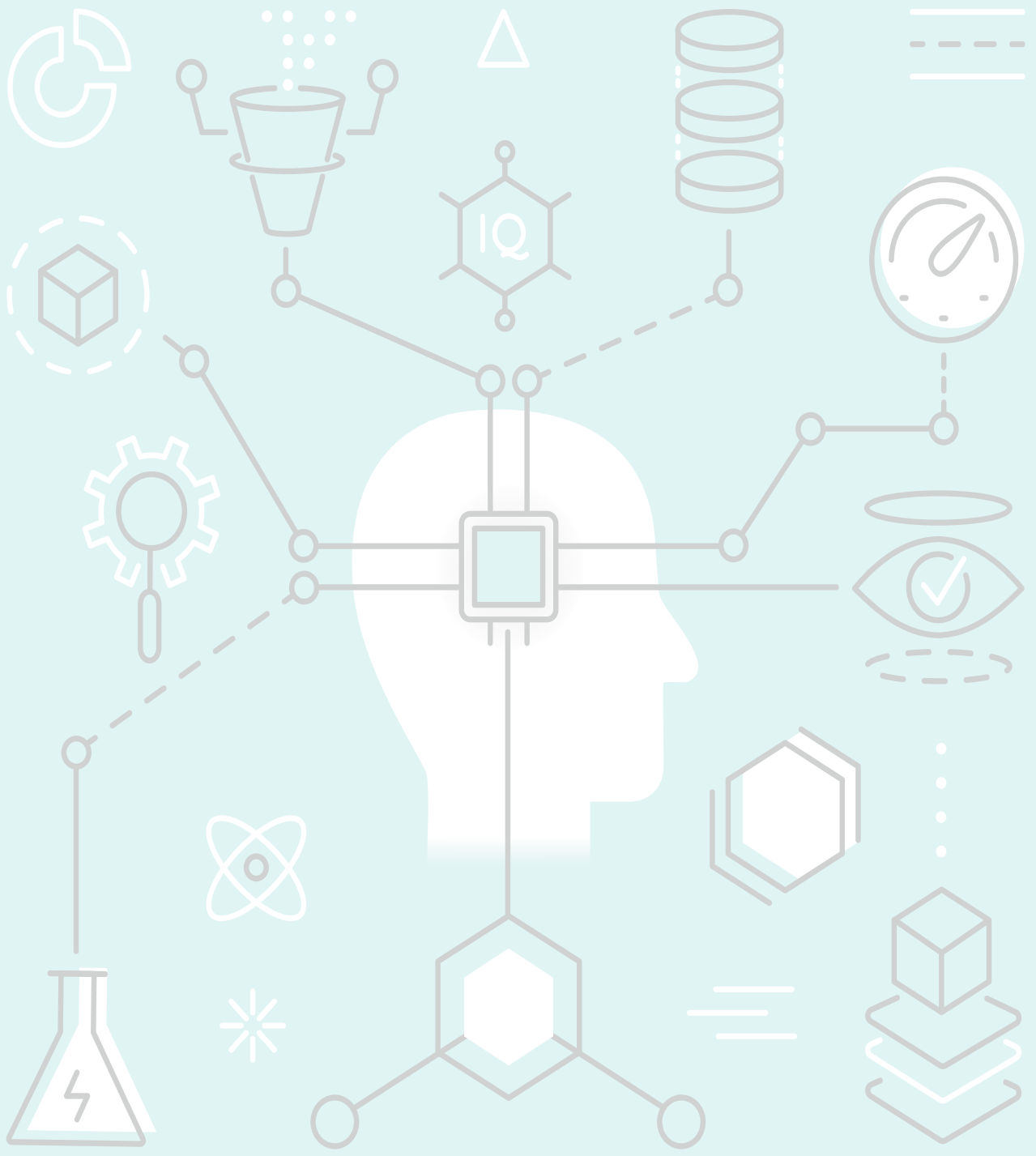


विज्ञान और  
इंजीनियरी  
अनुसंधान बोर्ड



Science and  
Engineering  
Research Board





विज्ञान और  
इंजीनियरी  
अनुसंधान बोर्ड



Science and  
Engineering  
Research Board

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वार्षिक रिपोर्ट 2016-17 **Annual Report**

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## From the Secretary's Desk

In keeping with our traditions, it gives me immense pleasure to present the 6th Annual Report of the Science and Engineering Board (SERB), depicting the outcome of our collective efforts. Although a nascent organization, SERB can trace its existence over the past four decades in the form of Science and Engineering Research Council (SERC), a division of Department of Science & Technology. Whereas SERB is trying to carry forward the rich legacy of SERC serving the cause of extramural research, it is also enriching the structure with the requisite infused ideas and energy.



Since its inception, SERB has contributed towards the nation in developing robust, comprehensive and sophisticated research facilities & infrastructures across the country which is being efficiently utilized by the scientific community of the country in taking the quality of science to the next higher level. SERB has re-organized its processes and systems, made innovative use of technology and automation tools to make them more efficient and enabling and set up tougher benchmarks of performance and delivery during the year. We collaborated with our counter parts in several countries to expose Indian Scientists to the latest developments in the field of Science & Technology.

The Board approved few of the new schemes like Overseas Doctoral Fellowships - Training for Indian PhD students, participation in Uchcharat Avishkar Yojana (UAY) on co-sharing basis, Mathematical Research Impact-Centric Support (MATRICS) and Teachers Associates for Research Excellence (TARE) during the year. Another new program named Visiting Advanced Joint Research (VAJRA) Faculty, announced by the Honourable Prime Minister was launched to bring a strong international connect to the R&D ecosystem of India. The scheme offers adjunct / visiting faculty positions to overseas scientist / faculty / R&D professionals including Non-Resident Indians (NRI) & Overseas Citizen of India (OCI) to undertake quality collaborative research in public-funded academic and research institutions of India.

I took over the reins of the organization towards the end of the last fiscal year. I am proud to have an opportunity to lead the activities of the organisation and its dedicated team of scientists, administration and other support staff. While I present this Annual Report of SERB for the fiscal year 2016-17, I would like to put on record my sincere gratitude and genuine appreciation to the SERB Board members, members of the Programme Advisory/Expert committees and all partners and stake holders for their strong support. Their continued support and encouragement would indeed be very much needed for us to strive for even higher levels of performance and delivery. Last but not the least, I would like to acknowledge all my colleagues in the board for their hard work in making the year a successful one.

**Dr. Rajiv Sharma**  
Secretary, SERB



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# 1 Organizational Structure

The origins of Science and Engineering Research Board (SERB) can be traced back to the erstwhile Science & Engineering Research Council (SERC), Department of Science and Technology (DST), Government of India that provided extramural funding for S&T research in India for more than four decades. Creation of SERB, in year 2011, is considered as an important institutional milestone in the Indian S&T ecosystem. Established through an Act of Parliament, SERB is a statutory body with requisite financial and administrative autonomy for performing its mandated functions. Chaired by Secretary, DST, SERB comprises of 17 members that includes seven Secretaries to the Government of India. An Oversight Committee advises and assists the Board. Figure 1 depicts the current office location of SERB at New Delhi.



Figure 1. SERB Office, New Delhi.

1.1 Vision, Mission and Goals

To better focus its energies and resources on realisation of its mandate, SERB defined its vision, mission and goals during the year under review.



## 1.2 Organization Chart

In the present organization structure of SERB, the Secretary is assisted by Director (Fin. & Admin.) and Scientists / Programme Advisers as given in Figure 2.

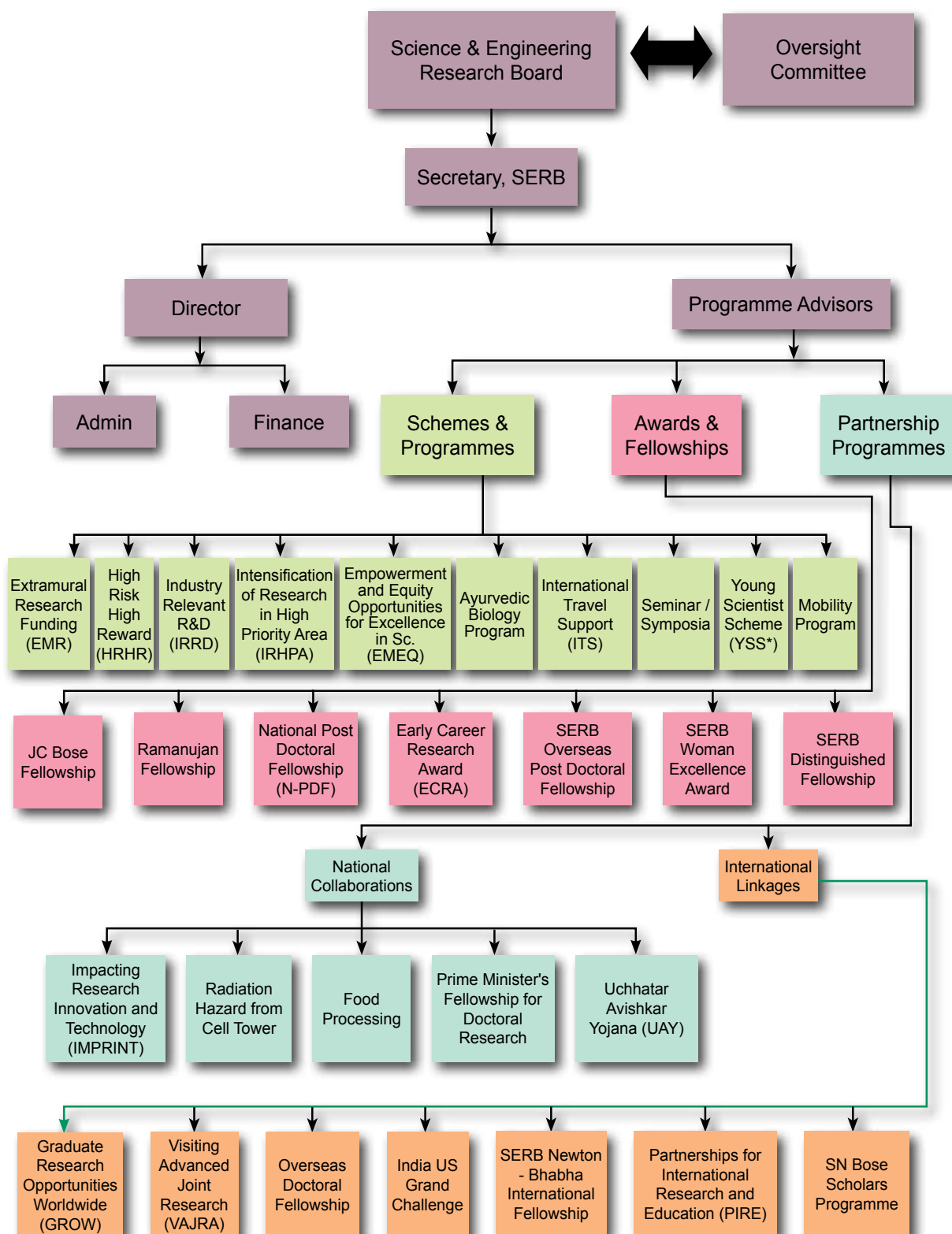


Figure 2. Organization chart.

\* Restructured as N-PDF and ECRA.

1.3 Board & Oversight Committee

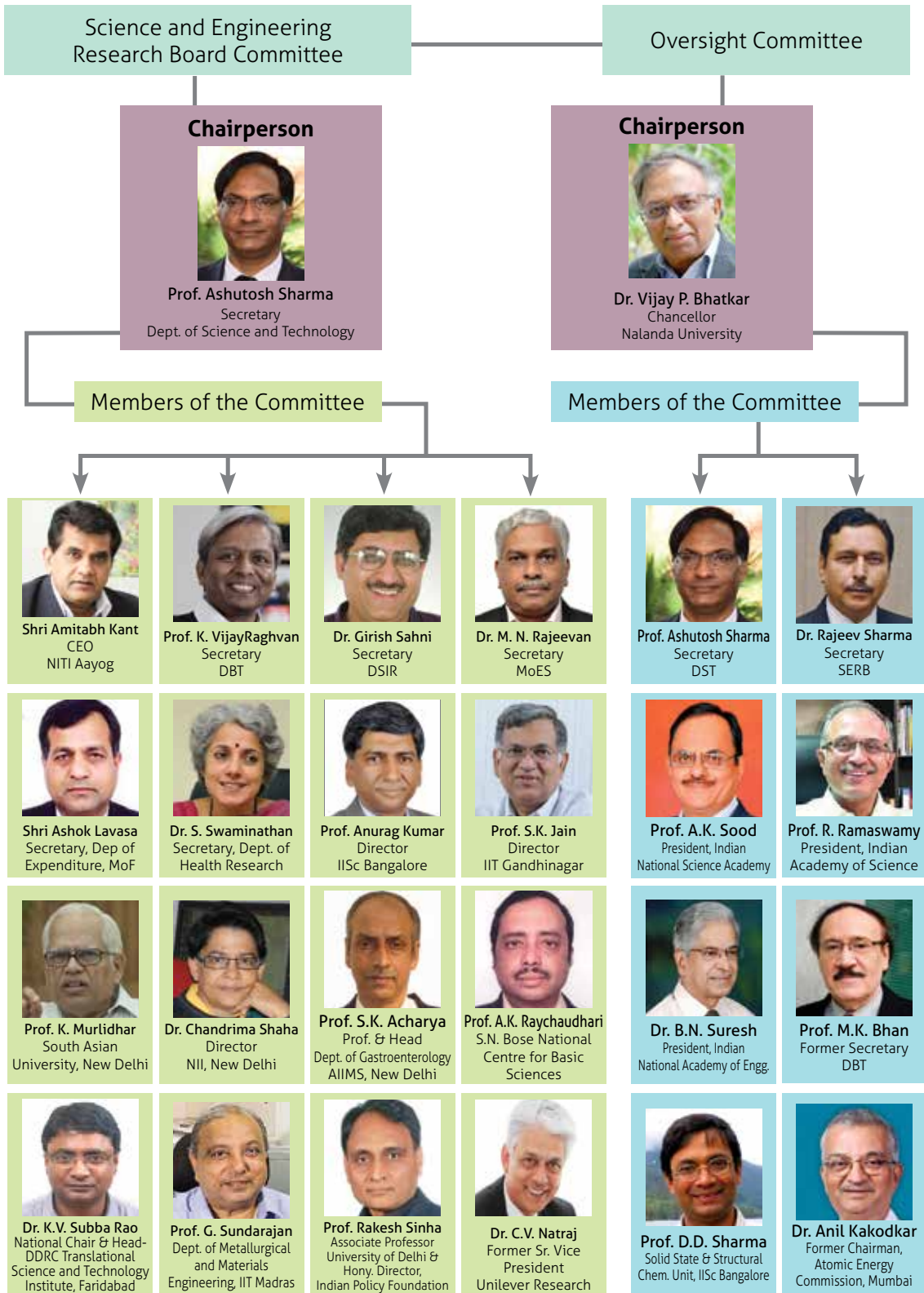


Figure 3. Organization structure; Board & Oversight Committee.

## 2 Overview

The mandate of SERB is to promote S&T research through appropriate policy interventions and to provide extramural funding to academic institutions, research laboratories and other R&D organisations for carrying out basic research in frontier areas of science and engineering. SERB strives to serve the needs of researchers through quick and responsive funding decisions. To achieve this, SERB has put in place the required policy and administrative framework that overrides conflicts of interest of grant seeking applicants, reviewers, committee members and SERB officers to bring its functioning at par with leading global R&D funding agencies. The aim is to bring-in more transparency and increased accountability to assure the general public that processes followed are fair and non-discriminatory.

### 2.1 Growth Profile

**2.1.1 Milestones:** The Board has come a long way in its journey from the erstwhile SERC to its current profile as depicted in Figure 4.

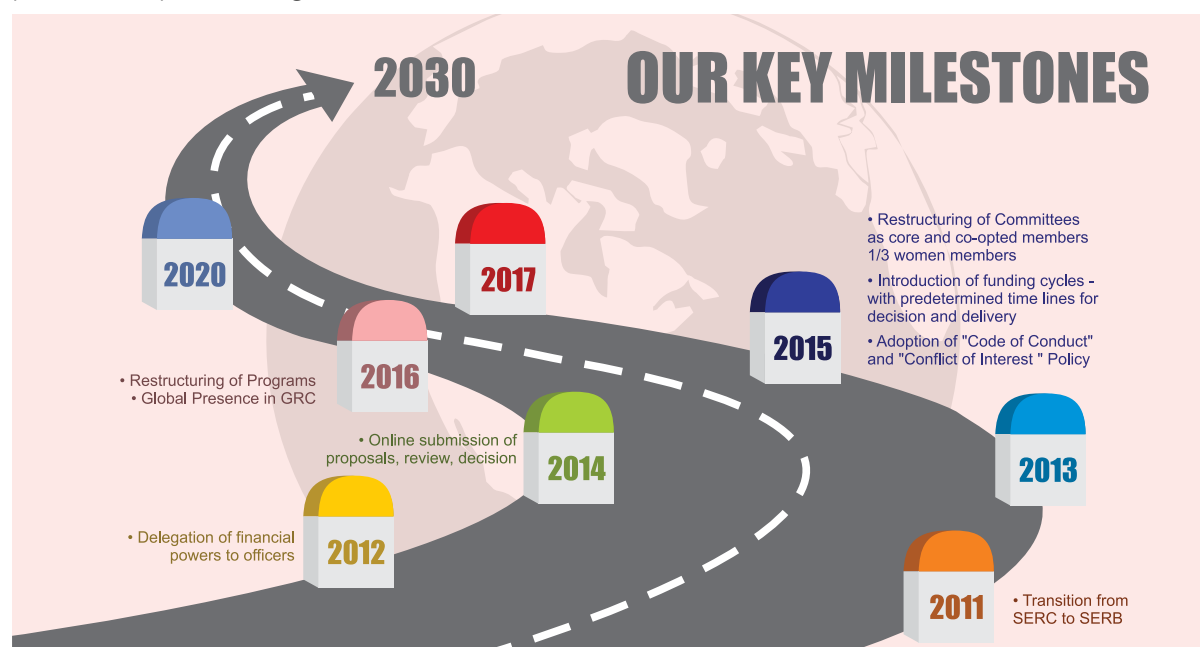


Figure 4. Key Milestones of SERB.

**2.1.2 New Schemes:** Over the last 6 years, SERB has grown manifold not only in terms of its budget outlays, but also in terms of number of schemes being implemented, targeting various

segments of the scientific community. On an average SERB has been instrumental in initiating and implementing three to four new schemes every year (Figure 5).

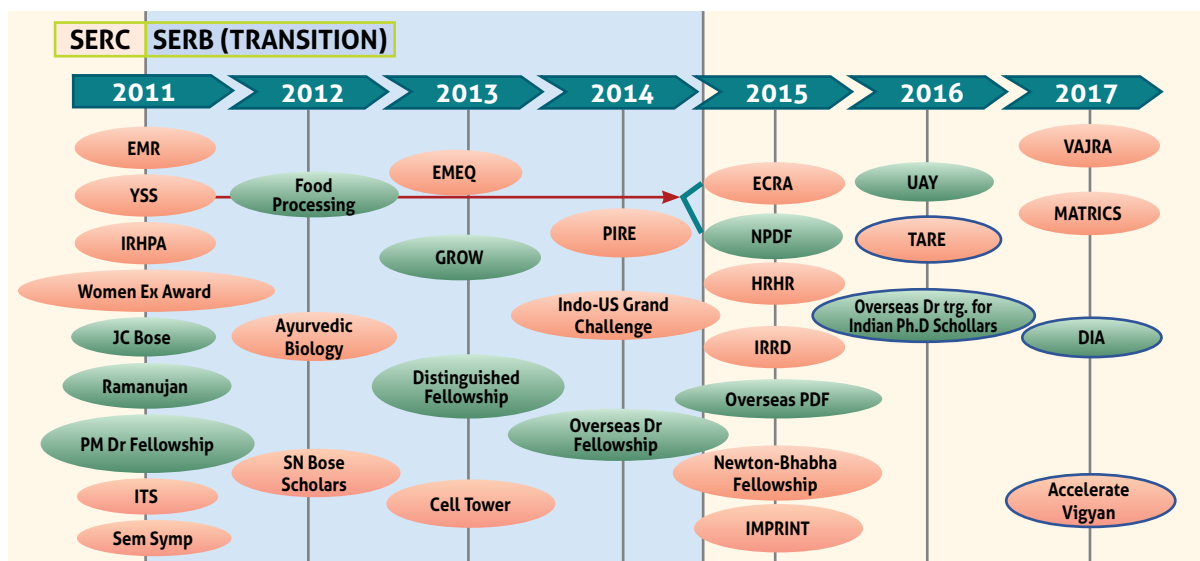


Figure 5. The Growth Profile of SERB Programmes.

### 2.1.3 Budget Transition

As can be seen from Figure 6 there has been an exponential growth in SERBs budget during the last six years. Almost all the budget allotted was disbursed during these years.

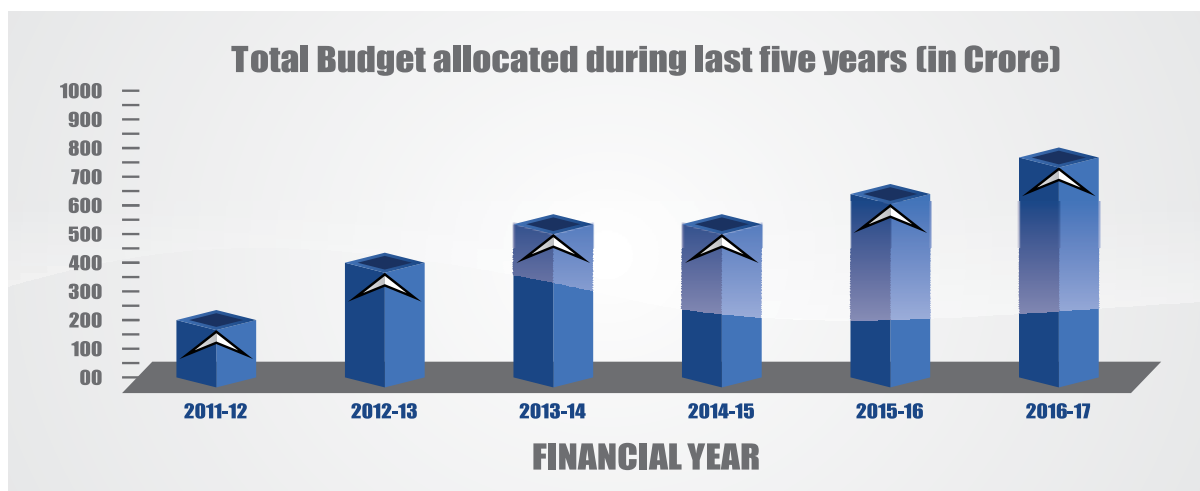


Figure 6. Budget allocated as grant to SERB.

