from this purpose. To maintain the vitality and responsiveness of the scientific community, we stress that it is necessary to foster and promote interactions with other areas of knowledge, with industry and with society. We take for granted that overall funding for education and science must reach levels at which Indian science can become an equal contributor to global knowledge.

In particular, we highlight the following aspects:

The Importance and Relevance of Basic Science

The pursuit of basic science is a fundamental expression of human creativity. No national scientific enterprise can be sustainable in the long term if it does not contain generous room for curiosity-driven research with no conceivable or immediate pay-off such as, for example, research in pure mathematics. While the technological outcomes and social benefits of basic science are almost always long-term and rarely predictable, such science creates and consolidates overall competence and intellectual diversity. In particular, the encouragement of "small" science as opposed to large project-mode science, offers many specific advantages for a country such as ours, including modest funding requirements, scalability as well as opportunities for self-correction. While certain areas of science require the focused team effort and techno-logical drive associated with "grand challenge" projects, such efforts can be successful and sustainable only against a background level of competence generated by relatively small, individual-centred efforts.

We see a judicious mix of small and big science as being key to our future progress, but particularly stress the role of small science. The state of mathematics education and research in India highlights many of the problems faced by basic science and may be a good test case where possible solutions may be tested without substantial additional investment.

Leveraging on our Advantages

Biodiversity, ecosystems unavailable elsewhere, a long history of knowledge of indigenous flora and fauna and a unique geological and geographical context are all India-specific advantages that other countries do not possess. India is a mega-biodiversity country because of its unique geological and climatic past: natural evolution, which thrived on changes in the realms of geology and climate has created an immense diversity of life here, matched by few nations on earth. Similarly, while India represents only a sixth of the world's population, it has the world's largest human diversity. Such locational advantages automatically privilege the category of sciences, which address them, such as ecology, zoology, botany, earth science and others. In particular, the specific needs of research conducted in "natural laboratories" by field scientists who face unique constraints, should be addressed.

We should specifically identify and support science which can leverage on the advantages of our bio- and geo- sphere, as our niche here is unique. The role of indigenous knowledge or "folk science" is an important one and managing the integration of such knowledge into more formal scientific systems is vital.

Science and Societal Goals

Issues such as climate change and environmental degradation, ensuring the availability of clean water, improving the quality of public health, feeding our population and renewable energy are all areas where science can contribute to societal goals. Doing this well requires a system that encourages and fosters close interactions between science, the social sciences and society. We emphasize the need here for networking practitioners from different fields, each practicing what they do, but with creative stimulus and input from the others. More generally, we stress the role of the scientific approach and the establishment of the scientific temper in eradicating superstition and irrational practices.

We should specifically identify and support science which impacts our social goals as a country, networking practitioners of such science from different fields, and taking care to explain our efforts to the general public in the interests of social engagement with science and its practice.

Bridging the Gap between Basic Science and Medicine

There has been a major gap between clinical practitioners and other scientists, in India more perhaps than in any other country. The effects of the remarkable rate at which life-styles and the environment have changed in recent decades on public health will present special challenges to the clinician in the future, supplying an unprecedented opportunity for fruitful collaboration between basic science and medicine. Clinicians, epidemiologists, biologists, scientists and engineers from all branches of sciences must collaborate to address the challenges we will face in the future in the context of public health. India-specific public health issues call for special attention from us since other scientific communities are unlikely to address them at the scale we require.

We see very strong reasons to bridge the basic science-medicine gap in India, with one possible test case the initiation of strong MD-Ph.D. programs.

Connecting Science and Industry

The interaction between science and industry is necessary from the point of view of inspiring innovation, generating socially useful knowledge and creating an education-employment without which the scientific community cannot grow and sustain itself. As the French Nobel laureate P.G. de Gennes once commented in this context ".. research is not clearly segregated between fundamental and applied. To blend the two mind sets is not only desirable, it is essential to maintaining our economic and industrial competitiveness". Many of the most remarkable technological developments of the past century were seeded in basic science immersed in an industrial environment, for example, the invention of the transistor, the laser and PCR, all of which were born in industrial laboratories.

In India, there is very little engagement of basic science with industry, a gap, which ought to be urgently bridged. We pose the question of how best to do this to the larger scientific and technological community. In particular, a closer connect between science and industry could help in establishing an atmosphere in which the creation of intellectual property is a

natural outcome. A policy framework and mechanism, which encourages and supports the filing of patents, technology licensing, the establishment of start-up companies etc. in scientific institutions, thus creating an eco-system which promotes innovation and entrepreneurship, is desirable.

Linking Science and the Humanities

Increasingly, the sciences and the humanities are converging in ways that could not have been anticipated. Disciplines such as econophysics and the cognitive sciences demand domain knowledge in several separated areas, while the ethical problems thrown up by modern biotechnology impact major philosophical issues. Yet, our training of students and researchers still proceeds along traditional lines, emphasizing rather than erasing the divisions between these fields.

We see a need for such "cross-cultural" interaction, which bridge the gap between natural and social scientist.

Increasing Public Engagement with Science

Public access to science and scientists is limited. Our institutions do little outreach of a significant nature. If our news papers do carry scientific content, it is often reproduced verbatim from articles published outside India and carry little that is India-specific or can inform the public about work done in this country.

A concerted effort should be made to communicate features of Indian science effectively. Given the considerably larger reach of newspapers and magazines in languages other than English, special attention should be paid to making works available in translation, wherever possible.

Science and the Framing of Public Policy

Public policy to which scientific input is a requirement must be addressed by independent, unbiased advice. In other countries, national academies of science often provide such input in the form of reasoned, accessible and well-argued advice on a variety of issues, such as global warming or genetically modified organisms. These documents are often sharply debated, clearly argued, written in language accessible to the layman and presented to lawmakers and administrators. The ability to do this would be a sign of the overall maturity and consolidation of our scientific community.

In particular, we stress that interaction of the scientific community with administrators and lawmakers should happen in the larger context of public engagement and societal support for science and the scientific activity. We suggest the creation of multiple forums in which representatives of the scientific community can provide useful and regular input to public servants over a variety of issues involving science and technology. It should be possible to ensure seamless mobility between the roles of science administrators and science practitioners to foster a better understanding of the others needs and requirements.

Cross-disciplinary Science

The push towards increased interdisciplinarity is a global phenomenon, one that we would be unwise to ignore. The biological sciences, for example, offer a unique advantage for cross-disciplinary science and we sense a growing excitement amongst scientists in many different

fields concerning the possibilities in this area. The Indian bio- and geo- sphere could provide an overall background for exciting research and teaching, which overlaps a wide range of fields.

We could promote interdisciplinarity by, for example, encouraging students to take courses across traditional departments, by centering meetings around two related and possibly convergent fields rather than a single area, and by making students and scientists aware of the possibilities of illuminating one field with ideas from another.

Increasing Access to Science

A large fraction of children of school-going age, especially residing in rural areas, are effectively denied good science education at the crucial early stages of their education and are thus excluded from taking up careers in science. Identifying bright students at an early stage, nurturing them through summer and winter camps and supporting them with generous scholarships will help improve the quality and number of students entering science significantly. This would also increase awareness about the opportunities available in science at the undergraduate and higher levels. Similar programs aimed at undergraduate colleges would also have a very positive effect. This increase in awareness about opportunities in science may be expected to have a cascading effect as information about such options reaches a wider audience.

We suggest an extensive national level program to identify and encourage bright students at the school-level through nurture camps and generous scholarships that recognize excellence and identify talent at an early stage.

The Role of Scientific Academies

Vision documents for Indian science will continue to remain just visions unless there is a deep commitment to translate these ideas and proposals into action. We see an important role for the scientific academies in this regard, since they are well placed to interface between practicing scientists and administrators and by their very nature bring together members of the scientific community who are distinguished by their scientific contributions, academic leadership and administrative abilities. However, for academy membership to be seen as more than membership of an elite club, the Indian academies of science should take a more active role than they have so far in promoting and defending science and its practitioners, standing unequivocally for the highest ethical norms and demonstrating leadership of the highest order.