## 2.2 Governance Through Value System

- ❖ **Efficiency:** R&D proposals are invited through "Call for Proposals" at regular periodicity with clear timelines announced for submission, review, decision and fund disbursal.
- ❖ **Optimal Resource Utilisation:** To improve the operational process, Programme Advisory Committees (PACs) have been restructured and realigned in recent times.
- ❖ **Timeliness:** As far as possible, the efforts are made to ensure that funding commitments are not carried forward to the next funding cycle, strictly ensuring the delivery of goals and tasks.
- ❖ **Innovation:** As has always been the case, this year too several new programmes have been initiated focusing on different segments/levels of researchers and teachers.

❖ **Code of conduct:** A 'Code of Conduct' and 'Conflict of Interest' policy has been enunciated for all grant applicants (including collaborators), reviewers & committee members and officers associated with various programs of

the Board. The aim is to bring more transparency, increased accountability in funding mechanisms and provide assurance to the general public that processes followed are fair and non-discriminatory.

## 2.3 Our Six Pillars of Success

SERB seeks to achieve its mandated objectives through activities built around six programmatic themes, referred here as "pillars". SERB provides a dynamic vehicle of choice catering to the diversified needs of institutions engaged in S&T research by developing inclusive processes in the various programmes and schemes listed under these pillars (Figure 7).

**Pillar 1:** Support for Core Research & Innovations (SCRI)

**Pillar 2:** Fostering the Young Researchers (FYR)

**Pillar 3:** Building Research Networks (BRN)

**Pillar 4:** Strengthening Linkages with Society (SLS)

**Pillar 5:** Awards & Recognitions (A&R)

**Pillar 6:** Support for Science and Technology Events (SSTE)

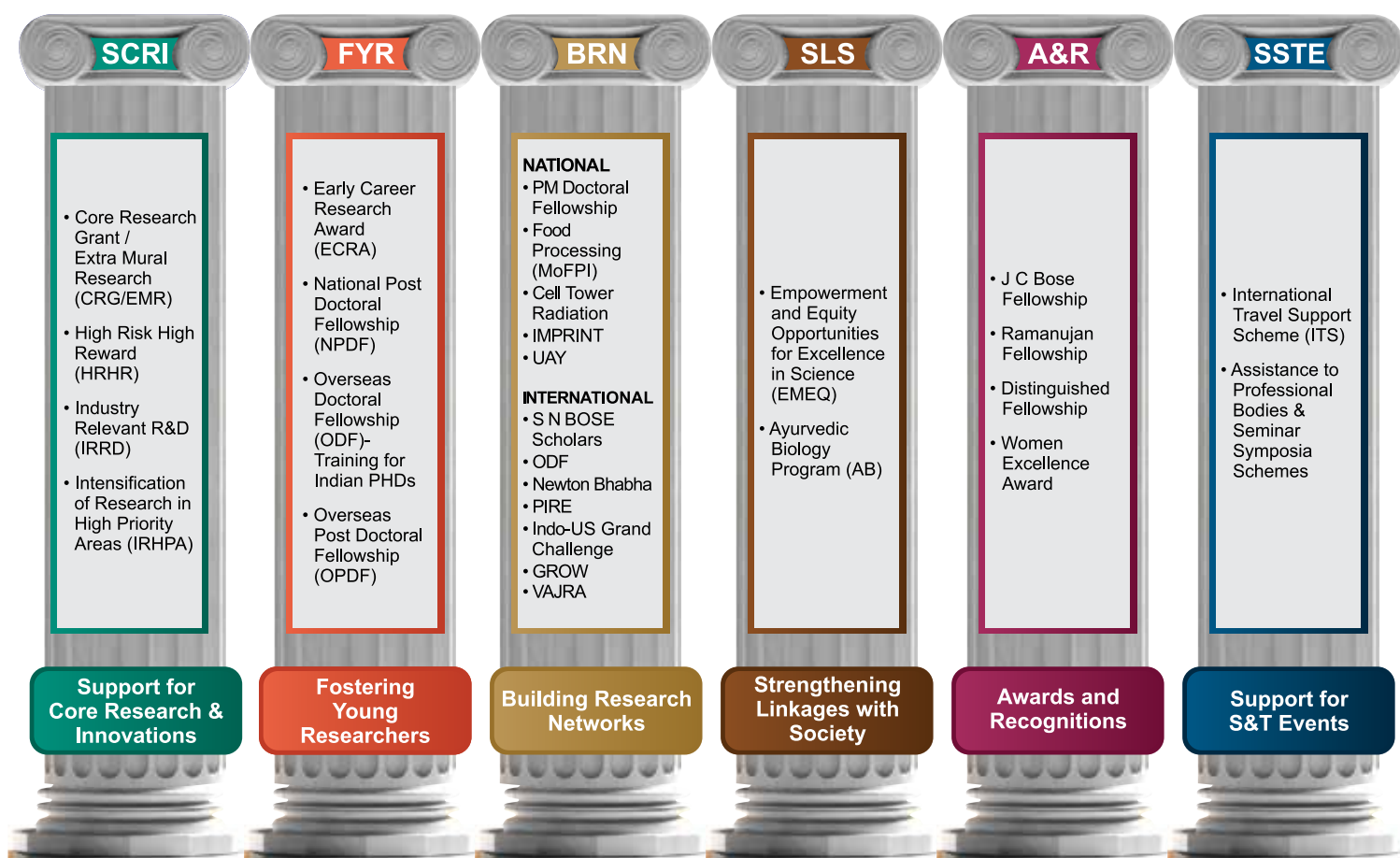


Figure 7 : Six Pillars of Success.

### 2.3.1 Pillar 1: Support for Core Research & Innovations (SCRI)

SCRI is the most vital pillar of SERB. The activities are broadly centred around four of its components, namely individual centric Extramural Research Funding (EMR), High Risk High Reward (HRHR), Industry Relevant R&D (IRRD) and Intensification of Research in High Priority Area (IRHPA). These schemes are described below:

#### ❖ Core Research Grant / Extra Mural Research (CRG/EMR) Funding

Individual centric competitive mode of funding is provided under the EMR. The Board supports potential scientists, without any upper limit to funding, for undertaking research in frontier areas of S&T. The grant is provided for manpower, equipment, consumables, travel, contingencies and overheads. The call for proposals is solicited two times a year. A total of 7054 proposals were considered and 952 have been funded under different disciplines during the year.

#### ❖ High Risk High Reward (HRHR)

The HRHR is aimed at supporting proposals that are new, challenge the existing hypothesis and provide 'out of box' thinking on important problems. HRHR projects contain significant risk elements but promise of high reward, if the

difficulties could be circumvented. The funding is provided normally for a period of three years. A total of 32 proposals were considered and two have been funded during the year.

#### ❖ Industry Relevant R & D (IRRD)

The IRRD is aimed to support ideas that address a well-defined problem of industrial relevance. The proposal is jointly designed and implemented by the academic partner (which includes a partner from national laboratories/recognized R&D institutions as the case may be) and industry. The funding is shared between SERB and Industry. The industry share should not be less than 50 % of the total budget. A total of 6 proposals were considered and only one has been funded during the year.

#### ❖ Intensification of Research in High Priority Areas (IRHPA)

The IRHPA supports proposals in high priority areas where multidisciplinary/ multi-institutional expertise is required which will put our nation in international science map in that segment. Call for proposals in identified areas is made every year. A total of three proposals were considered and all have been funded during the year.

### 2.3.2 Pillar 2: Fostering the Young Researchers (FYR)

This pillar FYR is aimed at providing young researchers in India an opportunity to focus on a freely chosen research theme based on their innovative ideas. The pillar achieved its target of fostering and securing young researchers through following segments during the year:

#### ❖ Early Career Research Award (ECRA)

The scheme aims to provide research support to the young researchers who are in their early career for pursuing exciting and innovative research in frontier areas of science and engineering. The Early Career Research Award is a one-time award and carries a research grant of up to Rs. 50 Lakhs for a period of three years. A total of 2495 proposals were considered and 817 have been funded under different disciplines.

#### ❖ National Post-Doctoral Fellowship (NPDF)

The NPDF is aimed at identifying motivated young researchers and provide them support for doing research in frontier areas of science and engineering. The fellows are to work under a mentor and this opportunity provides them a platform to develop as independent researchers.

The fellowship is purely a temporary assignment, and is tenable initially for a period of 2 years. A total of 3808 proposals were considered and 991 have been funded under different disciplines.

#### ❖ Overseas Doctoral Fellowship-Training for Indian Ph.D Scholars.

This program support students registered for a under a Ph.D program at an Indian institution to train for specified duration (normally 12 months) of research in a reputed overseas institution. To and fro air fare, a fellowship amount of US\$2000 p.m. and a contingency grant are provided. The fellowship also has a provision for the faculty adviser of the student as well as the overseas collaborator to visit each others labs. The fellowship was approved during the year for implementation.

#### ❖ Overseas Postdoctoral Fellowship

This fellowship is meant to enhance the research capacity and global prospective of Indian scholars. The applicants should have completed a Ph.D. degree not earlier than the preceding two years from any recognized institution in



India. Fellowship amount of US\$3000 per month and a contingency/preparatory allowance of Rs. 60,000/- are provided to each fellow. During the

year a total of 550 proposals were considered and 37 have been funded under different disciplines.

### 2.3.3 Pillar 3: Building Research Networks (BRN)

The Pillar BRN is aimed at providing networks for collaborative research opportunities both within the country and abroad. This is also important for gaining long term relationship among scientist and technologist engaged in research.

technology (product and processes) in selected technology domains. SERB is partnering in this program and funding mainly the proposals related to two domains, namely, "Nanotechnology" and "Advanced Materials". A total of 17 sub projects were supported, under one sanction.

#### 2.3.3.1 Partnership Programmes-National

##### ❖ PM's Doctoral Fellowship

The Prime Minister's Fellowship Programme for Doctoral Research is a Public- Private Partnership between SERB and Confederation of Indian Industry. The scheme is for supporting aspiring Ph.D. scholars with a double scholarship, 50% of which is provided by government (SERB) and balance 50% by a sponsoring industry for doing industrial research for a period of four years. A total of 64 proposals were considered and 37 were funded under different disciplines.

##### ❖ Uchhatar Avishkar Yojana (UAY)

The UAY has been launched by the MHRD with a view to promote innovation of a higher order that directly impacts the need of the industries, thereby improving the competitive edge of Indian manufacturing capabilities. While MHRD funds 50% of the project cost, industry and other participating Ministries share the balance project cost (25% each). A total of 30 sub projects were supported.

##### ❖ R & D Programme on Food Processing

The programme, developed in partnership with Ministry of Food Processing Industries (MOFPI), aims at extending financial assistance to individual scientists working in various institutions/universities, Public funded organizations and recognized R&D laboratories both in public and private sector, to promote and undertake demand driven R&D work in the field of Food Processing Sector for product and process development, design and development of equipment, improved storage, shelf-life, packaging etc. A total of 32 projects are ongoing under the programme.

#### 2.3.3.2 Partnership Programmes – International

##### ❖ S. N. Bose Scholars Programme

S.N. Bose Scholars Program is a dynamic student exchange program developed in partnership with Indo-U.S. Science and Technology Forum (IUSSTF) and the University of Wisconsin-Madison. It provides an opportunity to Indian and U.S. students to undertake a research internship. The internship program is conducted for 50 Indian students to intern at partner Universities in the U.S. for a period of 10-12 weeks beginning each summer. The program also supports 30 U.S. students to intern at a recognized Indian educational institution for a similar duration. A total of 50 scholars were funded during the year.

##### ❖ Cell Tower Radiation Programme

The program aims at studying the effects of cell tower radiations on the population living near the towers. This study is jointly supported by SERB and Department of Telecommunication, Ministry of Communication & Information Technology. A total of 19 projects are ongoing under the program.

##### ❖ Overseas Doctoral Fellowship

This fellowship aims to build national capacity where the talent supply of researchers in areas of interest is sub-critical by providing doctoral fellowship in selected areas in chosen overseas institutions, where an MoU exists between SERB and the international partner. Fellowship amount of US\$ 2000 per month for a period of 4 years (subject to satisfactory progress) and a contingency/preparatory allowance of Rs. 60,000/- are provided to each fellow. A total of 57 proposals were considered and 9 have been funded under different disciplines in the scheme.

##### ❖ Impacting Research Innovation and Technology (IMPRINT)

IMPRINT is a program piloted by the Ministry of Human Resource Development (MHRD) which aims to address and provide solutions to the most relevant engineering challenges faced by our nation by translating knowledge into viable

##### ❖ Newton - Bhabha International Fellowships

It is a joint initiative with the Royal Society of

the United Kingdom to enhance capacity in the area of research and innovation, covering fields of Science, Technology, Engineering and Mathematics (STEM). The awards are given for up to two consecutive years in the UK, for undertaking research at a host university or research institute. The awards provide a stipend, research expenses and one-off relocation expenses, up to an amount of £99,000 for two years. A total of 13 students were supported during the year.

❖ **Partnership for International Research and Education (PIRE)**

PIRE is a highly prestigious international collaborative program of National Science Foundation (NSF). It is aimed at leveraging the monetary resources of funding agencies as well as intellectual capabilities of research groups all over the world in front line areas of research and education. India has joined the PIRE programme through a bilateral agreement between SERB and NSF. A total of 6 scholar/student visits were supported during the year.

❖ **Indo-US Grand Challenge: Initiative on Affordable Blood Pressure Measurement Technologies for Low Resource Settings in India and the U.S.**

The programme encourages research collaboration within and between India and USA in this area through a framework (MOU) signed between SERB, and the National Institute of Bio Medical Imaging & Bioengineering (NIBIB), National Institute of Health (NIH), USA. The objective of the collaboration is to develop durable, reliable and affordable blood pressure

measurement technologies for either passive or active monitoring of hypertension. A total of ten projects are ongoing under the scheme.

❖ **Graduate Research Opportunities Worldwide (GROW)**

The programme is a coordinated effort between NSF and SERB to provide opportunities for enhanced professional development through research collaborations in top caliber research environments for U.S. Graduate Research Fellows (GRF) under the GROW programme. U.S GRF is placed in selected top research institutions in India for a period of 3 to 12 months. The selection of the GRF is done by NSF with the concurrence of the Indian host. A total of two projects are ongoing under the scheme.

❖ **Visiting Advance Joint Research (VAJRA)**

VAJRA provides for Adjunct / visiting faculty positions to overseas scientists, faculty members and R&D professionals including NRI & OCI to undertake high quality collaborative research in Public funded academic and research Institutions in India. The scheme was announced by honorable PM during Jan 2017, and has the following features:-

- Minimum of 1 month and a maximum of 3 months of residency period every year.
- A lump-sum amount of US\$ 15000 in the first month of engagement in a year and US\$ 10000 p.m. in the next two months. Host Institution may provide additional support (accommodation, medical / personal insurance etc).

### 2.3.4 Pillar 4: Strengthening Linkages with Society (SLS)

For realising the full potential of individual talent, it is important to build inclusive, productive and nurturing bonds between various stakeholders amongst the scientific community. This is the main focus of Pillar "Strengthening Linkages with Society (SLS)". Another aim is to develop and implement those programs having direct impact on the society. Various segments currently under the aegis of this pillar are as follows:

❖ **Empowerment and Equity Opportunities for Excellence in Science (EMEQ)**

The EMEQ is constituted to ensure enhanced participation of weaker sections of the society in research and development. The applicant should be an active Indian researcher belonging to the Schedule Caste and Schedule Tribe category working in academic institutions/ national labs

or any other recognized R&D institutions in the field of Science and Engineering. A total of 223 projects were funded under different disciplines of science during the year.

❖ **Ayurvedic Biology Program**

Development of a basic understanding of the concepts, procedures and products of Ayurveda in terms of modern sciences such as Molecular biology, Immunology and Chemistry. To Promote Human resource development in Ayurveda Biology and related areas by offering fellowships, training opportunities, providing support to scientific meetings and workshops. To Promote collaborative research with national institutions who are active in pursuing research activities on traditional medicine and may have shared interest in Ayurvedic biology. A total of 12 proposals

have been received & only three proposals were approved by committee during the year.

❖ In addition, a few more dimensions like

"Scientific Social Responsibility" are being planned under this pillar for implementation in the foreseeable future.

### 2.3.5 Pillar 5: Awards & Recognitions (A&R)

In order to encourage serving as well as superannuated scientists to contribute their fullest might towards the cause of development of Indian S&T sector, SERB offers various Awards and Fellowships to exceptionally distinguished individuals. The Pillar "Awards and Recognitions" is geared to make this happen through awards and recognitions as given below:-

#### ❖ J C Bose Fellowship

J C Bose Fellowship is instituted to recognize active scientists and engineers for their outstanding performance and contributions. These fellowships are scientist-specific, very selective and are open to Indian nationals residing in India, with upper age limit of 68 years. The value of the fellowship is Rs. 25,000/- per month in addition to the fellow's regular income. Rs. 15 lakhs per annum is provided as research grant for a period of 5 years. A total of 22 fellowships were awarded during the financial year.

#### ❖ Ramanujan Fellowship

Ramanujan National Fellowships are offered to brilliant scientists (below 60 years) returning from all over the world to take up scientific

research positions in India. The duration of Ramanujan Fellowship is five years. The amount of the fellowship is Rs. 85,000/- per month. Each Fellow, in addition, receives a research grant of Rs. 7 lakh per annum. A total of 36 fellowship were awarded during the financial year.

#### ❖ SERB Distinguished Fellowship

SERB Distinguished Fellowship Scheme is meant for eminent and performing senior scientists to continue active research even beyond their superannuation. The Scheme offers a fellowship amount of Rs. 60,000/- per month and a research grant of Rs. 5 lakhs per annum for a period of 3 years, extendable by two more years. A total of 6 ongoing awards were supported during the financial year.

#### ❖ SERB Women Excellence Award

This is a one-time award given to women scientists below 40 years of age and who have received recognition from any one or more of the six national Indian science academies. These women researchers are supported with a research grant of Rs.5 lakh per annum for a period of 3 years. A total of 15 women were awarded the SERB women excellence award during the year.

### 2.3.6 Pillar 6: Support for Science and Technology Events (SSTE)

The development of science in an inter-disciplinary world depends, to a very large extent, on dialogue and cross-fertilisation of ideas. This requires productive opportunities for scientists and researchers to come together to discuss issues of common interest and plan strategies to overcome challenges of various kinds. The Pillar "Support for Science and Technology Events" has been playing an instrumental role in fostering deliberations on pertinent scientific issues. International Travel Support (ITS) Scheme and Assistance to Professional Bodies & Seminar / Symposia are the two categories of Support for Science and Technology Events.

#### ❖ International Travel Support (ITS) Scheme

ITS is designed to provide financial assistance for presenting a research paper or chairing a session

or delivering a keynote address in an international scientific event held abroad or to young scientists for attending training programs and short-term schools/workshops/courses. Economy class air-fare by shortest route, registration fee airport-tax and visa fees are provided under the scheme. A total of 1864 grants were sanctioned during the financial year.

#### ❖ Assistance to Professional Bodies & Seminar / Symposia

The Program extends partial support for organizing seminar / symposia/ training program / workshops / conferences at national as well as international level. The Program also supports professional bodies in the field of S&T. A total of 735 grants were sanctioned during the year.

## 2.4 Process and Procedural Flows

The applications from the candidates in majority of the online programmes undergo the following process of scrutiny, selection and recommendation, before the funds are disbursed to the individuals (Figure 8).

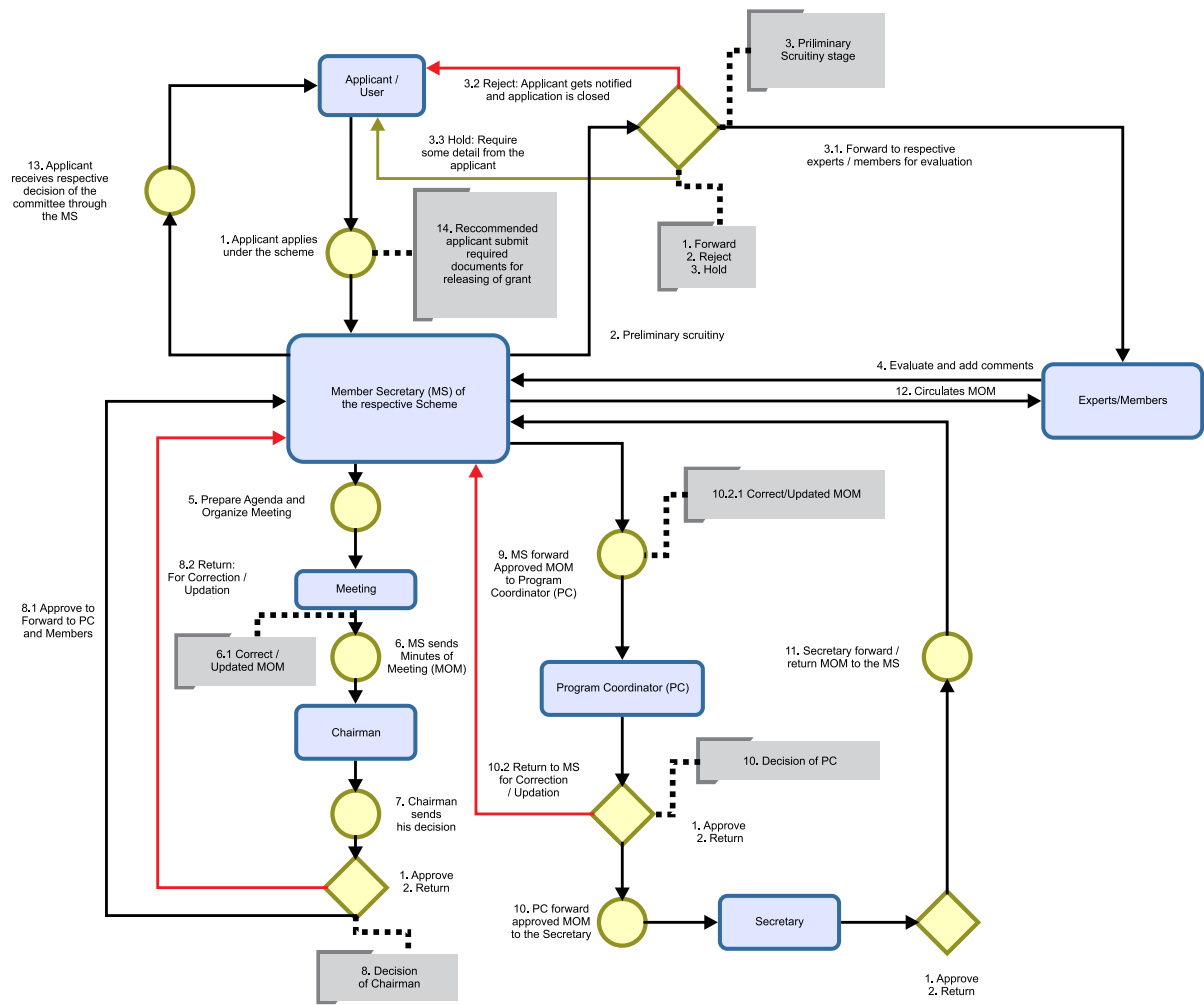


Figure 8. Procedural Flow-Chart of SERB online application.

## 2.5 New Initiatives

### 2.5.1 New Schemes/Programmes

The Board has given special attention to initiate new programmes having far reaching consequences in the scientific R&D sector. Some of the new schemes approved by the Board during the year are as follows: -

- i. Visiting Advanced Joint Research (VAJRA)
- ii. Overseas Doctoral Fellowships- Training for Indian PhD scholars.

- iii. Uchchatar Avishkar Yojana (UAY)
- iv. IMPacting Research INnovation and Technology (IMPRINT)
- v. Distinguish Investigator Award (DIA)

Details of all these schemes have already described in preceding paragraphs, under various pillars.

### 2.5.2 Signing of new MoU with foreign collaborators

Taking cue of the prevailing global policy to depute students for doctoral research in top institutions around the world. The SERB signed the following MoUs during the year for its

international partnerships: -

- Alberta University
- Purdue University
- The Royal Society

## 2.6 Future Initiatives

### 2.6.1 MATRICS (Mathematical Research Impact-Centric Support)

This scheme is aimed at providing fixed grant support to active researchers with good credentials in Mathematical Sciences. The main attribute of this scheme would be the submission

of a simple one-page mathematical proposal along with curriculum vitae. The funding provided would cater to the specific needs of Mathematical Sciences research.

### 2.6.2 Accelerate Vigyan

The objective of this scheme is to have a systems approach, that can push high-end scientific research and prepare scientific manpower capable enough to venture into research careers.

This programme has been conceived by SERB on the recommendation of Group of Secretaries (SGO-8) to give a boost to science.

#### Component 1 - AARAMBH

Consolidation of the existing training related

programs and activities in the country so as to provide single platform for access for the ease of students as well as other stakeholders.

#### Component 2 - ABHYAAS

Initiation and support of the High-End Workshops and Research Internships by SERB during next five years for the purpose of dedicated capacity building in selected areas / disciplines / fields.

### 2.6.3 TARE (Teachers Associateship for Research Excellence)

Expanding R&D base in the country is an important issue. Mobility of faculty members working in State Universities / Colleges as well as private academic institutions, to carry out

research work in central institutions and other such organisations is the key to this scheme that aims to achieve equitability in R&D.

### 2.6.4 DIA (Distinguished Investigator Award)

To award performance based research grant with honorarium to PIs who have excelled in existing SERB or DST projects, the board is also working on a onetime carrier award known as Distinguished

Investigator Award (DIA), that grant an additional project sanction to the perspective Project Investigator as well as a monthly honorarium.

## 2.7 Vital Statistics

### 2.7.1 Work load trends and cost

Table 1. Project proposals and workload trend captured during last 5 years in all the schemes

Measure	2012-13	2013-14	2014-15	2015-16	2016-17	% change in last one year
<b>PROPOSALS</b>						
Received	10534	11557	11630	13769	24353	76.86 (+)
Supported	4023	3435	4589	4237	5616	32.54 (+)
<b>WORKLOAD</b>						
Officers handling the scheme*	1	3	8	21	21	Nil
Supporting staff	34	47	51	58	79	36.20 (+)
<b>FINANCIALS</b>						
Total cost of sanctioned projects (in Cr)	478.26	589.67	509.04	689.48	1125.16	63.18 (+)
Amount Released (Cr)	394.27	554.91	554.93	648.24	788.48	21.63 (+)
Number of releases	5999	7158	8550	8632	9859	14.21 (+)

\*This number indicates only officers of SERB; and excludes a few DST officers who support the cause on dual charge basis.

It is evident from the Table 1, the numbers of proposals being processed by the SERB have been steadily increasing and so is the associated work load during last five years.

### 2.7.2 Proposals supported during last five years

The graphs below (Figure 9 & 10) depict the substantial increase in funding levels and number of projects supported in the major two schemes of SERB, namely EMR and YSS (ECRA & NPFD).



Figure 9. Funding Status under EMR scheme during last five years.

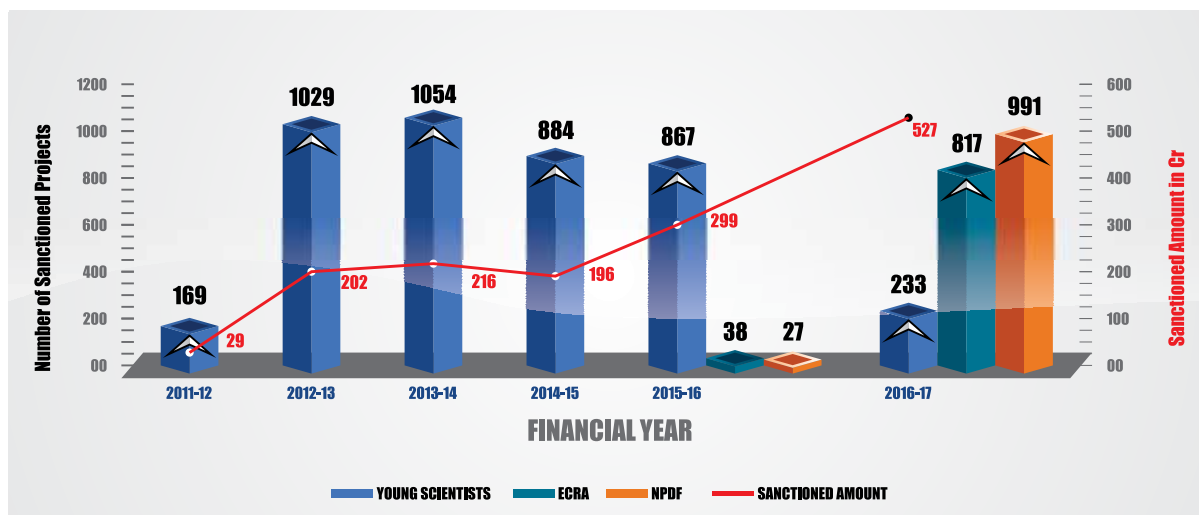


Figure 10. Funding Status under YSS, ECRA and NPDF scheme during last five years.

### 2.7.3 Total Expenditure distributed for the year 2016-17

The pie chart shows total expenditure during the year 2016-17 under different schemes and administration (Figure 11).

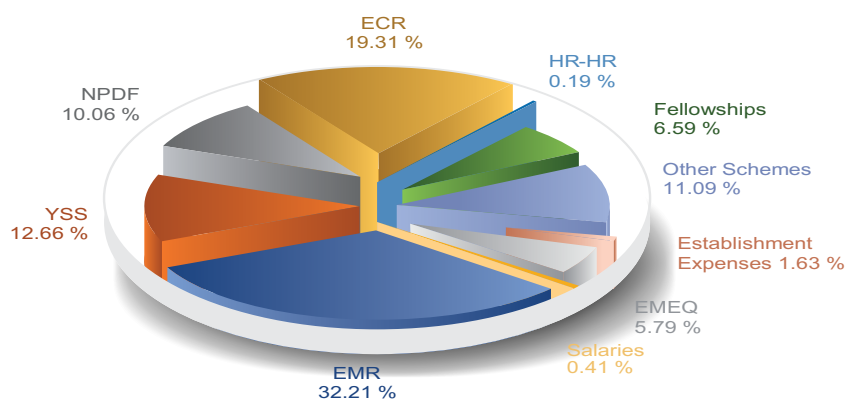


Figure 11. The expenditure during Financial Year 2016-17.

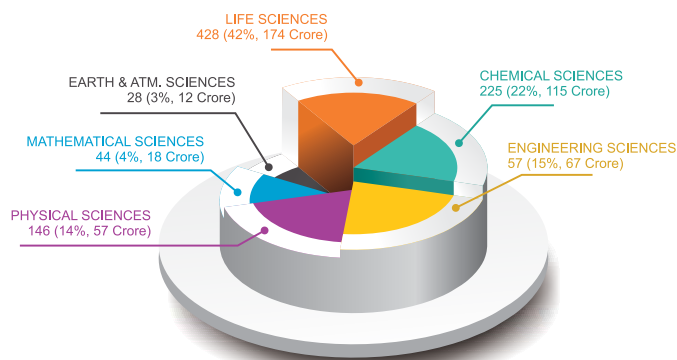
As is seen from the pie chart, almost two-third of the funds being disbursed by SERB are for three major schemes EMR, ECRA and NPDF.

### 2.7.4 Proposal approval rate during the year 2016-17

The Figure 12, 13 and 14 are the representation of various disciplines for three major schemes EMR, ECR and NPDF during the financial year. As is evident; Life Sciences takes the major

share among EMR and NPDF, followed by the Chemical Sciences. However in ECRA scheme the major share during the year was taken away by Engineering Sciences, followed by Life Sciences.

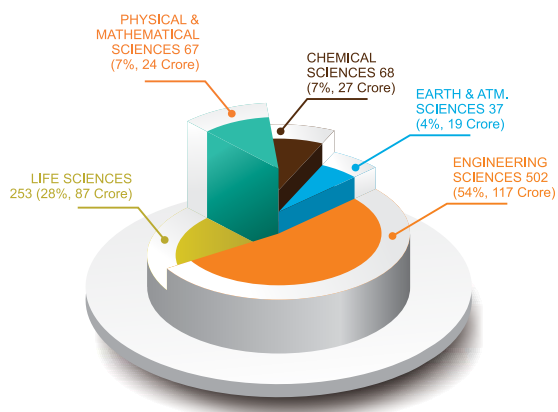
### New Proposals : EMR (2016-17)



TOTAL (2016-17)	
Considered	6535
Recommended	1028
Approval Rate (%)	16

Figure 12. Funding Status under EMR scheme for the financial year 2016-17.

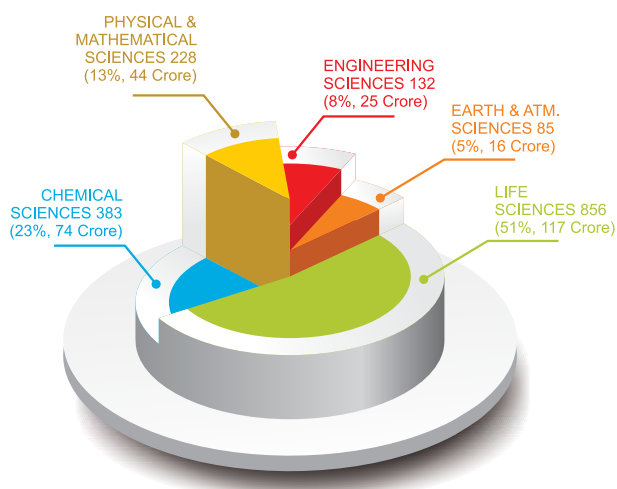
### New Proposals : ECRA (2016-17)



TOTAL (2016-17)	
Considered	2318
Recommended	927
Approval Rate (%)	40

Figure 13. Funding Status under ECRA scheme for the financial year 2016-17.

### New Proposals : NPDF (2016-17)



TOTAL (2016-17)	
Considered	3808
Recommended	1684
Approval Rate (%)	44

Figure 14. Funding Status under NPDF scheme for the financial year 2016-17.



### 2.7.5. Grant categories for the year 2016-17

The details of sanctioned proposals under various categories is given in Table 2 and Table 3.

**Table 2. Online programmes**

Category	Sanctioned Projects	Window	Average Process Time
EMR	952	Two times in a year	6 months
HRHR	2	Throughout the year	6 months
IRRD	1	Throughout the year	6 months
NPDF	991	Two times in a year	4 months
ECRA	817	Two times in a year	4 Months
EMEQ	223	Once in year	6 months
Seminar/ Symposia	735	3-6 months before the event	3 months
Travel support	1864	60-90 days prior to the event	20-25 days
Prime Minister's Fellowship for Doctoral Research	37	Throughout the year	6 months

**Table 3. Offline programmes**

Category	Sanctioned Projects	Window	Average Process Time
IRHPA	3	Throughout the year	6 Months
<b>Awards and Fellowships</b>			
J C Bose National Fellowship	37	Throughout the year	7 months
Ramanujan Fellowship	36	Throughout the year	7-12 months
SERB Overseas Postdoctoral Fellowship	37	Once in a year	1 month
SERB Women Excellence Award	15	Once in a year	1 month
SERB Distinguished Fellowship	05	Based on call	60 days
<b>National Collaborations and International Linkages</b>			
Graduate Research Opportunities Worldwide (GROW) Program	NIL	Based on call	NA
India US Grand Challenge	NIL	Based on call	NA
Partnerships for International Research and Education (PIRE)	1	Based on call	NA
SN Bose Scholars Program	50	Based on call	6-9 months
Ayurveda Biology Programme	04	Throughout the year	6 months

### 2.7.6 Gender Wise Distribution of Major scheme

S.No	Schemes	Male	Female	Total
1	EMR	665	287	952
2	NPDF	635	356	991
3	ECRA	687	130	817
4	EMEQ	189	34	223
	Total	2176	807	2983

The Gender wise distribution of some of the major schemes suggests almost 2:1 ratio in the EMR and NPDF; where almost 5:1 ratio in ECRA

and EMEQ. In comparison to few years ago, greater participation of women scientists is being observed in the major schemes of SERB.

## 2.8 Connectivity

If one has to draw a comprehensive picture of what SERB does to connect with tens of thousands of stakeholders each year; it can be seen as depicted in (Figure 15).



Figure 15. SERB Connectivity at a glance on annual basis.

## 2.9 Challenges

Since its inception, SERB has been striving hard to live up to the expectations out of the national R&D funding agency in the country. The organisation was conceived with an aim to build it at par with the global standards. The same is being aimed through policy interventions, processes and mechanisms, in order to ensure expeditions decision making in R&D.

It's been an interesting journey, wherein we are trying to ensure that the rich legacy of erstwhile SERC is carried forward and new organisation is enriched with requisite infused energy and vigour. This is being done through revamping of existing schemes and at the same time initiate plan and implement innovative new schemes to the diverse needs of scientific community. However, there are challenges in this journey,

enumerated below, which SERB is steadily trying to overcome: -

- Ever increasing number of proposals as well as increasing number of schemes vis-à-vis the fewer manpower resources in SERB.
- Quality of proposals being received in certain streams/ sub-disciplines being lesser than desirable.
- Encourage the independent experts to undertake the timely and quality peer review process for fresh proposals; their occupancy in the name of cause for science.
- Adopting and ensuring the conflict of interest policy on all its stake holders, be it grant seeking applicants, committee members of Advisory Committees, Peer Reviewers and SERB's own officers.
- Timely decisions and disbursement of funds on account of many of the above factors.

## 3 Support for Core Research & Innovation

Development of new technologies and consequent innovation is rooted in basic research efforts undertaken on long term basis. Realising this critical need of core research in pushing the scientific envelop and making the country an S&T player of global level, the pillar "Support for Core Research and Innovation (SCRI)" is being developed to extend support to universities, academic institutions, research laboratories and other R&D organizations to carry out basic research in frontier areas of science and engineering. Key components of this pillar are EMR, IRHPA, HRHR & IRRD which have been described for the respective discipline/sub-disciplines in succeeding paragraphs. For the sake of brevity, research highlights for only one project from each domain has been included in this report as a representative from large number of individual projects supported by SERB during the year.

### 3.1 Core Research Grant / Extramural Research Scheme

	Features	
<p><b>Objective</b> EMR scheme also being referred as Core Research Grant (CRG) in recent times, provides research support to individual scientists to undertake cutting edge research.</p>	<p>This is the flagship scheme of the board accounting for almost one-third of SERB's budget.</p> <p>The scheme is for doctoral candidates/applicant(s) who are holding a regular academic/research position in a recognized academic institution or national laboratory or in any other recognized R &amp; D institution in India.</p> <p>INSPIRE Faculty, Ramanujan and Ramalingaswamy Fellows are also eligible to apply.</p> <p>Grant is provided for equipment, manpower, consumables, travel and contingency.</p> <p>Normal duration of projects is three years.</p>	<p><b>Website links</b> <a href="http://serbonline.in/SERB/emr">http://serbonline.in/SERB/emr</a> <a href="http://www.serb.gov.in/emr.php">http://www.serb.gov.in/emr.php</a></p>

### 3.1.1 Chemical Sciences

#### 3.1.1.1 Organic Chemistry

During the financial year 2016-17, a total of 399 proposals were received, and 74 were supported in different sub disciplines (Figure 16).

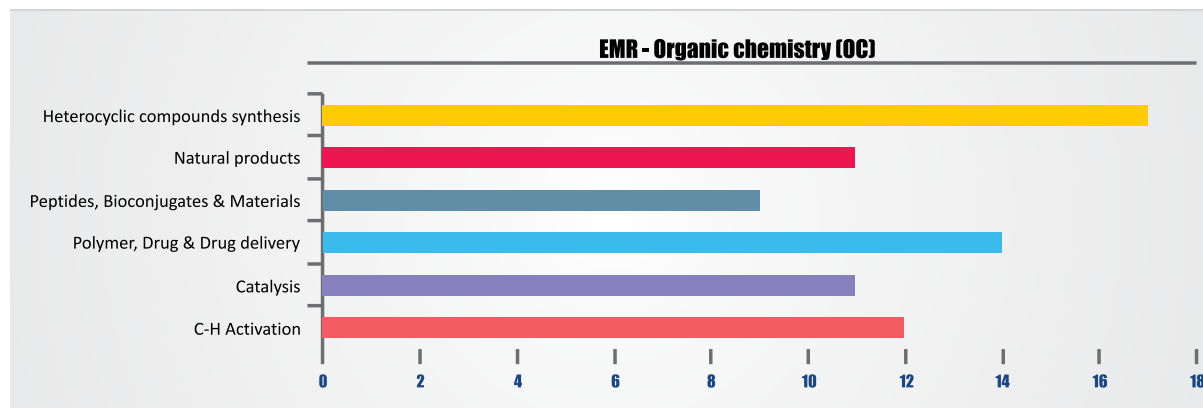


Figure 16. Projects supported in different sub disciplines of organic chemistry.

#### Research Highlights

**Effect of Polyethylene Glycol on Properties and Drug Encapsulation–Release Performance of Biodegradable / Cytocompatible Agarose–Polyethylene Glycol–Polycaprolactone Amphiphilic Co-Network Gels:** Biodegradable/biocompatible amphiphilic co-network (APCN) membranes are immensely important for controlled release and tissue engineering applications. Researchers from Central Salt & Marine Chemicals Research Institute, Bhavnagar have prepared Biodegradable APCN membranes of FDA approved agarose (Agr), poly (caprolactone; PCL) and poly (ethylene glycol) (PEG) by the sequential nucleophilic substitution reaction between amine functional Agr (Agr-NMe<sub>2</sub>) and activated halide terminated PCL (ClCH<sub>2</sub>Ph-PCL-Ph-CH<sub>2</sub>Cl) or PCL-b-PEG-b-PCL triblock copolymer (ClCH<sub>2</sub>Ph-PCL-b-PEG-b-PCL-Ph-CH<sub>2</sub>Cl) for controlled release of therapeutics. These APCN gels displayed good cytocompatibility and blood compatibility. The PEG in the APCN lowered the sol fraction, phase separation and burst release of drugs as well as enhanced the mechanical property of the membranes. Furthermore, the mechanical property of the membranes is suitable for use in particular tissue engineering applications (Figure 17).

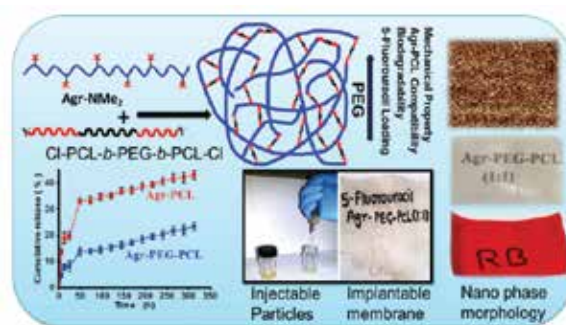


Figure 17. Effect of Polyethylene Glycol on Properties and Drug Encapsulation–Release Performance of Biodegradable/Cytocompatible Agarose–Polyethylene Glycol–Polycaprolactone Amphiphilic Co-Network Gels, ACS Appl. Mater. Interfaces, 2016, 8 (5), 3182–3192

#### 3.1.1.2 Inorganic and Physical Chemistry

During the year, a total of 215 proposals in inorganic chemistry and 227 in physical chemistry were received. A total of 59 proposals in inorganic and 69 in physical chemistry were supported for funding (Figure 18).

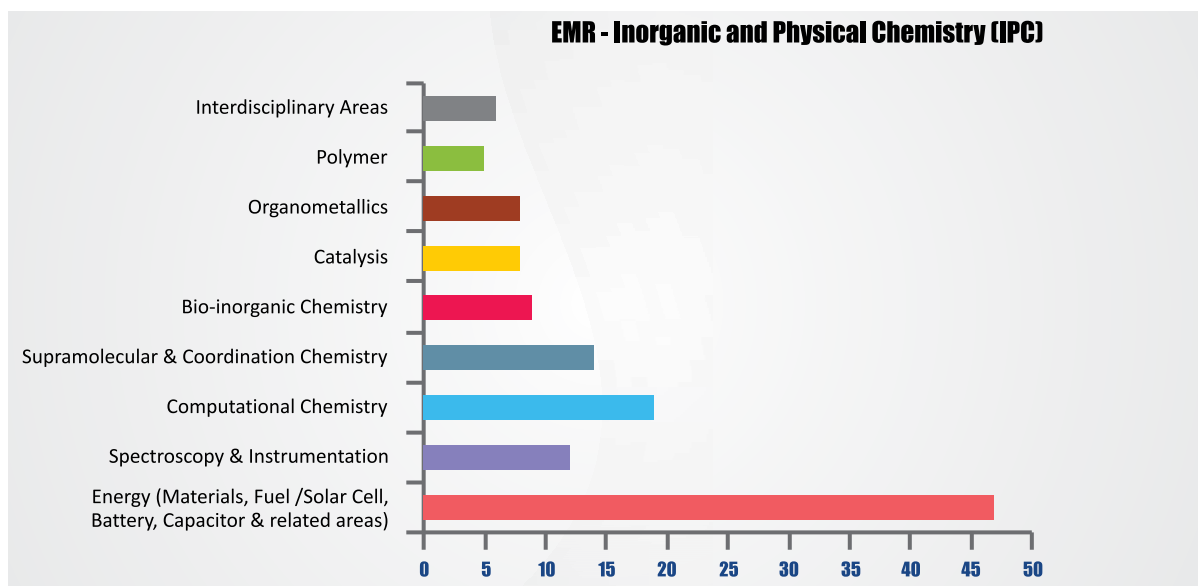


Figure 18. Projects supported in different sub disciplines of inorganic and physical chemistry.