The various Indian academies of science should provide moral and practical leadership at the highest level, taking the responsibility not just for the formulation of decadal visions for Indian science but for their detailed implementation, working closely with the broader scientific community to realize them and monitoring progress towards clearly defined common goals.

2. Scientific Institutions

In framing our suggestions in this section, we proceed from the consensus that scientific institutions must provide

- a broad base, in terms of both institutions and individuals, with a high level of competence in a multiplicity of disciplines,
- the opportunity for constructive and sustained interdisciplinary interactions,
- an engagement with the local environment, in both the geographical and social senses.

We have also kept in mind the changing social context of the last two decades, driven by globalization and a changing demographic profile. One outcome of economic growth and liberalization has been to generate a sense of collective self-confidence in all spheres, including that of science and technology. However, for this to have a positive effect on scientific and educational institutions, it is necessary to correct the skewed competence and infrastructure gradient that exists at present.

More than a half-century of democracy has meant a changing demographic profile in our institutions of higher education and a recognition that such education can be enormously enabling for individuals. The resulting demand for greater access to higher (particularly professional) education by a wider cross section of society, could be an excellent catalyst for scientific growth, provided expansion is accompanied by an awareness of the minimum parameters required for quality.

Our key proposals at the institutional level are:

Revitalizing Universities

The traditional university as a home for learning has advantages that no other system appears to possess. These include access to diverse disciplines, student numbers that are large enough to address the problems of scale, clear connection between research and teaching and the possibility of cross-fertilization between disciplines of science and the humanities. Traditional universities in many cases have been reduced to degree awarding bodies, with highly unsatisfactory undergraduate education that serves neither the purpose of post-school skill formation nor provides the necessary intellectual exposure or training required for research. Together with the setting up of new institutions, we must revitalize traditional universities by whatever means possible, engaging urgently in an effort to transform them into true centres of learning.

While the model of a research university that integrates both undergraduate teaching and research addresses the multiple needs for disciplinary diversity, pedagogical quality and excellence in research, we should also seek and explore possible alternatives to such structures, recognizing that the gap between supply and demand is likely to remain high in the fore-seeable future.

We suggest, as others before us, that full autonomy coupled to rigorous, periodic and publicly accessible review may help to revitalize our universities.

Coupling the Research Institute with the University

The Indian scientific enterprise contains both small, relatively high-profile, stand-alone institutes as well as a large system of public and private universities. We can see only advantages in coupling these, thereby providing scientists from both types of institutions the stimulus of young minds as well as access to a variety of complementary approaches. This would also provide faculty from both research institutes and universities access to a joint spectrum of research facilities. One way to do this would be to recommend that all new institutes to be set up must forge links with one or more universities at the outset. In tandem, we must explore ways of connecting existing institutions with similar aims in mind.

We suggest a significant increase in the number of joint appointments between universities and research institutes, stressing that such joint appointments must allow for equal

participation, and thus a genuine stake, in both institutions. Joint Ph.D. programs, offered between a cluster of universities and research institutions, may help to create critical masses of students in graduate programs, thus partially addressing the long-term problems of a shortage of faculty.

Public and Private Support for Science

Science and education, which are by nature collective investments in a common good, require public support. In most developed countries, however, there is significant additional private sector funding in key areas of technology, medicine and education. We believe that it is important that the private sector sees advantages in engaging with and supporting research through the exploration of common interests. For example, such support could come from private funding to support Ph.D. students and post-doctoral fellows working on problems of interest to industry. More broadly, the employability of graduates is something that a dialogue between private industry and research/education could play a large role in addressing. Regarding mechanisms for the funding of science, it is important that mechanisms for the selection of project proposals, as well as for the disbursement of funding and subsequent evaluations, be constructed such that they are geared towards speed, efficiency and fairness and can be executed with the minimum of bureaucracy.

While we need to make public funding more effective and transparent, we need to attract private funding of science. How and where private investment can positively reinforce our goals in the Indian context needs to be addressed, while avoiding treating education solely as a commodity to be purchased. We must build in efficiencies in science evaluation and funding, eliminating unnecessary bureaucracy and streamlining procedures, while ensuring accountability.