### Research Highlights

**Design and synthesis of amino acid based Metal Organic Framework (MOF) and gel materials for water adsorption, chiral separation and drug-delivery applications:** Metalhydrogels based on an amino acid-based ligand and Zn(II) salts have been synthesized via an easy and convenient route in this project. These hydrogels show a rare, reversible, time-dependent transformation from the opaque to transparent state. These hydrogels also exhibit gradual dissolution in water (pH = 7) over time. A water-soluble stimulant, caffeine, could be in situ loaded into the hydrogels and slowly released during dissolution. Thus, the hydrogels have been successfully applied as drug-delivery vehicle.

Systematic studies have revealed the effect of incorporation of active chromophores inside a porous framework. A new Mg(II) based photochromic porous metal-organic framework (MOF) has been synthesized bearing naphthalenediimide (NDI) chromophoric unit. This MOF (Mg-NDI) shows instant and reversible solvatochromic behaviour in presence of solvents with different polarity. Mg-NDI also exhibits fast and reversible photochromism via radical formation. Due to the presence of electron deficient NDI moiety, this MOF exhibits selective organic amine (electron rich) sensing in solid state (Figure 19).

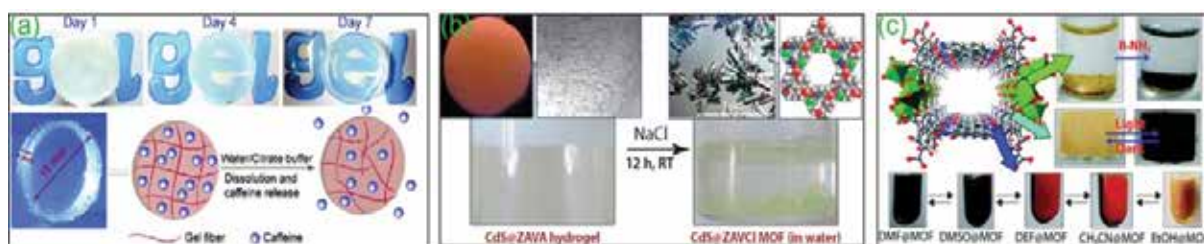


Figure 19. (a) Conversion of opaque form to transparent form of the metallohydrogel and the release of loaded drug molecules; (b) Photoluminescence of QD loaded metallohydrogel and its conversion into crystalline MOF in presence of chemical stimuli; (c) Solvatochromic property and amine sensing with NDI based porous metal-organic framework.

### 3.1.2 Earth and Atmospheric Sciences

During the year a total of 87 proposals in earth and atmospheric science were received. A total of 30 proposals were supported in different sub disciplines (Figure 20).

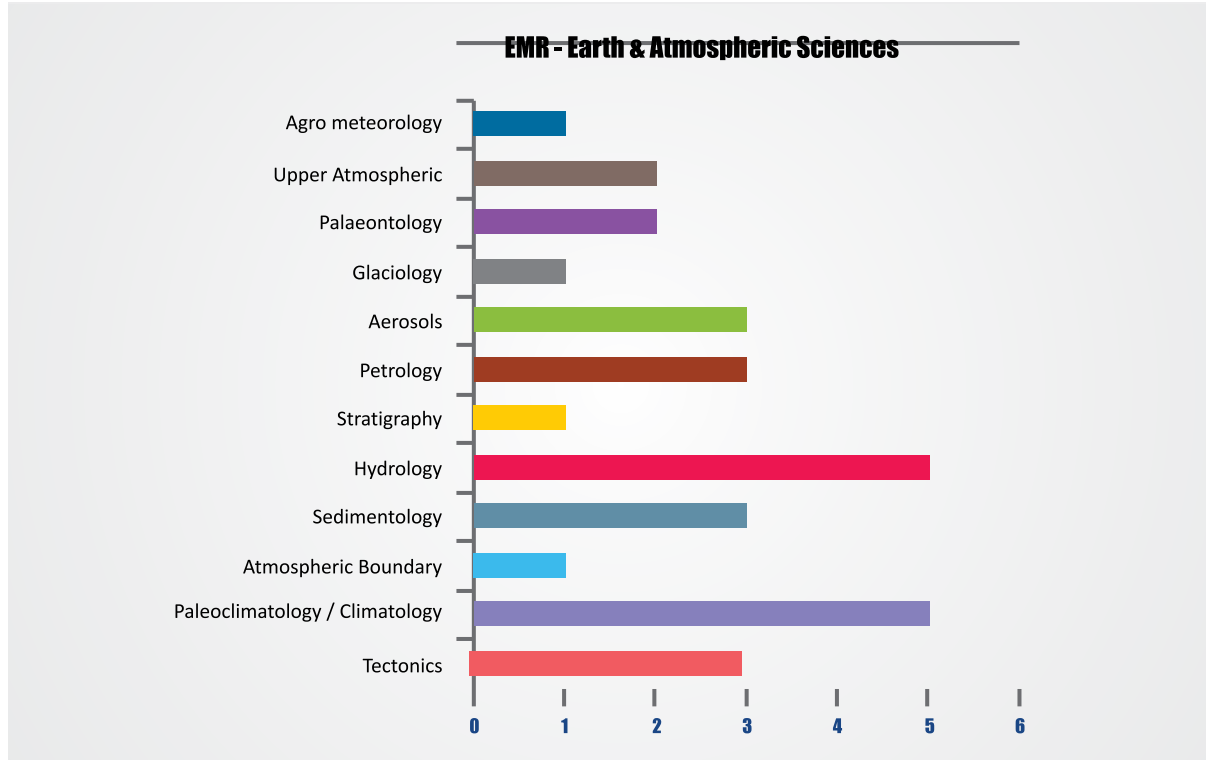


Figure 20. Projects supported in different sub disciplines of earth and atmospheric sciences.

#### Research Highlights

**Study of factors controlling the mass balance and dynamics of Chhota Shigri Glacier and implications for downstream flows:** The project realised that annual glacier-wide mass balance was generally negative during 2002-2015, except for four hydrological years (2004/05, 2008/09, 2009/10 and 2010/11) when it was slightly positive with cumulative glacier-wide mass balance of -6.88 m w.e a-1 corresponding to a mean annual glacier-wide mass balance over the same period being -0.53 m w.e. a-1 ( $\pm 0.40$  m w.e a-1). The study suggests a clear imbalance condition of the glacier, with more melting and less accumulation, especially in the lower elevation of the glacier. The cycle of diurnal temperature measured over

three sites on Chhota Shigri Glacier also suggest that the diurnal heating plays a substantial role in day time temperature evolution. In addition, the moisture advection and high temperature in the peak monsoonal period (July-August) is responsible for higher values of vapour pressure in different locations of the Chhota Shigri Glacier. Glacier stream discharge melt water (of year 2015) shows higher electrical conductivity (EC) as compared to rain, snow core, supraglacial and surface ice resulting from the mixture of all components and reaction with the subsurface processes leading to the dissolution of mineral ions in the solution (Figure 21).

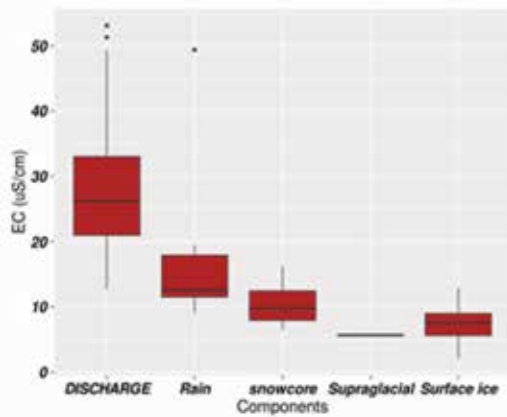


Figure 21. Electrical Conductivity (EC) of melt water, rain, snow core, supraglacial and surface ice resulted from the mixture of all components and reaction with the subsurface processes leading to the dissolution of mineral ions in the solution

Annual and seasonal series of Chhota Shigri glacier since 2002 is the longest continuous time series measurement in the entire Hindu-Kush-Himalaya region and should be continued to use this glacier as a benchmark for climate change studies. Melting at lowest part of the ablation zone is reduced by -1 to -2 m w.e. a-1 regardless of its altitude due to the “debris effect”, which shields the underneath ice from direct solar radiation and surface atmosphere. This study suggests that over the past few decades the glaciers of Lahaul and Spiti region (based on Chhota Shigri and regional glaciers dataset) have experienced a substantial amount of mass loss as well as surface thinning (Figure 22).

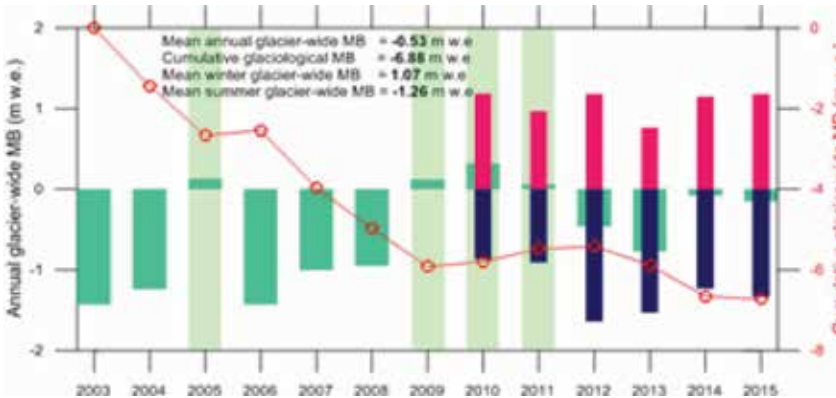


Figure 22. The annual (green histograms) and cumulative (line with red circles) glacier-wide MBs of Chhota Shigri glacier between 2002 and 2015. Light green shades are the years with positive (+) glacier MB. Also shown are the seasonal (winter (purplish-red histograms) and summer (deep blue histograms)) glacier-wide MBs between 2009/10 and 2014/15 hydrological year.

### 3.1.3. Engineering Sciences

#### 3.1.3.1 Civil and Mechanical Engineering

A total of 704 proposals (244 in Civil and 460 in mechanical, manufacturing and robotic), were received. A total of 27 proposals (6 in civil and 21 in mechanical, manufacturing and robotics) were supported (Figure 23).

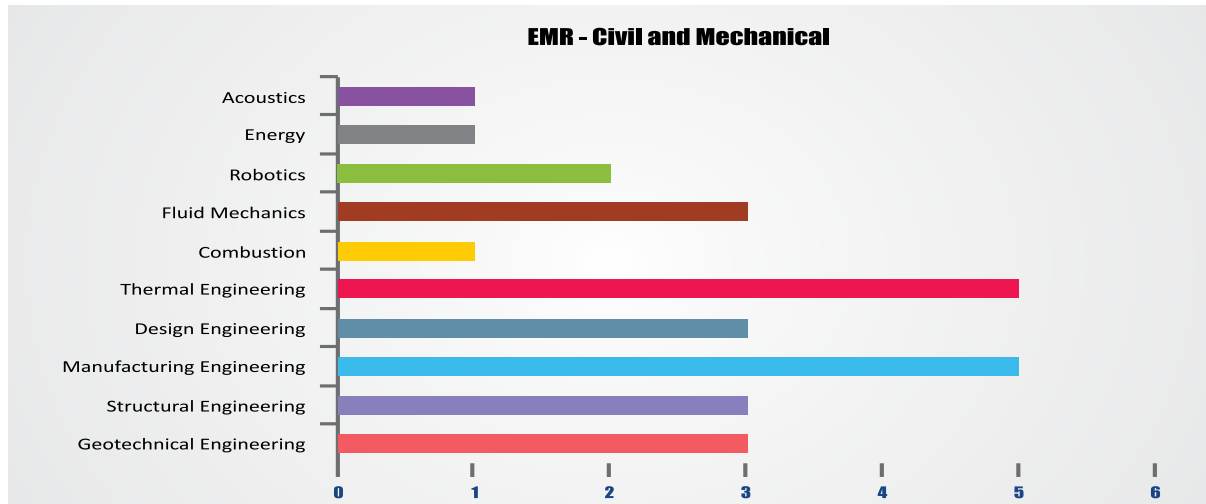


Figure 23. Projects supported in different sub disciplines of civil and mechanical sciences.

**Research Highlights**

**Development of Thermally Coupled Three Stage Pulse Tube Cryocooler:** This equipment developed at IIT Bombay attained lowest temperature of 19.61 K at the third stage. The developed

Cryocooler can be used in medical appliances such as MRI, low temperature materials characterization tools e.g. IR detectors, SQUID etc. including space applications (Figure 24).

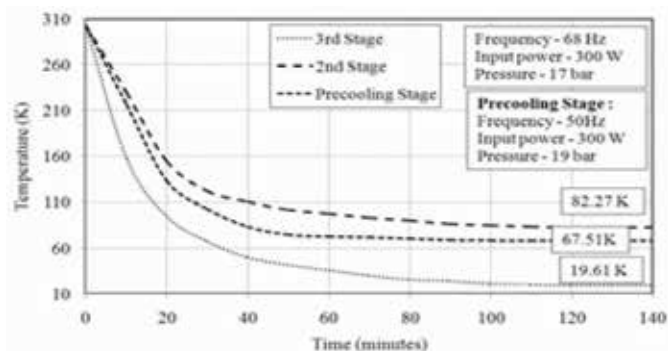


Figure 24. Thermo-coupled three stage pulse tube cryocooler.

**3.1.3.2 Materials, Mining and Minerals Engineering**

A total of 176 proposals were received and 22 were supported in different subdisciplines (Figure 25).

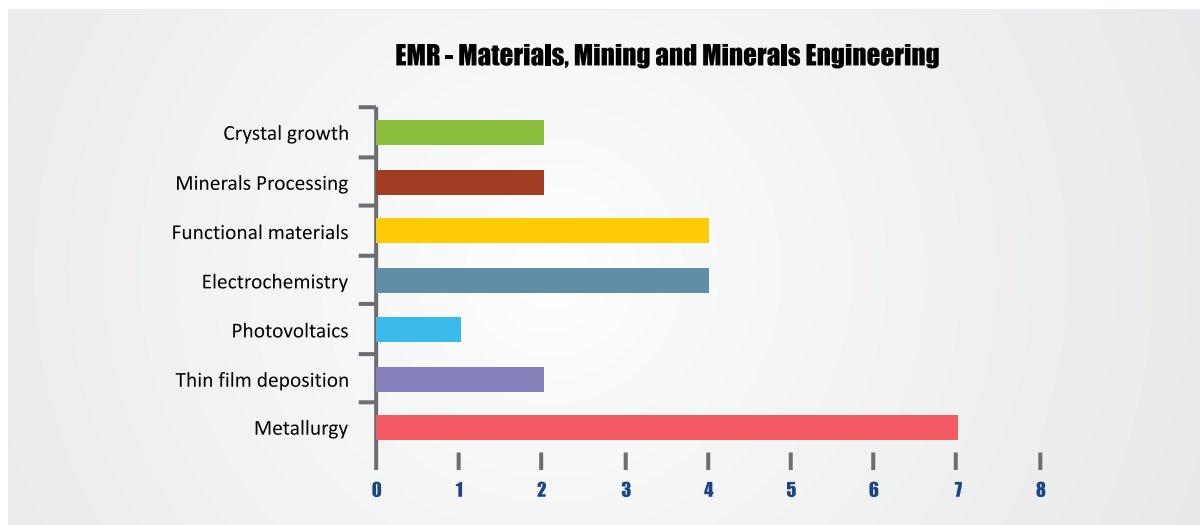


Figure 25. Projects supported in different sub disciplines of materials, mining and minerals engineering.

**Research Highlights**

**A novel user-friendly electro-mechanical gene transfection device:** This device was developed using nanoenergetic materials for synergistic generation of controlled electro-mechanical pressure-waves in biological fluids for

repeatable and high-yield gene transfection. The synchronized electro-mechanical pressure-waves demonstrated more efficient gene transfer to *E. coli DH5α* bacteria than the heat shock method (Figure 26).



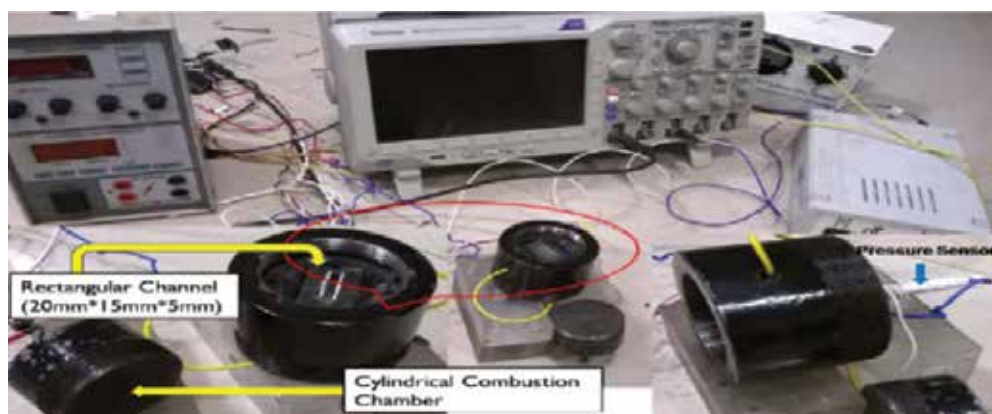


Figure 26. Electro-mechanical gene transfection device.

### 3.1.3.3 Electrical, Electronics and Computer Engineering

A total of 1384 proposals were received, and 53 proposals were supported in different sub-disciplines (Figure 27).

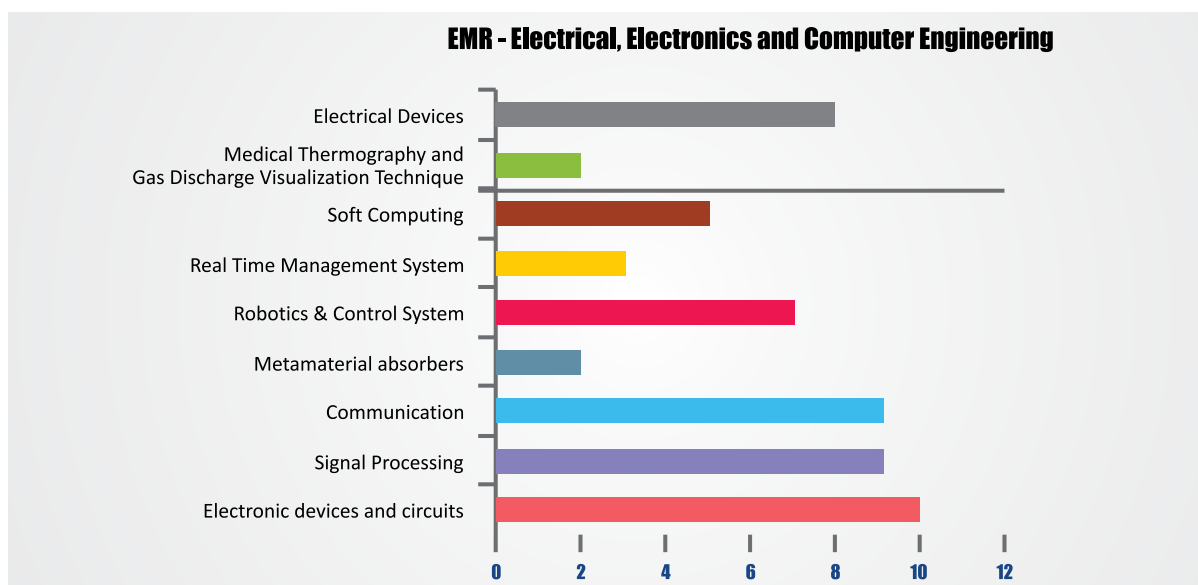


Figure 27. Projects supported in different sub disciplines of electrical, electronics and computer engineering.

#### Research Highlights

**Low Cost Disposable Smart Chip Technology for Bio Sensors in Diabetes Management:** The specific focus is to develop a manufacturing technology for low cost test strips to enable Glycated albumin measurements for the treatment of diabetes. In order to achieve test strips development for glycated albumin (GAlb) measurement, a technique should first be developed to achieve test strips for the measurement of human serum albumin (HSA) using electrochemical technology. Independent of the utility of GAlb for diabetes management, HSA on its own is an excellent marker for liver functionality test. For the first time, an electrochemical technique has been developed exploiting Copper binding property of

albumin. A cotton fabric based membrane is used to hold the dry sensing chemistry (by dispensing  $2\mu\text{L}$  of  $\text{CuCl}_2$  using Biodot automated dispenser) on top of screen printed carbon electrodes. This technique is then extended for GA measurement using boronic affinity principle and a custom designed carbon printed multi-electrode test strip. The manufactured test strip is used to measure actual blood samples and the technique is validated against enzymatic Glyco-gap assay from Diazyme. To translate the research outcome into a commercial product, IISc has incubated a start-up PathShodh Healthcare Pvt. Ltd. ([www.pathshodh.com](http://www.pathshodh.com)); Figure 28 & 29).

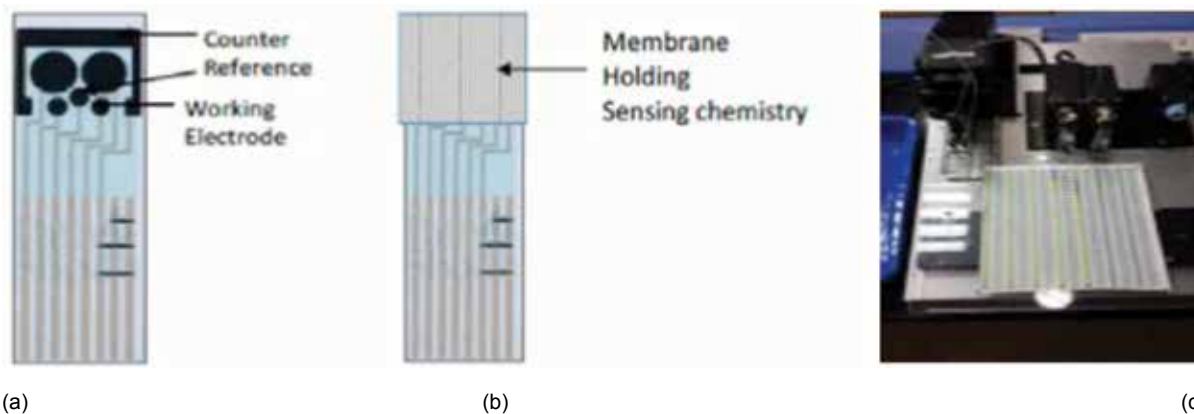


Figure 28. (a)-(b) Test strips coated with cotton membrane, (c) XYZ 3210 platform from Biodot for automated chemistry dispensing.

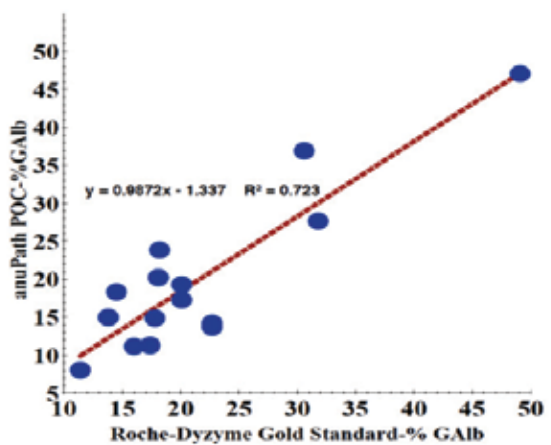


Figure 29: Validation of %GA on handheld POC device

### 3.1.3.4 Chemical and Environmental Engineering

A total of 478 proposals (234 in chemical and 244 proposals in environmental engineering) were received. A total of 33 projects (26 in chemical and 07 in environmental engineering) have been supported (Figure 30).

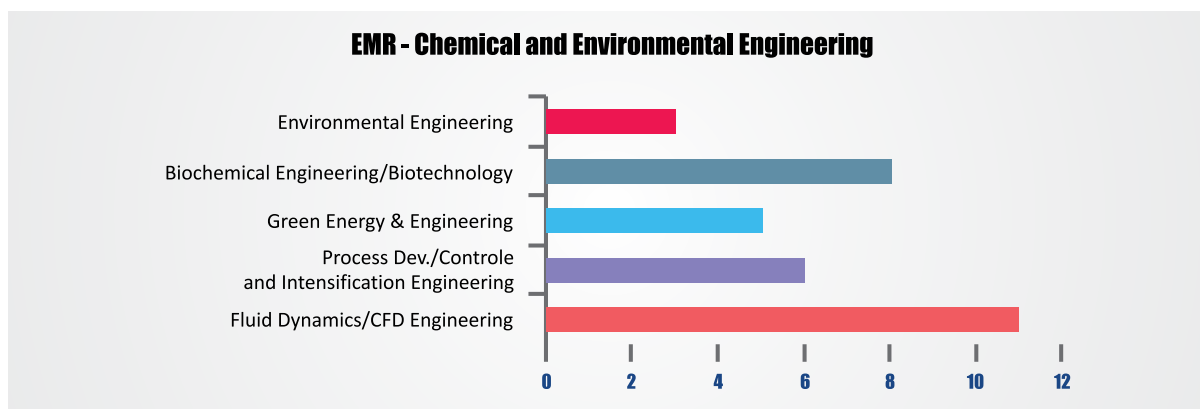


Figure 30. Projects supported in different sub disciplines of chemical and environmental engineering.

## Research Highlights

**Non-gassing electrode materials for Electro-osmotic pumping based subcutaneous drug delivery system:** First time, the application of proton coupled electron transport behaviour of redox moieties for electro-osmotic pumping is reported by generating quinone / hydroquinone redox couple on carbon paper by oxygen plasma treatment. It was further confirmed by synthesizing polybenzoquinone polymer from

acid catalysed polymerisation of benzoquinone. The minimum potential at which the pump was able to pump the water was 1V, the potential well below the thermodynamic potential of water splitting. The flow of the pumps was depending on the coulombic capacity of the electrodes. The obtained coulombic capacity has been utilized to develop supercapacitor (Figure 31).

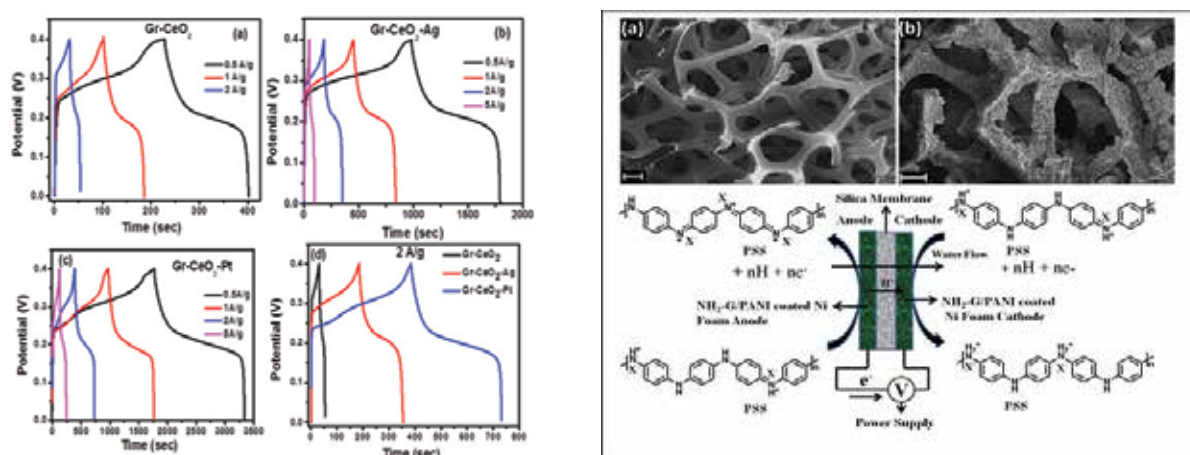


Figure 31. (a) Schematics of Graphitic oxide coupled polyaniline on nickel foam electrode for non-gassing electro-osmotic pumping. (b) Show the galvanostatic charge/discharge of  $\text{Gr-CeO}_2$  electrode (b) charge/discharge of Ag doped  $\text{Gr-CeO}_2$  electrode (c) charge/discharge of Pt doped  $\text{Gr-CeO}_2$  electrode (d) over lap of charge/discharge curve for different electrode.)

### 3.1.4. Life Sciences

#### 3.1.4.1. Animal Sciences

A total of 291 proposals were received and a total of 76 proposals were supported in different sub disciplines (Figure 32).

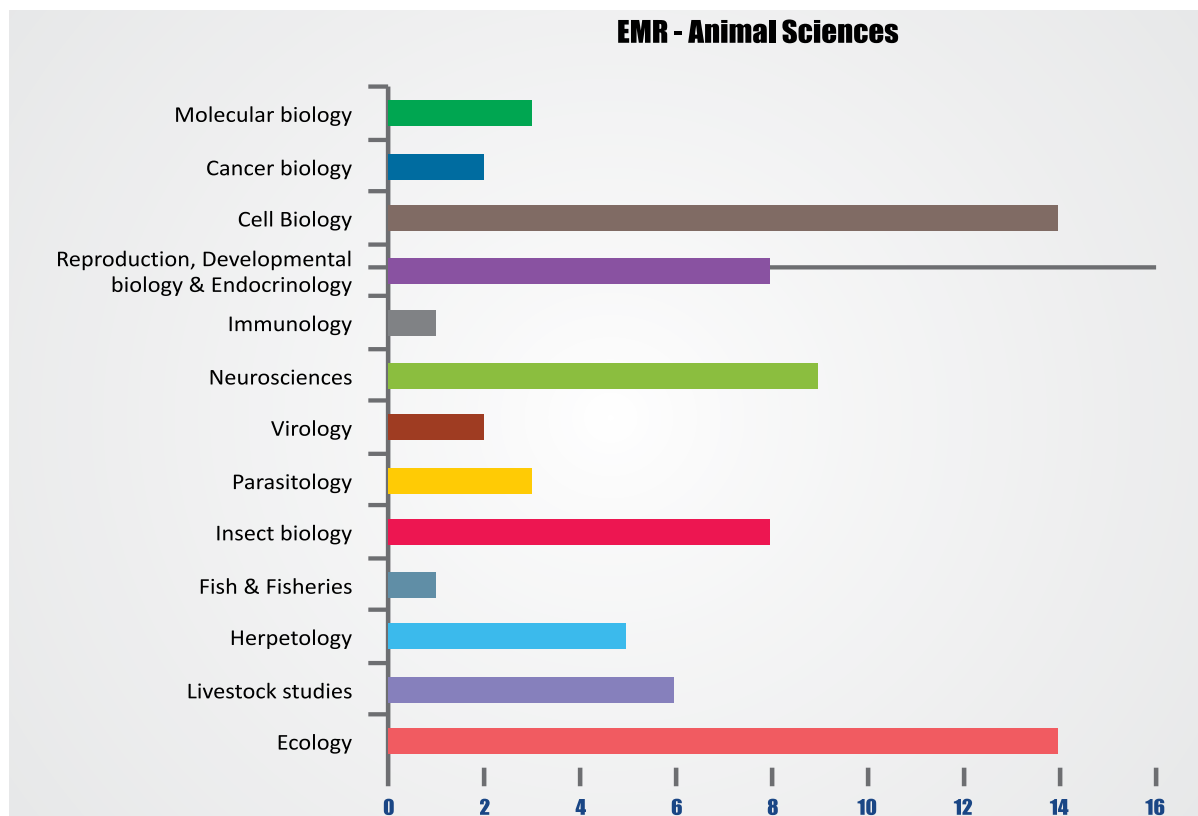


Figure 32. Projects supported in different sub disciplines of animal science.

#### Research Highlights

**Role of dopamine in the regulation of reproduction of the catfish, *Clarias sp.*:** The study explored the organization of dopamine (DA)-containing system in the brain and pituitary of two important food fish of the Indian sub-continent viz. the catfish, *Clarias batrachus* and the Indian major carp, *Cirrhinus cirrhosus*. In both teleosts, DA system seems to be widely organized, with several similarities. However, the presence of DA in the neurons of the terminal nerve was observed only in the olfactory bulb of *C. cirrhosus*. Neurons of the Nucleus preopticus periventricularis-anterior (NPPa) in preoptic area (POA) and their innervation to the pituitary seem to be a distinct sexually dimorphic DAergic system in *C. batrachus*. DAergic

system may serve as a component of the neural mechanisms controlling sexually dimorphic LH surge in teleosts.

For the first time, the hypophysiotropic DA neurons in the POA of *C. batrachus* was demonstrated. Two distinct nuclei viz NPPa and NPPp contain tyrosine hydroxylase (TH)-ir neurons. Majority of the retrogradely labelled neurons co-expressing DA were observed in NPPa. In addition, it has been observed that the non-hypophysiotropic DA neurons in NPPa and NPPp innervate and regulate the isotocin neurons in the nucleus pre-opticus (NPO) of *C. batrachus* (Figure 33 & 34).

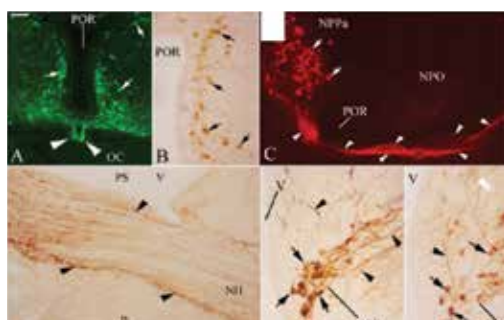


Figure 33. TH cells (arrows) and fibers (arrowheads) in the preoptic area and pituitary of *C. batrachus*. A, B: Cells in NPPa and their axons above optic chiasm (OC). C, Axons originating from NPPa traveling posteriorly towards pituitary. D, fibers in pituitary stalk (PS) and neurohypophysis (NH). E, F: TH cells in NPPp. No cells are seen in nucleus preopticus (NPO) but NPO show dense TH innervations. P, pituitary; POR, preoptic recess. V, third ventricle. Scale bar = 25  $\mu$ m.

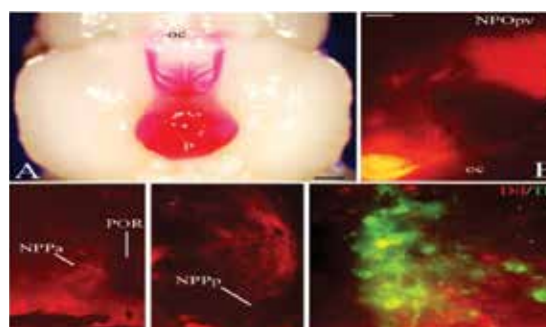
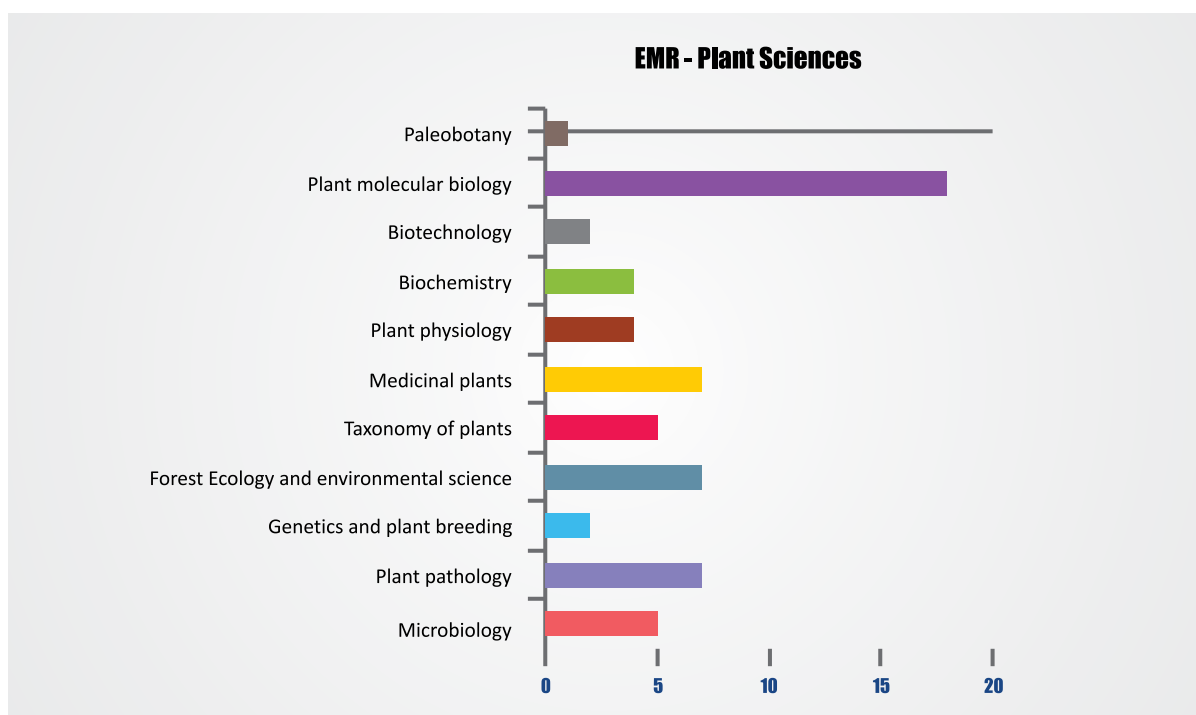


Figure 34. Retrograde neuronal tracing to identify hypophysiotropic DA neurons in preoptic area (POA) of *C. batrachus*. Location of Dil injection in the pituitary gland (P) and labeling of the preoptico-hypophyseal tract (A). Retrograde accumulation of this substance is seen in the paraventricular subdivision of the nucleus preopticus (NPOpv) (B), nucleus preopticus periventricularis anterior (NPPa) (C) but not in NPP posterior (NPPp) (D). Several TH neurons (green) in NPPa show Dil accumulation (red) and appear yellow due to color mixing (E). oc, optic chiasm; POR, preoptic recess; V, ventricle. Scale bar = 1 mm in A, 25  $\mu$ m in B-E.

### 3.1.4.2 Plant Sciences

A total of 663 proposals were received, and 62 new proposals were supported in different sub discipline (Figure 35).



Figures 35. Projects supported in different sub disciplines of plant science.

### Research Highlights

**Linking plant functional traits to ecosystem services across:** Plant Functional Traits (PFTs), which characterize various physiological, physical and chemical attributes, can provide

us with key insights into plant responses to environmental stresses, their interactions with soils and atmosphere, and contributions to ecosystem-level processes and ecosystem

services. A database of 20 functional traits of 226 woody plant species from peninsular India have been generated. It is one of the most comprehensive databases of PFTs for Indian trees. The data generated as part of this project has been able to address fundamental scientific questions about the range and extent of inter- and intra-specific variation in plant functional traits, the relationship between multiple traits, as well as to predict the ecosystem consequences of anthropogenic alterations to ecosystems through simulation models that explicitly link

plant response and effect traits. The results of simulations suggest that defaunation effects on aboveground carbon stocks are likely to vary by region contingent on floristic composition, with forests of the Neotropics, Africa and South Asia where tree communities are dominated by animal-dispersed species incurring carbon losses, while carbon stocks remain unchanged or marginally increase in forests of south-east Asia and Australia where large, abiotically-dispersed species are prevalent (Figure 36).

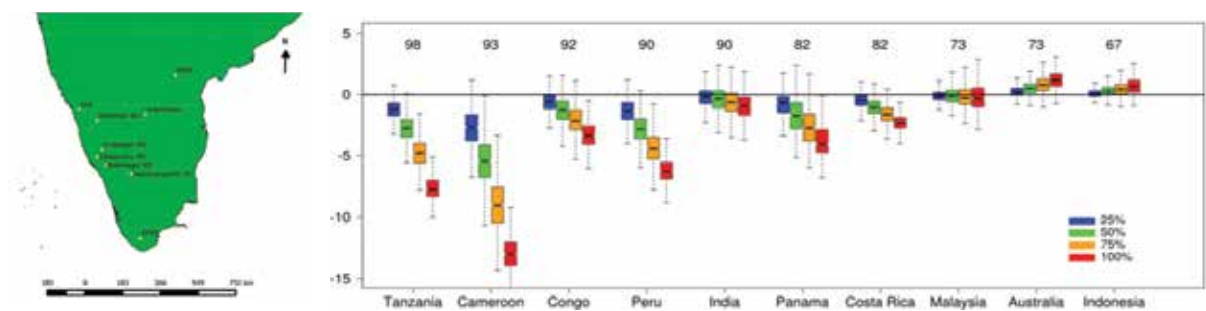


Figure 36. Effects of simulated extirpations of large-seeded animal-dispersed species on aboveground carbon stocks. Boxes represent changes relative to original carbon stocks for 1000 simulation runs following removal of 25%, 50%, 75% and 100% of individuals belonging to large-seeded animal-dispersed tree species. Numbers above boxes represent the proportion of animal dispersed species in the overall community (Osuri et al. 2016).

### 3.1.4.3 Health Sciences

A total of 1084 proposal were received, and 144 proposals were supported in different sub disciplines (Figure 37).

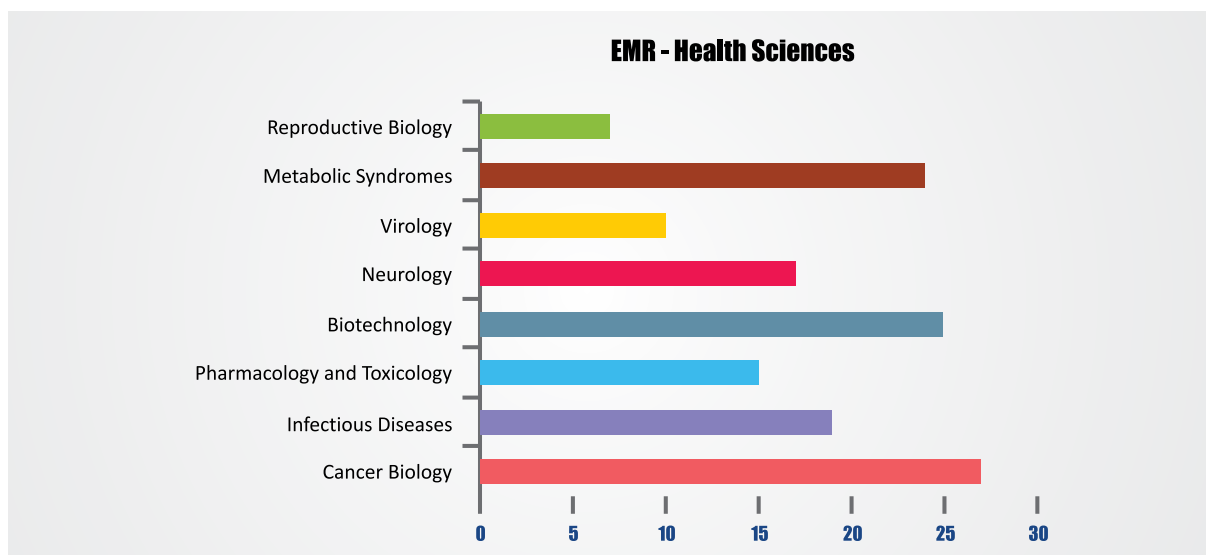


Figure 37. Projects supported in different sub disciplines of health science .

## Research Highlights

### **Molecular characterization of *Anopheles stephensi* gut epithelial peroxidases and their role in modulating immunity against bacterial and fungal antigens:**

**Malaria** is a life-threatening disease caused by the parasites that are transmitted to people through the bite of *Anopheles* mosquitoes or infected mosquitoes. In this study the *Anopheles gambiae* heme peroxidase 15 (AgHPX15) orthologs has been characterized in Indian malaria vectors to understand its novelty and also, whether it can serve as a plausible target to block *Plasmodium* development. It has been observed that anopheline-specific and evolutionary conserved heme peroxidase HPX15 may serve as a unique target for designing transmission-blocking strategies to block *Plasmodium*-mosquito cycle.

Further the investigators observed that AsHPX15 is highly induced in blood fed mosquito midguts. The expression kinetics of AsHPX15 gene in *Anopheles stephensi* midgut revealed that this gene promoted the proliferation of endogenous as well as exogenous fed bacteria. In case of AsHPX15 silenced midguts, the proliferation of midgut bacteria was largely reduced through the induction of nitric oxide synthase (NOS) gene, a downstream effector molecule of the JAK/STAT

pathway. Interestingly, no significant induction of the classical immune pathways was observed in these midguts (Figure 38).