Institutional Autonomy

In the long term, rigorous autonomy of academic institutions i.e. autonomy at the level of determining research and teaching goals, hiring faculty and constructing appropriate and modern syllabi appears to be the only way to proceed. We do, however, see the need for a few restrictions, particularly in those spheres, which impact diversity and inclusiveness.

We see no reason to deny scientific institutions and universities increasing functional autonomy, provided they are evaluated periodically and effectively through unbiased external review and aligned with social goals regarding diversity and inclusiveness.

Ensuring Accountability and Periodic Evaluation

Publicly-funded institutions should be reviewed regularly and in a credible, professional manner, with the results of the review placed in the public domain and responses to it also made publicly available. An emphasis on accountability places a stronger responsibility on both the institutions being reviewed as well as the reviewer, whose comments will come into the public domain. The counterpart to this for private institutions is a credible assessment and accreditation system, which students can trust. An institution should also be accountable for how it treats its "clients", including faculty members and scientists who work there, the students who pursue their degrees there and the support and administrative staff who act as enablers.

We see accountability as being critical and a transparent, publicly accessible review mechanism as the single most important way of ensuring such accountability.

Encouraging Diversity and Inclusiveness

Institutions in a diverse society ought to reflect a comparable diversity. However, many Indian institutions reflect only a small part of that diversity, depriving students and the Indian scientific enterprise of the benefits of cross-fertilization of backgrounds and knowledge. We stress the need for broader representation of diversity at all levels and review of hiring policies that are not consistent with questions of social justice. We, as an academic and professional community, should take initiative to nurture potential for accomplishment and excellence in all populations and give due attention to remove gender/caste/class inequality that exists in the country. We need to ensure that larger numbers of women enter (as well as remain in) science for which no legal provisions have been made so far. We must review working conditions and informal practices that make it hard for women to be equal participants with men.

Our working environments must be inclusive, safe and supportive for all who are part of them.

Broad-basing Input for Decision-making

One way of building up engagement of an institution's members to that institution and its goals is to encourage wide and meaningful input from them. Then, decision-making can be largely collective and consensual rather than imposed from outside.

We suggest, for example, a far broader role for faculty at a given institution in hiring decisions, (a situation which does not exist at the moment in a large number of Indian institutions), subject to our concerns regarding accountability. This will enable separate institutions to choose growth paths, which are adapted to their special skills and background and aid in the process of democratizing decision making. Broad-basing decision making should also apply at the broader level of science policy making, so that policies reflect the input and collective wisdom of the larger scientific community.

Encouraging and Supporting Hands-on Science

In general, the space for practical, hands-on, laboratory or field-based science appears to be declining, possibly as a consequence of the increasingly theoretical bent of our examination system and the fact that hands-on science demands a larger fraction of resources (Quantifying a pen-and-paper answer is surely easier than evaluating skilful lab technique or special ability in designing working experiments). This presents dangers at many levels; a society which views "manual" work as something different and inferior to "intellectual" work will find it difficult to bridge the gap between theory and practice.

We specifically suggest a greater emphasis on hands-on, laboratory science at the undergraduate and post-graduate level, with targeted funding for this purpose made available.

Attention to Pedagogy

While what we communicate is important, how we communicate it is often no less important. Can we develop effective, localized methodologies to transfer knowledge? To what extent can electronic methodologies expand access to larger numbers of students? Are there non-traditional ways to approach the problem of upgrading the quality of knowledge? How can we make India-specific pedagogies, which have a higher likelihood of success?

We stress the need for innovative teaching methods in science, connecting real-life observations with textbooks, encouraging critical thought and teaching the joy of science. We need to make our textbooks and our teaching, particularly at the school level, more stimulating and challenging for the student. We also stress the importance of enhancing skills of science communication at all levels.

3 The Individual Scientist

The Importance of Individual Evaluation

Very few scientists can claim to be entirely self-motivated. The vast majority require feed back, through either institutional mechanisms or community mechanisms, for development. We suggest that evaluation mechanisms be developed which encourage periodic, systematic and productive review, beyond the two or three promotion exercises a faculty member undergoes during the course of his or her career.