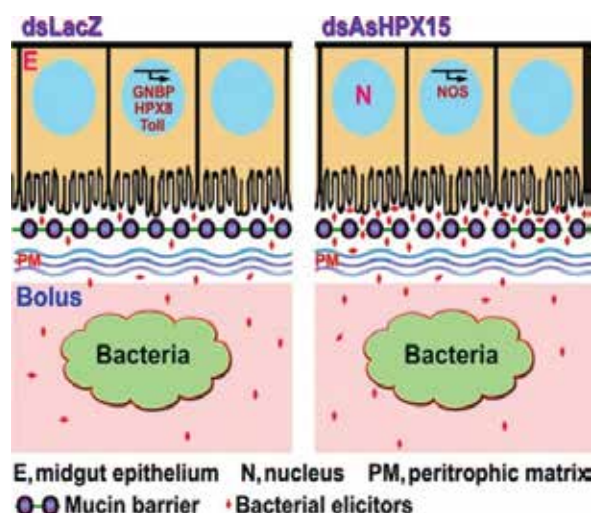


Figure 38. Molecular characterization AsHPX15 gene.

AsHPX15 gene silencing reduced the formation of gut mucin barrier and exposed malaria parasite to the mosquito immune system. The induction of NOS in AsHPX15 silenced mosquitoes killed the parasite.

## 3.1.4.4 Biochemistry, Biophysics, Molecular Biology and Microbiology

A total of 646 proposals were received and 83 proposals were supported in different sub disciplines (Figure 39).

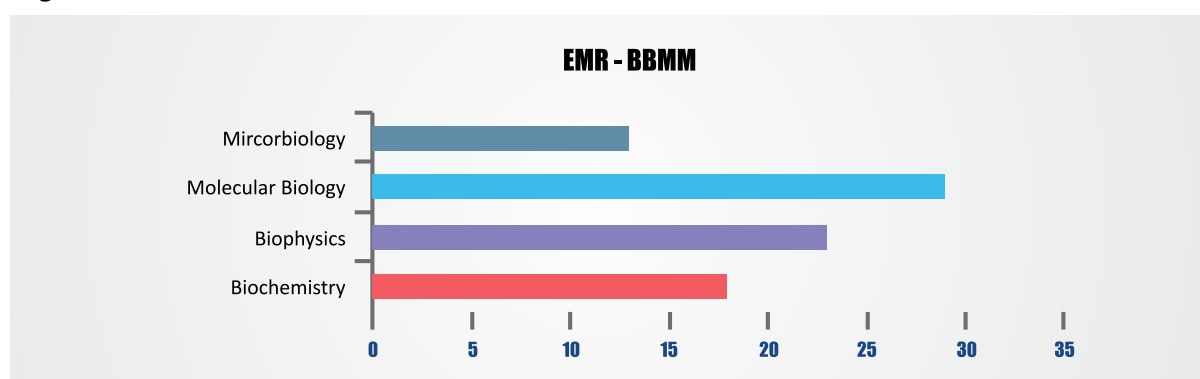


Figure 39. Projects supported in Biochemistry, Biophysics, Molecular Biology and Microbiology.

## Research Highlights

**Biomimetic Approach to Measure In-Situ Generated Force from Nucleated Microtubules on 2D Micropattern Surface:** Microtubules, a key filament present inside our cell plays key

role in cell division. As we know that in cancer, uncontrolled cell division occurs, thus, the filament is extremely important for development of anticancer drugs. Further, it is also important

to understand the connection between dynamic instability of this key filament and magnitude of force generated on the cell membrane. The key goal of this project proposal is to fabricate a two-dimensional platform artificially nucleate

microtubule in a reconstitution approach through mimicking intracellular environment followed by measurement of nucleation of polymerization force of microtubules using AFM (Figure 40).

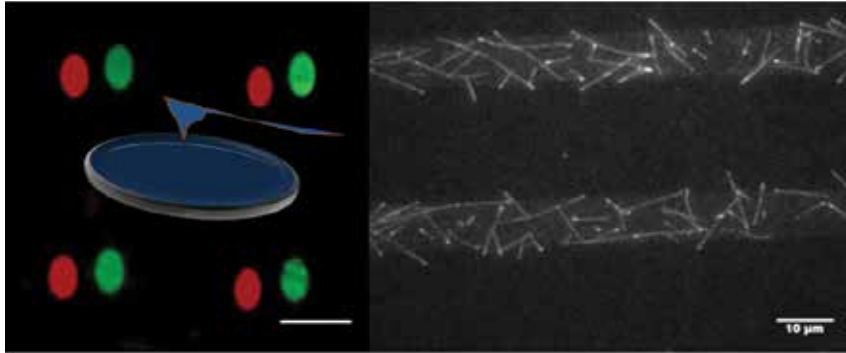


Figure 40. (left panel) fabrication of chromosome (red oval) and centrosome (green oval) mimetic 2D micropattern surface. Centre of left panel represents force that can be measured using AFM. Right panel, nucleation of microtubules from 2D micropattern line surface.

### 3.1.5 Physical & Mathematical Sciences

#### 3.1.5.1 Physical Sciences

A total of 506 proposals were received, and 173 proposals were supported (Figure 41).

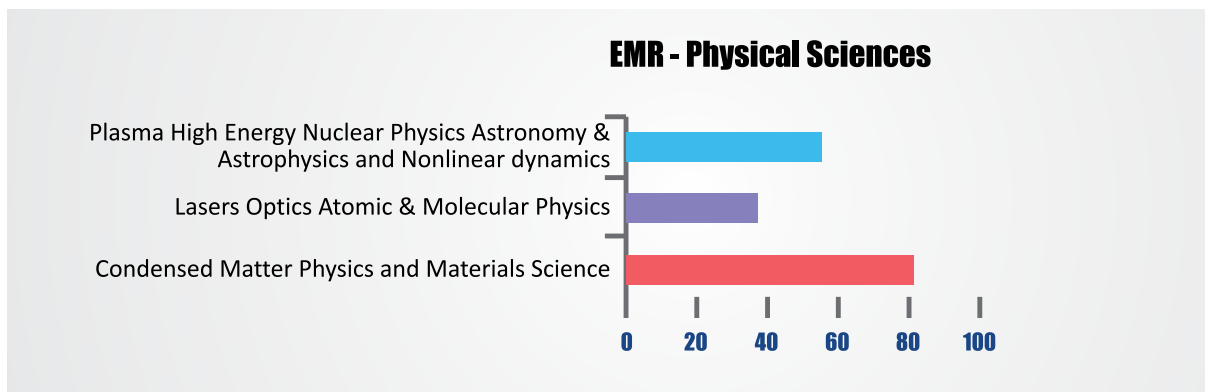


Figure 41. Projects supported in different sub disciplines physical sciences.

#### Research Highlights

**Pulsar Monitoring observations program with the upgraded Ooty Radio Telescope:** The project was initiated last year (February 2016) with the procurement of the sanctioned equipment, -Rubidium clock, a GPS receiver, a personal computer and a UPS. These have since been commissioned at the Ooty Radio Telescope and are in regular use for last six months for multi-epoch pulsar observations. Two pipelines for

single pulse analysis and analysis of pulse scatter broadening for multi epoch observations using the Ooty Radio Telescope (ORT) have been developed. These are currently being tested extensively off-line. The recruitment of Senior Research Fellow was initiated immediately after the sanction of funds and was completed in March 2016. (Figure 42).





Figure 42. The image shows the GPS receiver and Rubidium clock installed at the ORT. The black panel on the top is the GPS unit (Spectrum TM4M/D) and the bottom right panel shows the Rb clock (FS725).

### 3.1.5.2 Mathematical Sciences

A total of 194 proposals were received, and 38 proposals were supported (Figure 43).

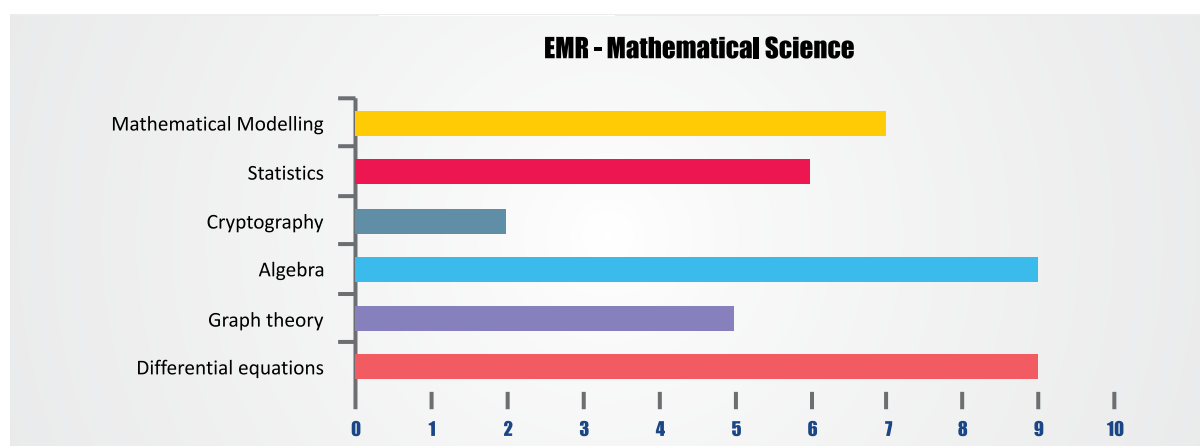


Figure 43. Projects supported in different sub disciplines mathematics.

#### Research Highlights

**Stochastic differential equation models and their applications to agriculture:** Nonlinear deterministic growth models, like logistic and Gompertz models are widely employed in Indian Agriculture. Richards four-parameter nonlinear growth model, is a generalization of the well-known logistic and Gompertz models, for describing many growth processes. Employing usual methodology for fitting a nonlinear deterministic model by simply adding an error term is not capable of describing the underlying fluctuations satisfactorily. In a physical situation, random environmental fluctuations generally occur with great rapidity as compared to the time-scale of population growth. However, one limitation of these models is that they are

applicable only when the data are available at equidistant epochs. Another limitation is that the fluctuations in the system cannot be satisfactorily explained simply by adding an error term to the deterministic formulation. Optimal predictor of untransformed data along with prediction error variance is derived in the proposed model. Relevant computer programs for its application have been written. Finally, as an illustration, superiority of the proposed model is shown over Richards nonlinear statistical model for the real data, and the same has been validated. The study shows lots of promise in future application in agriculture and other sectors: where stochastic differential equational models are utilised.

### 3.2 High Risk - High Reward (HRHR)

A total of 32 proposals were received and two proposals under the discipline Biochemistry, Biophysics, Molecular Biology and Microbiology were approved.

#### Objective

To support proposals that are conceptually new and risky, and if successful, expected to have a paradigm shifting influence on the S&T. This may be in terms of formulating new hypothesis, or scientific breakthroughs which aid in emergence of new technologies.

#### Features

The scheme signifies the beginning of highly competitive quality and impactful R&D in the country: Majority of R&D funding in Science in the Developed world currently is of this nature.

The applicant(s) must secure a regular academic/research position in a recognized institution.

The funding is provided normally for a period of three years. In exceptional cases, the duration can be up to 5 years as assessed by the expert committee.

#### Website links

<http://serbonline.in/SERB/HRR>  
<http://www.serb.gov.in/hrhr.php>

### 3.3 Industry Relevant R&D (IRRD)

A total of 6 proposals were considered and only one proposal was approved for funding under the discipline Chemical Sciences (organic chemistry).

#### Objective

To support ideas that address a well-defined problem of industrial relevance in the country. The proposal, therefore, shall be jointly designed and implemented by the academic partner (which includes a partner from national laboratories/ recognized R&D institutions as the case may be) and industry.

#### Features

Routine proposals that address conventional problems and those not related to industry, or with already established approaches are not encouraged.

The academic partner must hold a regular academic/ research position in an academic institution or national laboratories or recognised R&D institutions

For Industry Partner, all industries (including MSME & Industrial R&D Centres) are eligible. More than one Industry and/or more than one Investigator can apply.

The funding is shared between SERB and Industry. The industry share should not be less than 50 % of the total budget. The funding can be provided for a maximum period of three years. The support from SERB shall be extended only to the academic partner.

#### Website links

<http://serbonline.in/SERB/IRR>  
<http://www.serb.gov.in/irrd.php>

### 3.4 Intensification of Research in High Priority Area (IRHPA)

A total of 3 proposals were considered and all have been funded.

#### Objective

To support proposals in high priority areas where multidisciplinary / multi institutional expertise may be required and which will put our nation in international science map in that particular discipline.

#### Features

Identification, formulation and implementation of national R&D Programmes through involvement of scientists from different agencies & institutions is encouraged.

The amount of grant is slightly higher than regular projects, since in order to set up core groups or units/facilities under this scheme, existing infrastructural facilities of the institutions needs to be strengthened.

The duration of these type of Projects is 5 years.

A Core Group/Unit is set up for a period of five years so that it can serve as focal point for a national programme. The parent institute is asked to take over the unit after five years.

#### Website links

<http://serbonline.in/SERB/irhpa>  
<http://www.serb.gov.in/irhpa.php>

Summary of few of the major IRHPA Projects is given below :


Title of the project	Name of the PI	Affiliation of the PI
Development of Li-ion batteries for Electric Vehicle applications	Dr. R. Gopalan	Scientist-G, Department of Centre for Automotive Energy Materials, ARCI, Hyderabad
<p><b>Salient features</b></p> <p>LIB was fabricated to test cells (100Ah capacity). Prototype cells of 3.2V-10 Ah was developed (capacity= 8 Ah at 1C rate &gt; 75% capacity retention after 700 cycles). Prototype modules of 48V-10 Ah was demonstrated with e-cycle (48V-10Ah, 12h/charge) and e-scooter (48V-20Ah, 6 h/charge) under NL condition. The large scale <math>\text{LiFePO}_4</math> and <math>\text{Li}_4\text{Ti}_5\text{O}_{12}</math> materials were synthesized and characterized (Figure 44).</p>		
		

Figure 44. Top: LIB Pilot Plant Facility and bottom: Testing facility and prototype module demonstration.

Title of the project	Name of the PI	Affiliation of the PI
Combined Centres for Combustion Research	Prof. T. Sundararajan; Prof. S. Chakravarty; Prof. R.V. Ravikishna & Dr. Charlie Oommen	IIT, Madras & IISc., Bangalore

**Salient features**

The twin challenges of alternative energy and environmental protection afflicting a modern emerging economy like India is predicated on effective utilization of combustion as a means of thermo-chemical energy conversion. Realising the SERB is supporting the establishment of the National Centre for Combustion Research & Development (NCCRD) at IIT, Madras and IISc., Bangalore. The research interests are in three major application sectors, automotive, thermal power, and aerospace propulsion, besides fire research and microgravity combustion to minor extents (Figure 45).

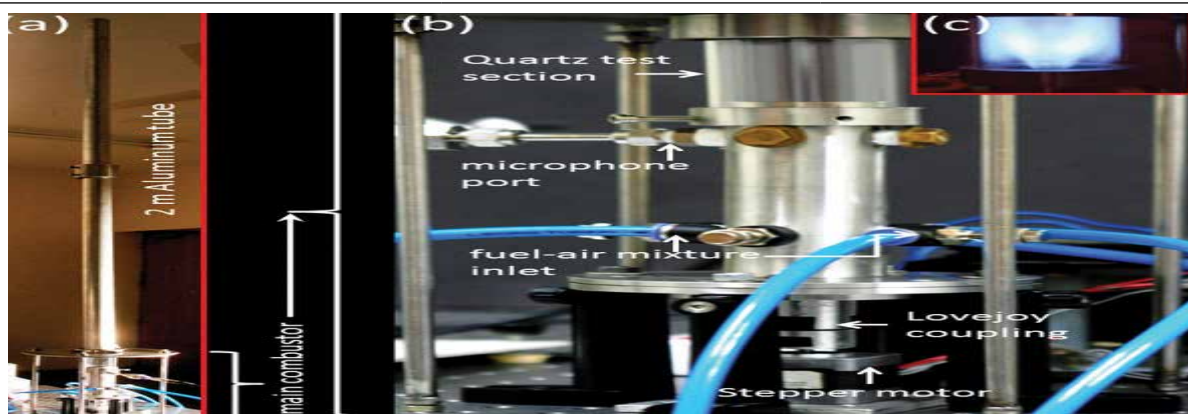


Figure 45: Laboratory combustor demonstrating combustion instability mitigation using actuated swirler.

Title of the project	Name of the PI	Affiliation of the PI
A Novel feasibility study of newborn screening fortreatable disorders and epidemiologic data generation for inborn metabolic errors in Delhi state.	Prof. B.K. Thelma	Department of Genetics, University of Delhi

**Salient features**

The current findings suggest that expanded NBS for all treatable and untreatable inborn IEMs is an important issue. NBS for common treatable condition namely congenital hypothyroidism, congenital adrenal hyperplasia and Glucose-6-phosphate dehydrogenase deficiency are being carried out in a limited number of hospitals in our country. Epidemiological data for all the treatable and untreatable IEMs in the country are sparse or not yet available. Keeping the genetic landscape of the Indian population combined with socio-cultural practices carrying out systemic prospective screening of IEMs in each of the Indian state is imminent, and is proposed in this study (Figure 46).

**New Born Screening For Treatable Inborn Metabolic Errors In Delhi S**



Figure 46. New Born Screening for Treatable Inborn Metabolic Errors in Delhi State

Title of the project	Name of the PI	Affiliation of the PI
Petrology of kimberlites from southern India and garnets from kimberlite concentrates: Implications on sub-continental lithospheric mantle"	Prof. S.C. Patel	Department of Earth Sciences, IIT Bombay

### Salient features

The Wajrakarur Kimberlite Field in southern India contains 48 intrusions which are distributed in six clusters. Higher oxygen fugacity appears to have prevailed in TK1 as indicated by higher content of ferric iron in spinel, perovskite and phlogopite in the rock. Close spatial association and likely near contemporaneous emplacement of Mesoproterozoic kimberlites, lamproites, lamprophyres and UML in southern India can possibly be explained by a unifying model which involves the interaction of an asthenosphere-derived melt with variably metasomatized source regions in the SCLM. In the above basin, a rift-related origin for these rocks is being thought as the possibility in the study (Figure 47).

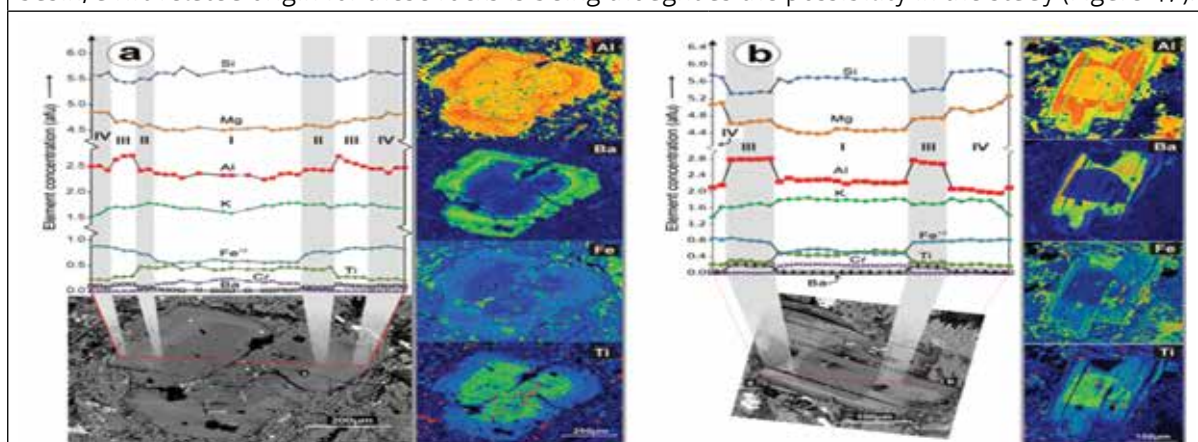


Figure 47. Chemical zonation in two phlogopite mica grains from the TK4 kimberlite showing multiple stages of growth from an evolving magma [Reference: Chemical Geology, 2017, <http://dx.doi.org/10.1016/j.chemgeo.2016.10.030>].

Title of the project	Name of the PI	Affiliation of the PI
Petrogenesis and Rare Earth Element potential of Kamthai and Amba Dongar carbonatites	Prof. Biswajit Mishra	Dept. of Geophysics, IIT Kharagpur

### Salient features

The Amba Dongar carbonatite-alkaline complex is a sub-volcanic diatreme that consists of a sövite ring dike with an inner rim of carbonatite breccia and is surrounded by a K-rich fenite zone. While the dominant magmatic phases in the carbonatite are calcite, albite, aegirine augite, the accessory minerals include pyrochlore and apatite as euhedral zoned crystals (Figure 48).

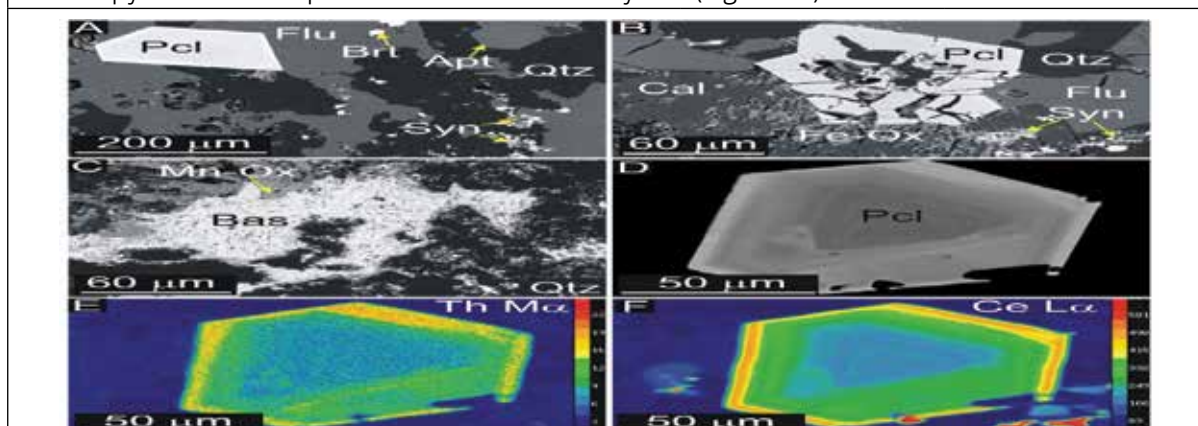


Figure 48. SEM-BSE image showing (A) association of magmatic pyrochlore (Pcl), apatite (Apt) with fluorite (Flu), barite (Brt) and minor synchysite (Syn); (B) fractured pyrochlore with relatively more synchysite; (C) abundant bastnäsite (Bas) mineralization; (D) zoning in a pyrochlore grain.

Title of the project	Name of the PI	Affiliation of the PI
Setting up of a National Facility on Electron Probe Micro Analyser at BHU, Varanasi	Prof. Chulipati Rao	Banaras Hindu University

### Salient features

The CAMECA SXFive EPMA at the Department of Geology, Banaras Hindu University was inaugurated on 11<sup>th</sup> April, 2016 and became fully functional ever since. Apart from the PIs of the project, twenty-five users from various Faculties/institutions/Universities/Colleges within the Banaras Hindu University and across the country are utilising this facility (Figure 49).

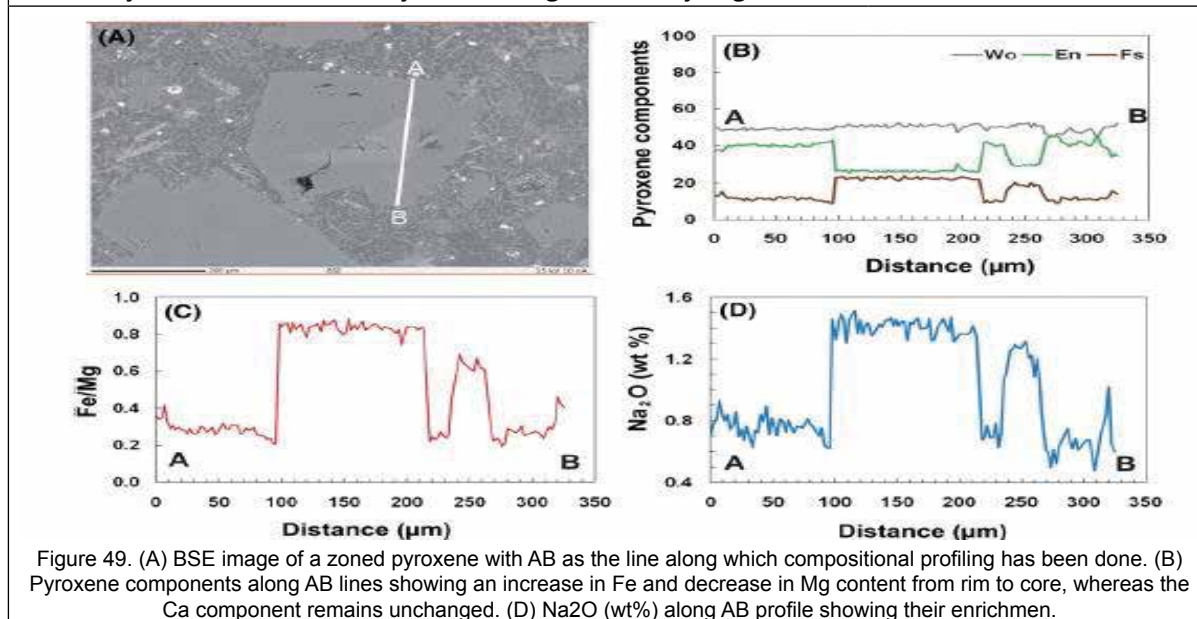


Figure 49. (A) BSE image of a zoned pyroxene with AB as the line along which compositional profiling has been done. (B) Pyroxene components along AB lines showing an increase in Fe and decrease in Mg content from rim to core, whereas the Ca component remains unchanged. (D) Na<sub>2</sub>O (wt%) along AB profile showing their enrichment.


Title of the project	Name of the PI	Affiliation of the PI
Unit on Spatially Resolved Magnetic Resonance	Prof. N. Chandrakumar	IIT-Madras, Chennai


### Salient features

Overhauser Dynamic Nuclear Polarization (ODNP, or simply DNP) is a technique that allows enhancement of the sensitivity of NMR spectroscopy by anywhere upto three or even four orders of magnitude, without serious compromise in NMR resolution. This would allow application of NMR to molecular problems that were hitherto beyond its scope owing to sensitivity limitations (Figure 50).



Figure 50. Top view of part of the custom-built multi-band DNP system: (l to r) X/Q-band electroma.

Title of the project	Name of the PI	Affiliation of the PI
National Centre for Catalysis Research (NCCR)	Prof. P. Selvam; Prof. B. Vishwanathan	Indian Institute of Technology, Madras
<p><b>Salient features</b></p> <p>The National Centre for Catalysis Research (NCCR) was established by the Department of Science and Technology at Indian Institute of Technology, Madras in 2006 with a mandate to i) build human resource and knowledge, ii) establish advanced R&amp;D facilities, iii) initiate research programs in frontier areas and iv) cultivate a vibrant partnership between academy and industry. A bench scale process for the trans-esterification of vegetable oils with alcohols into bio-diesel has been developed at NCCR. Further, a process for catalytic conversion/deoxygenation of vegetable oils (including non-edible jatropha oil into diesel hydrocarbons (green diesel) using a novel zeolite based Ni-Mo-catalyst was also developed. Ruthenium based multi-metallic catalysts for condensation of bio-ethanol with &gt;80% selectivity towards butanol and higher alcohols was also synthesized. Many industrial processes have been developed at NCCR, along with many patents and publications (Figure 51).</p>		
 <p>Figure 51. National Centre for Catalysis Research.</p>		

Title of the project	Name of the PI	Affiliation of the PI
Studies on the tropospheric feature and stratosphere coupling processes over the Monsoon region using stratosphere tropospheric (ST) Radar at Cochin.	Prof. K. Mohankumar	Director, Advanced Centre for Atmospheric Radar Research
<p><b>Salient features</b></p> <p>The Cochin University of Science and Technology (CUSAT) has recently installed the most sophisticated and indigenously developed Stratosphere-Troposphere (ST) radar being operated at 205 MHz frequency. Besides being the first radar in the World operating at this frequency, it is also the first wind profiler radar in the near equatorial site set up primarily to study the characteristics of Indian summer monsoon right at its Gateway in the region at Cochin. This radar provides a cost effective and high precision technology data of atmosphere upto 20 km at least (Figure 52).</p>		
 <p>Figure 52. A schematic arrangement of TR Modules.</p>		

Title of the project	Name of the PI	Affiliation of the PI
Setting up of ST Radar System at ARIES Nainital, Uttarakhand.	Director, ARIES	Aryabhata Research Institute of Observational Science (ARIES), Nainital, Uttarakhand.

**Salient features**

Another Stratosphere Troposphere Radar has been installed at ARIES, Nainital at a relatively lower frequency. During 2016-17, after successful installation of the clutter fence around the antenna array, the radar has been operated for nearly 500 hours with its seven clusters and captured wind data up to a height ~13 Km (AMSL). Observed wind pattern from the system is consistent with the general wind patterns over this region. The radar is being made fully operational by early next year (Figure 53).



Figure 53. ASTRAD antenna array on the roof-top of the ASTRAD building with recently installed clutter fence along the periphery of the antenna array.

Title of the project	Name of the PI	Affiliation of the PI
Setting up of ST Radar System at University of Calcutta, West Bengal.	Prof. Ashi Paul	Institute of Radio Physics and Electronics, University of Calcutta.

**Salient features**

The facilities of another ST Radar (53 Hz) will be used to carry out scientific studies on tropopause convection, gravity waves, equatorial/planetary wave and ionospheric E and F region irregularities. This region is characterised by pre-monsoon convective rainfall and norwesters which have a profound influence on the day to day lives of the common people. The radar will also have the capability to probe the lower atmosphere from about 3-20 km (Figure 54).



Figure 54. ST Radar System at University of Calcutta, West Bengal.



## 4 Fostering the Young Researchers

It is of extreme importance to offer opportunities to young researchers to focus on a research theme based on their original ideas. The pillar "Fostering the Young Researchers (FYR)" provides support to relatively younger scientists for pursuing exciting and innovative research in frontier areas through various components which are focusing on young scientists & technologists, having adequate background and training in fields of S&T inclined to pursue research projects. The pillar also supports training of the Ph.D students outside the country, thereby enhancing the education and research function at universities.

### 4.1 Young Scientist Scheme (YSS)

The Start-up Grant is an important element in the career of a young scientist. In recent times, the YSS (erstwhile) has been restructured into two parts – National Post-Doctoral Fellowship (N-PDF) and the Early Career Research Award (ECRA). The N-PDF aims to provide opportunities for young PhDs to avail post-doctoral research

fellowships in academic institutions and research laboratories of the country. The ECRA provides start up research grants to young researchers. The erstwhile YSS continue to be in existence w.r.t its already ongoing approved projects in all the five basic disciplines.

### 4.2 Early Career Research Award (ECRA)

#### Objective

ECRA scheme aims to provide supplementary and concentrated support to the young and emerging Indian researchers in the area of Science, Engineering and Medicine who are in their early career for pursuing exciting and innovative research.

#### Features

One of the most vital research opportunities for young professionals.

A regular academician/researcher in a recognized academic institution/ or national laboratory or any other recognized R&D institutions can apply.

This grant is one-time award with up to Rs.50 lakhs (Excluding Overheads) for duration of three years.

#### Website links

<http://serbonline.in/SERB/ecr?HomePage=New>  
<http://www.serb.gov.in/ecr.php>

### 4.2.1. Chemical Sciences

A total of 375 proposals have been considered under different sub disciplines of Chemical Science and 103 proposals were supported (Figure 55).

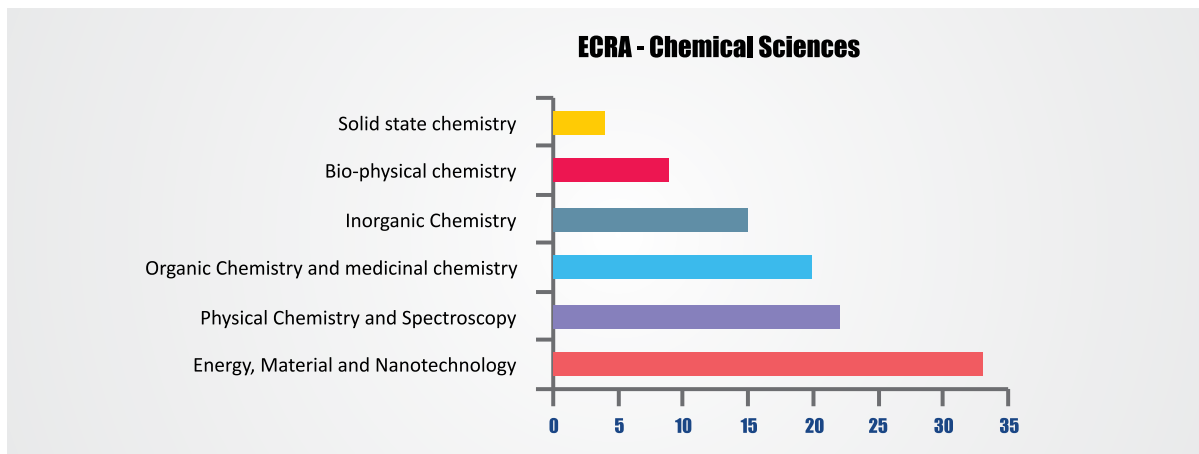


Figure 55. Project supported in different sub-disciplines of Chemical Sciences.

### 4.2.1 Earth and Atmospheric Sciences

A total of 71 proposals have been considered under different sub disciplines of Earth and Atmospheric science and 37 have been supported (Figure 56).

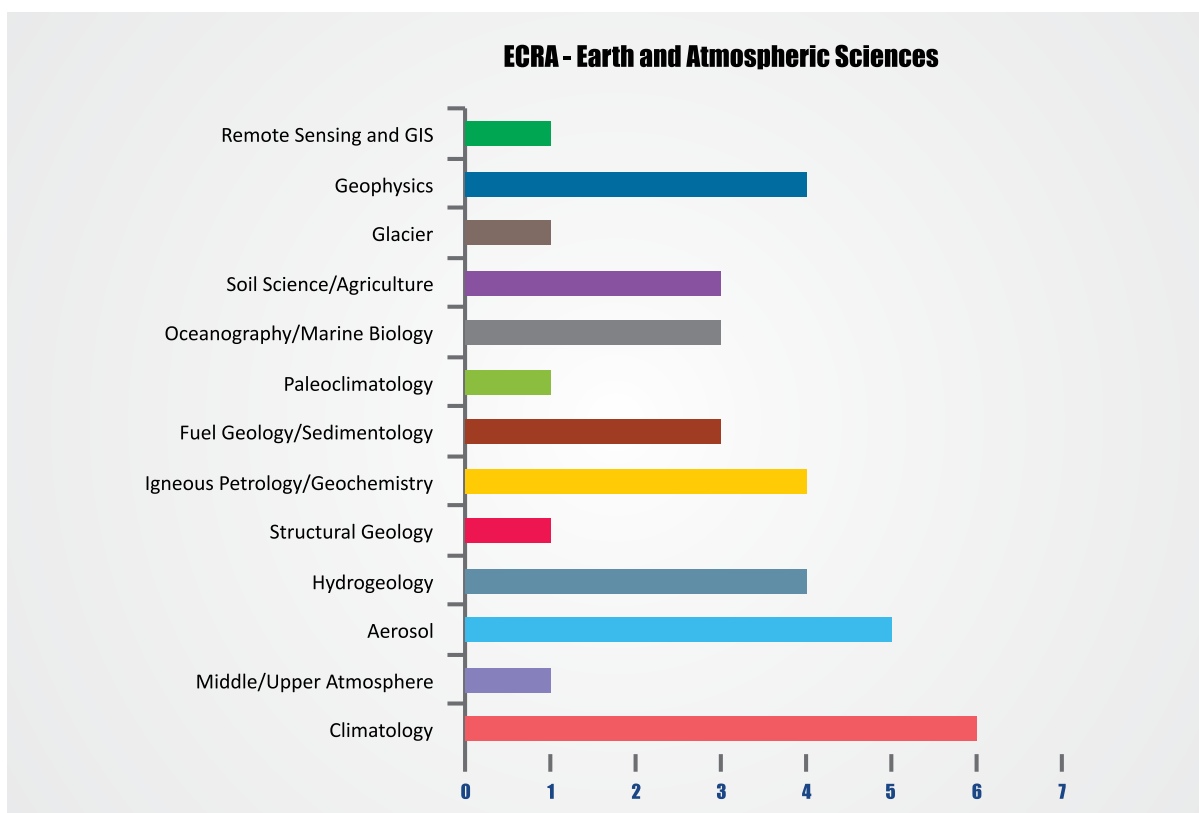


Figure 56. Projects supported in different sub-disciplines of Earth and Atmospheric sciences.

### 4.2.3 Engineering Sciences

A total of 1169 proposals have been considered under different sub disciplines of Engineering Science and 333 were supported (Figure 57).

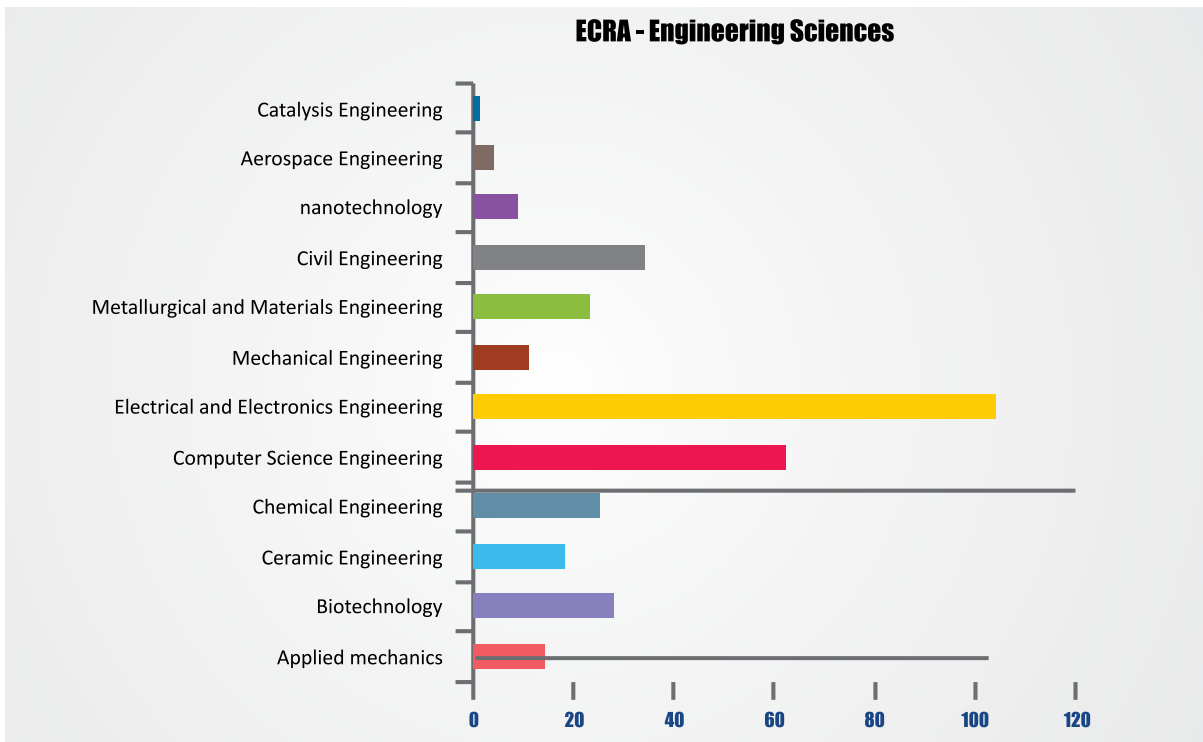


Figure 57. Projects supported in different sub-disciplines of Engineering Sciences.

### 4.2.4 Life Sciences

A total of 700 proposals have been considered under different sub disciplines of Life Science and 248 have been supported (Figure 58).

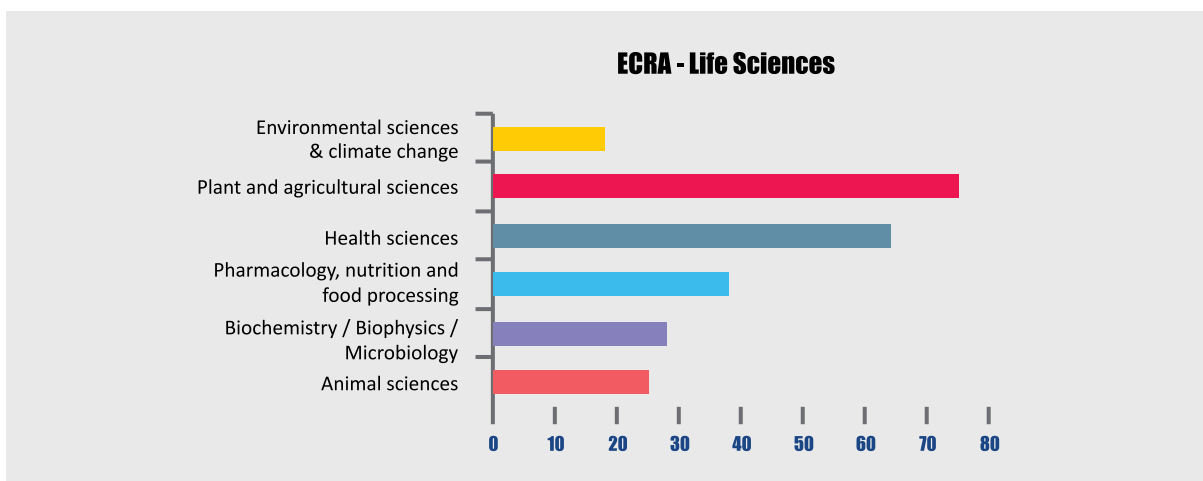


Figure 58. Projects supported in different sub-disciplines of Life Sciences.

### 4.2.4 Physical and Mathematical Sciences

A total of 180 proposals have been considered under different sub disciplines of Physical and Mathematical Sciences and 88 have been supported (Figure 59).

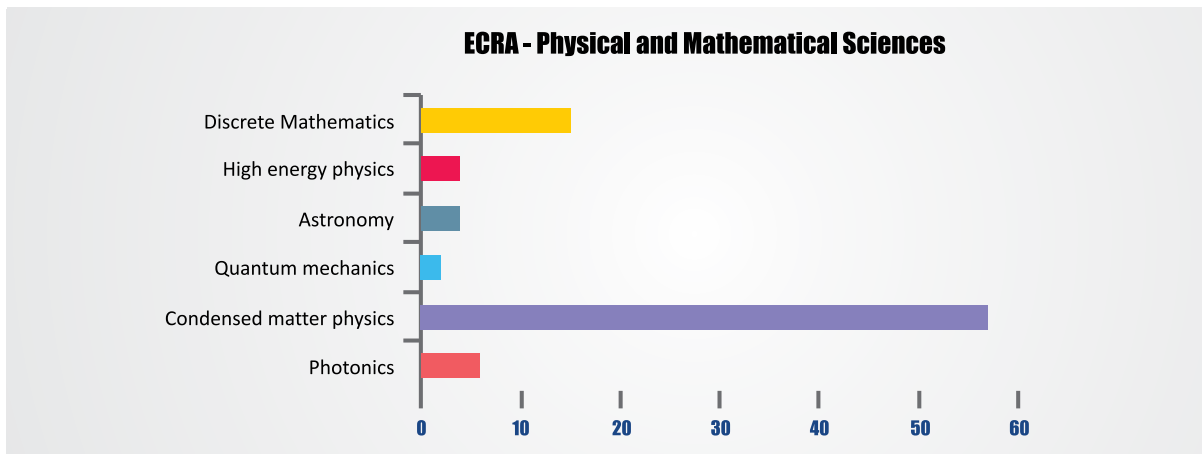


Figure 59. Projects supported in different sub-disciplines of Physical and Mathematical Sciences.

## 4.3 National Postdoctoral Fellowships

### Objective

This Fellowship aims to identify motivated young Indian researchers and provide them support for doing research in scientific field.

### Features

Fellows availing NPDF are required to work under a mentor so that the training provided to them act as a platform to develop them as an independent researcher.

NPDFs are open to the applicants who have obtained Ph.D degree in Science, Engineering and Medicine.

The fellowship is a temporary assignment and provide a sum of Rs. 35,000 to 55,000 per month for the period of 2 years with overhead amount of Rs. 1,00,000 per annum to each awardee.

### Website links

<http://serbonline.in/SERB/npdf?HomePage=New>  
<http://www.serb.gov.in/npdf.php>

### 4.3.1 Chemical Sciences

A total of 863 proposals have been considered under different sub disciplines of chemical science and 277 have been supported (Figure 60).