It is crucial that we, as scientists, be comfortable with regular review, and a culture for doing this must evolve.

Developing Methods for Rewarding Performance

No system can encourage achievement unless it is able to reward the achiever suitably. In the past, such rewards were memberships of academies or came through awards and prizes, reflecting the approbation of the community as a whole.

While we need to make financial incentives more competitive and effective, we believe there is, however, scope for much more at the local, institutional level, in which the rewards might be non-financial but nevertheless useful, such as a category of no-strings grants for high achievement.

The Importance of Mentoring

We pay too little attention to the mentoring that a young scientist must receive, apart from informal mechanisms. We need to evolve systematic and formal mechanisms for the mentoring of young scientists, to enable them to navigate the maze of research funding and to efficiently establish useful networks. Regular meetings in which young scientists and post-doctoral fellows can be given an opportunity to meet senior mentors would be a good investment in the longterm.

It should be possible to make mentoring young scientists an additional input for promotion to a more senior level as well as to recognize, publicly, the cascading effects of good mentorship.

Promoting Investment in Collective Goals

We need to evolve mechanisms by which institutions benefit from investment by competent individuals in collective goals while recognizing and responding to individual and specialized needs.

Such goals must be clearly articulated while recognizing the need for individuals to preserve their time and concentration, a particularly important requirement in the case of teaching institutions as well as research institutions with very specific mandates and little academic freedom beyond them.

Rewarding Outreach at an Individual Level

Public disengagement with science stems largely from the relatively low levels of outreach. Outreach can be both at the institutional level as well as at the level of the individual scientist.

It should be possible for individual scientists to receive credit and support for scientific outreach activities, such as teaching at the school and college level, writing popularly accessible books and articles, translation of scientific material into local languages, development of teaching aids etc.

Promoting Leadership

We have no mechanisms in place, apart from informal ones, which promote specific qualities of leadership. The importance of good, principled leadership at the helm of scientific affairs cannot be overemphasized. The ability to manage effectively is, to some extent, a teachable skill and we should examine how this may best be done. In particular, we believe that seniority should play, at best, a minor role in deciding appointments to positions of leadership; what is far more crucial is the ability to lead imaginatively and transformatively, something younger scientists may be able to do more effectively.

We need to identify scientific leaders and trust them early with positions of authority and influence.

Encouraging National and International Networks

Much of science internationally is done as a consequence of the use of networks of research interests, which hinge on separated but synergistic skills being combined towards a single, well-defined goal. Meetings of professional societies provide a model for the planned interaction of large numbers of scientists belonging to the same scientific community and the systematic promotion of the meetings of professional societies may be another way of achieving the right quality of networking. To better integrate Indian institutions with international ones, the possibility of having a number of non-Indian faculty must be examined. Scientists from the Indian diaspora are a natural community with which increased networking might be more efficient and we stress the importance of continued efforts to attract scientists of Indian origin working outside India to Indian institutions.

We must make a deliberate effort to increase networking in the sense of collaborations both at the national and the international level.

Conclusions

We hope the ideas proposed and discussed here will help provide a deeper understanding of the challenges we face as well as signal our own confidence that we, as a community, can address them at this time. We suggest “Science for excellence, empowerment and enlightenment” as a desirable outcome, describing an emphasis on excellence, the positioning of Indian science in a larger social context, and the all-round development of scientific temper as larger goals to be addressed in any vision for Indian science.

We believe that there may be no perfect model for how Indian science should develop, but rather that any such model should, in the spirit of our democracy, incorporate the “peer review of the community” at every stage. Thus, both the consolidation of a vision for Indian science and its implementation should be a democratic, peer-reviewed activity. Finally, we note that discipline-specific proposals, which consider the specific needs and projections of individual fields are vital inputs towards implementing an overall vision for Indian science. We request the larger scientific community to provide us with such specific inputs, so that they may be consolidated into a comprehensive vision document for Indian science.

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