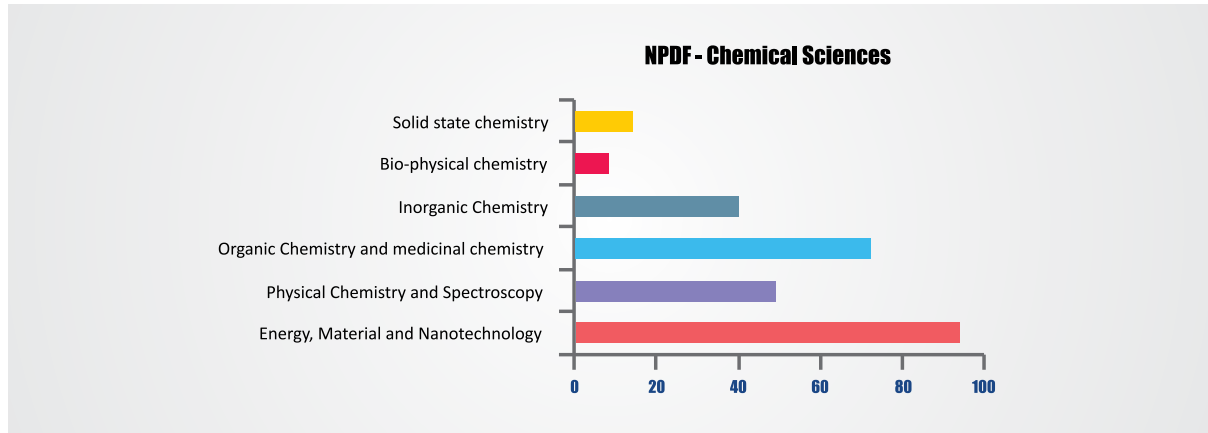


Figure 60. Projects supported in different sub-disciplines of Chemical Sciences.

### 4.3.2 Earth & Atmospheric Sciences

A total of 247 proposals have been considered under different sub disciplines of Earth & Atmospheric Sciences and 53 have been supported (Figure 61).

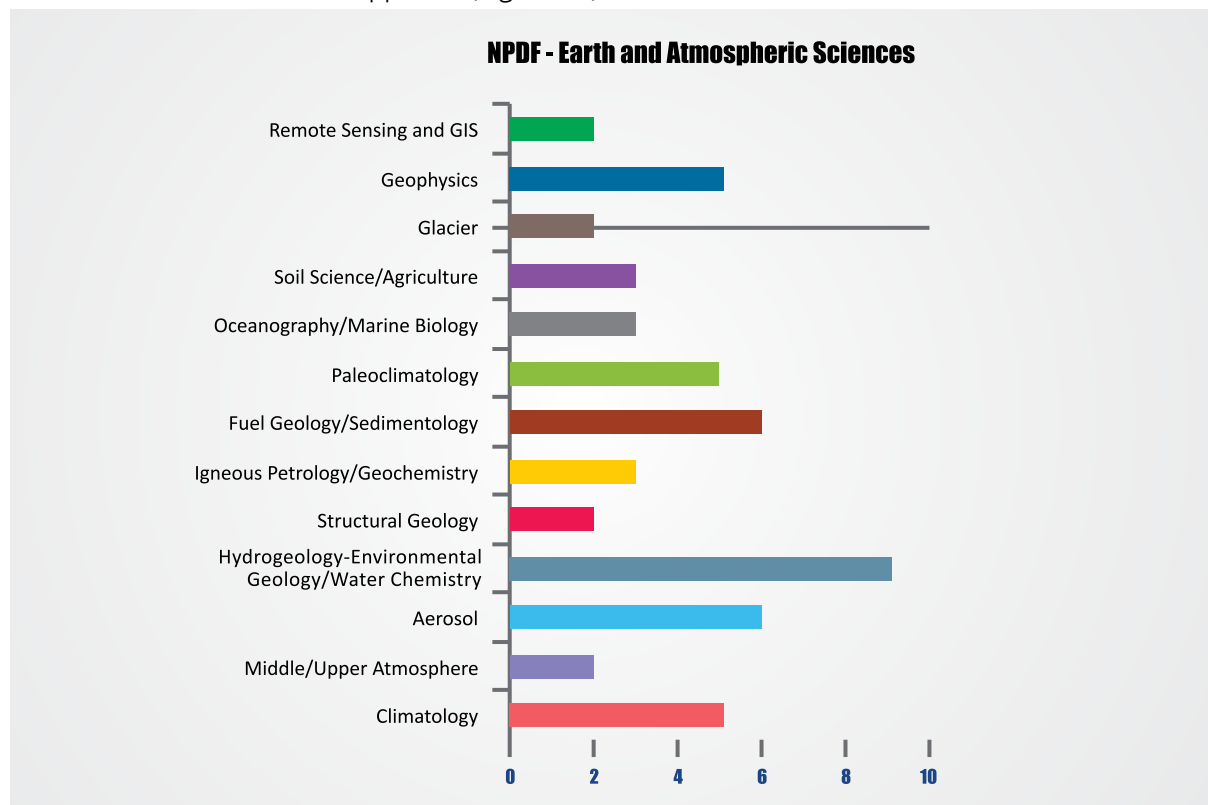


Figure 61. Projects supported in different sub-disciplines of Earth and Atmospheric Sciences.

### 4.3.3 Engineering Sciences

A total of 290 proposals have been considered under different sub disciplines of engineering science and 107 have been supported (Figure 62).

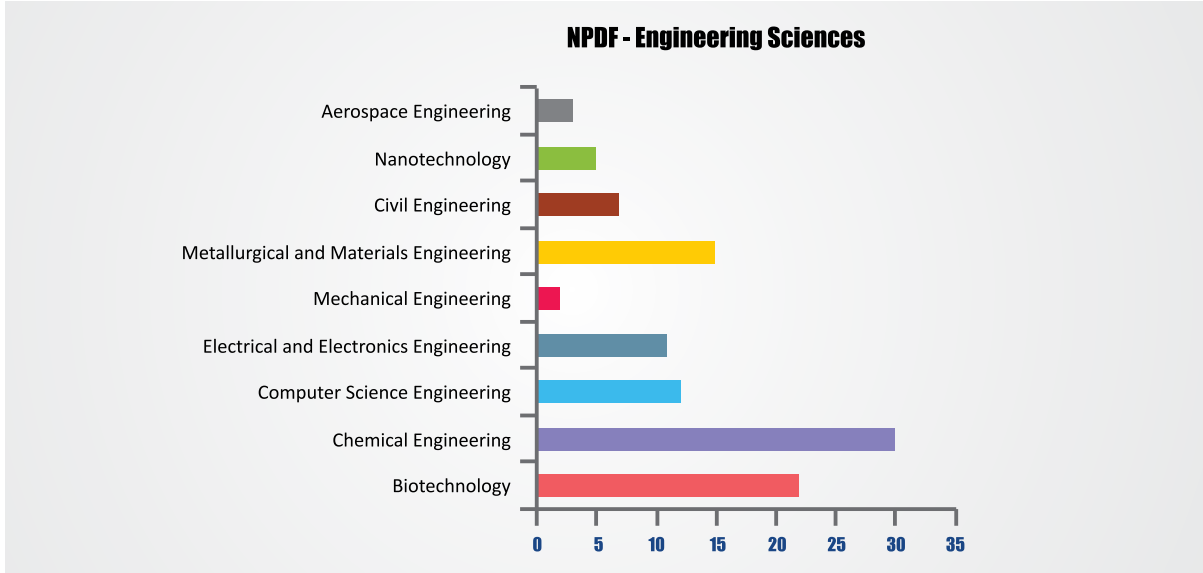


Figure 62. Project funded under different sub-disciplines of Engineering Science.

### 4.3.4 Life Sciences

A total of 1871 proposal have been considered under different sub disciplines of life sciences and 445 have been supported (Figure 63).

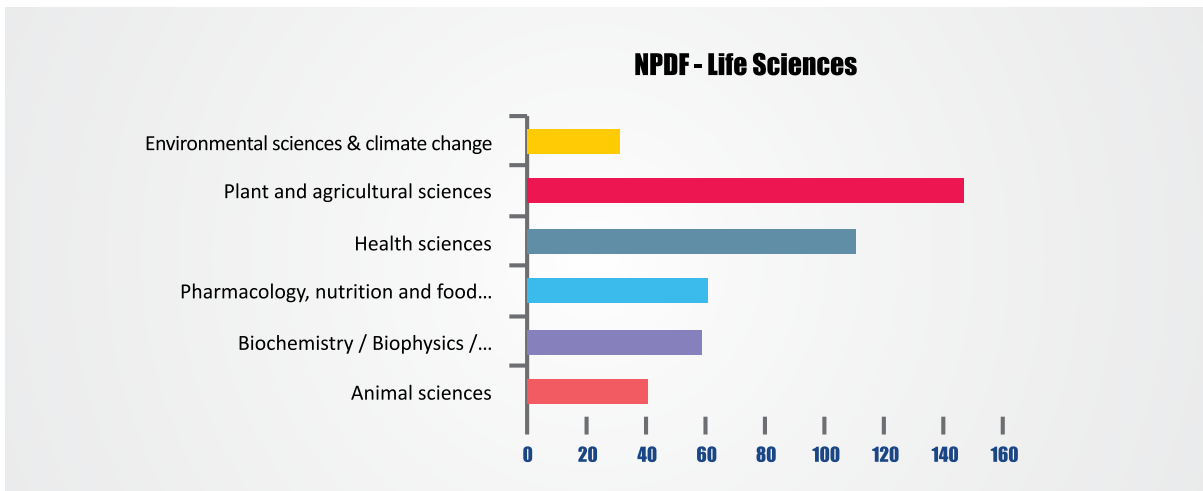


Figure 63. Projects supported in different sub-disciplines of life sciences.

### 4.3.5 Physical and Mathematical Sciences

A total of 537 proposals have been considered under different sub disciplines of physical and mathematical sciences and 109 have been supported (Figure 64).

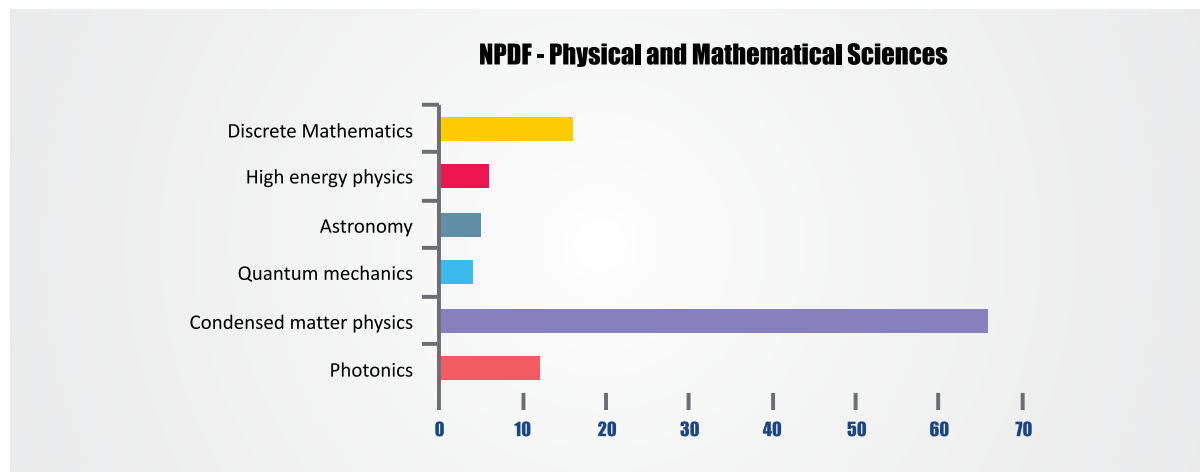


Figure 64. Projects supported in different sub-disciplines of physical and mathematical sciences.

## 4.4 Some Significant Research Highlights from YSS/ECRA/NPDF Projects

### 4.4.1 Chemical Sciences

**Atomistic understanding of kinetic pathways of protein-ligand recognition and improvement of virtual drug discovery.** The molecular recognition events are underlying principles of many biochemically relevant processes. Protein-ligand interaction is one of the most prevalent molecular recognition events, which is of utmost importance for drug discovery. However, currently an atomistic understanding of the kinetic pathways of protein-ligand recognition is lacking.

The group in TIFR led by Dr. Jagannath Mondal aim to decipher, at an atomic level resolution, *both* binding and unbinding pathways of ligand to and from the native protein cavity, using novel approaches of computational chemistry. The project proposes to use a combination of high-

performance computing and enhanced sampling approaches of classical Molecular Dynamics (MD) simulation to shed lights on complex binding and unbinding pathways of a protein-ligand system namely: L99A mutant of T4 Lysozyme/benzene.

The proposal plans to utilize the advent of Graphics processing unit (GPU)-based computing architecture and emergence of novel sampling techniques, which will supplement the computing infrastructure required to achieve the experimentally relevant timescale and overcome the sampling bottlenecks. The research aims to induce scientific collaboration with experimental laboratories and pharmaceutical industries. The project will attempt to inspire and expose young students and researchers to cutting edge research of computational chemistry (Figure 65).

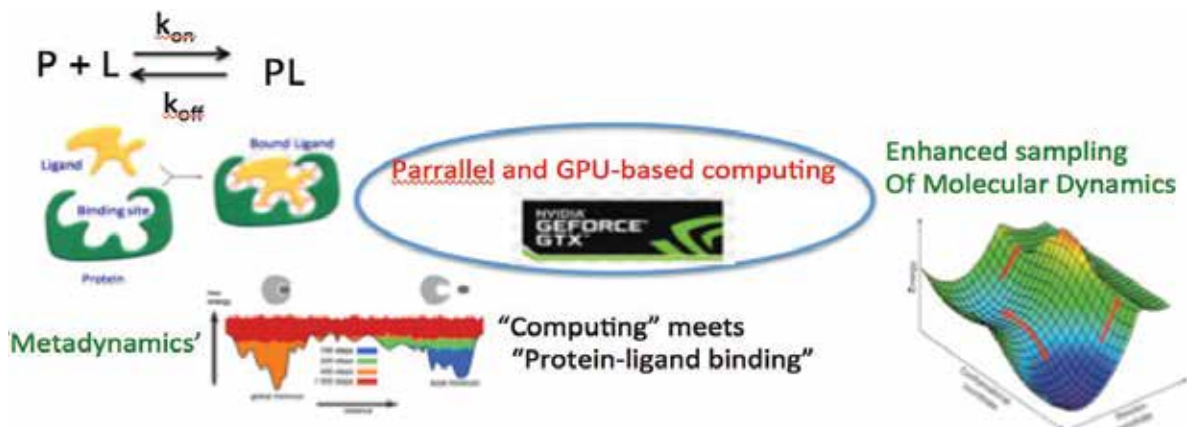


Figure 65. Schematic of Proposed research of understanding protein-ligand interaction by computer simulation.

#### 4.4.2 Earth and Atmospheric Sciences

**Changing climate and its effect over India under global warming scenario:** The natural variability on multidecadal timescales in the Pacific and the extratropical North Atlantic Oceans extremely affects the climate of India. This raises the possibility that the regional SST variability of the Pacific and the extratropical North Atlantic may provide supplementary information that will improve monsoon predictions over India. A better understanding of low-frequency variability may, therefore, be essential in improving the monsoonal predictability as well as for the policymakers because they want to know the

climate trajectory in the upcoming decades for the applications to water resources, agriculture, energy, and infrastructure development. Furthermore, the results presented here have important ramifications for the development of skilful decadal predictions at regional scales, which depends on better understanding of the linked mechanisms and in particular of the identification of the climate patterns that offer some degree of decadal predictability. This will in turn help the society in improving the plans to mitigate the adverse effect of monsoon. (Figure 66 & 67).

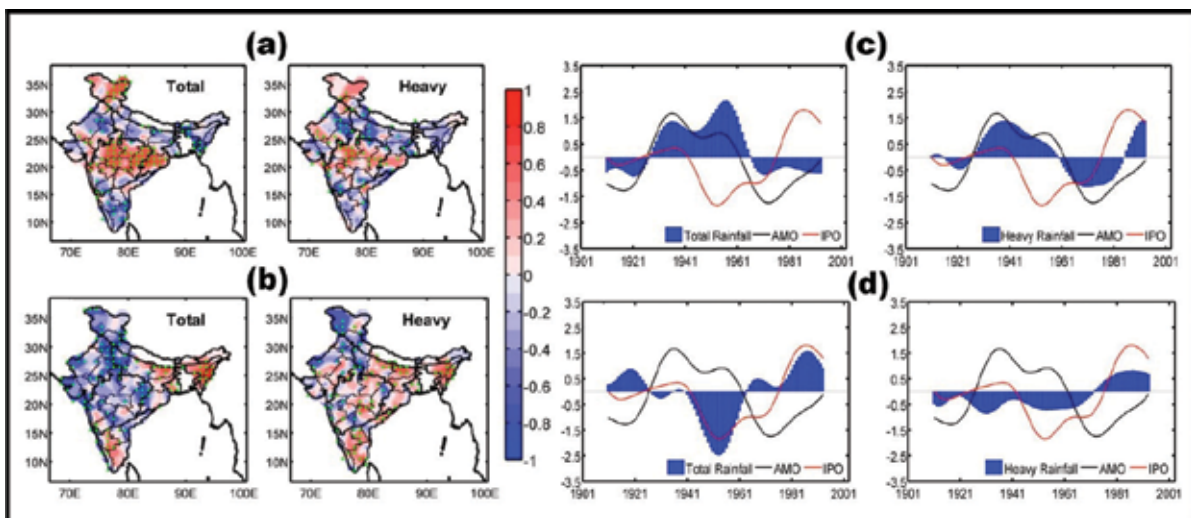


Figure 66. Maps of correlation coefficients between low-pass filter (a) AMO and rainfall and (b) IPO and rainfall for the period 1911-1993. Variability of low-pass filtered total and heavy rainfall over (c) west central and (d) northeast regions along with the variability of low-pass filtered AMO and IPO indices. The unit of AMO and IPO is °C, while that of rainfall is millimetres.



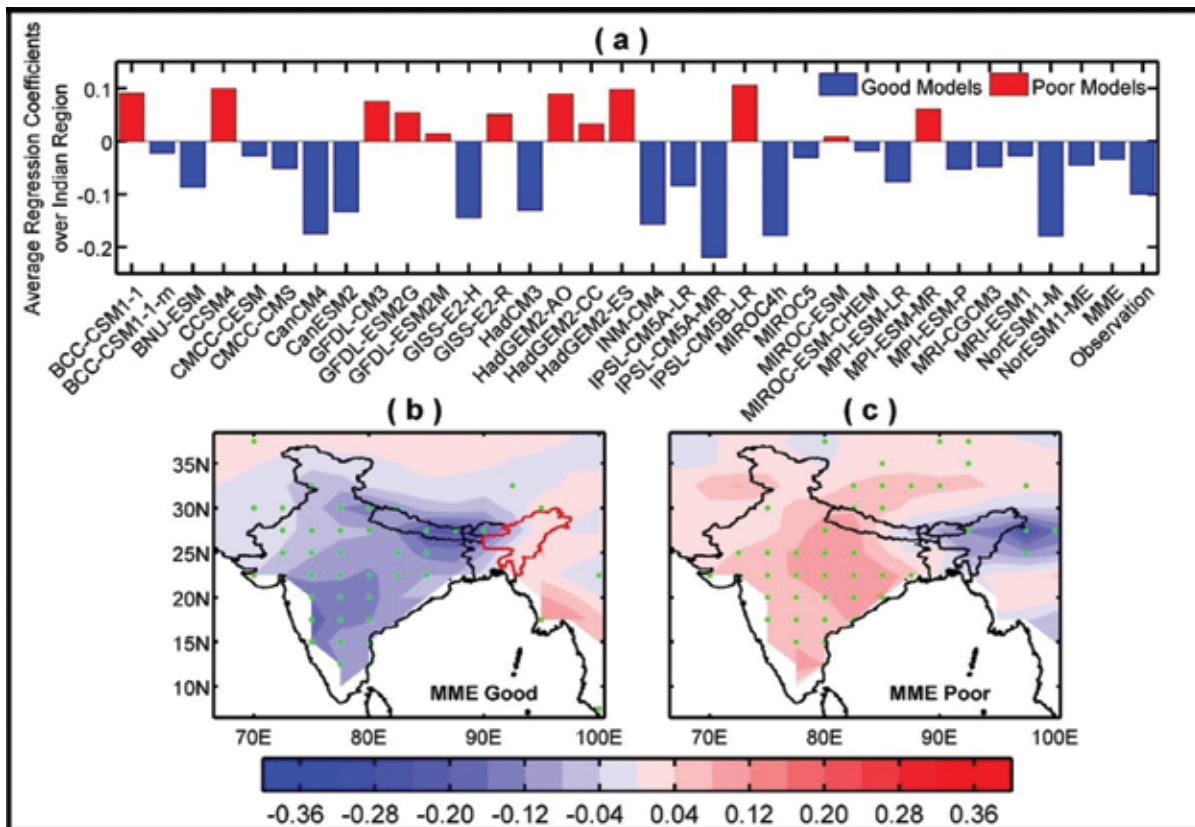


Figure 67. (a) Area-average of IPO precipitation regression maps over Indian land points, excluding northeast region. CMIP5 model's having negative (positive) average regression coefficient is categorized as good (poor) model shown by blue (red) bar in Fig. 2a. (b) and (c) Ensemble means of the IPO precipitation regression patterns of 20 good (MME good) and 12 poor (MME poor) CMIP5 models, respectively. The green stippling in MME good and MME poor indicates the grid point where the sign of regression coefficient coincides in at least 15 out of the 20 good and 9 out of the 12 poor models, respectively. The unit of regression coefficient is mm/d per standard deviation.

### 4.4.3 Engineering Sciences

A new technique of tuning (Transmission Zero) TZs or TP across the passbands or stopbands along with bandwidth tunability is implemented in a (Band pass) BP to (Band stop) BS switchable filters has been developed. (Radio Frequency-Micro electromechanical system) RF-MEMS switch has been used for switching the filter from BP to BS mode (Figure 68).

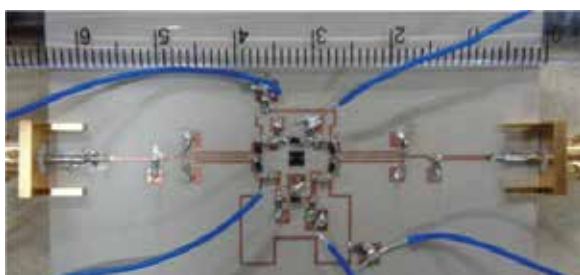


Figure 68. Fabricated switchable and tunable Dual-band Bandpass to Bandstop filter.

Development of a new type of optical sensor that will enable intricate intracochlear measurements of otoacoustic emissions near their site of origin in rodents. This instrumentation is built upon a technology called the "optical coherence tomography" (OCT) which is an optical analogue of ultrasound (Figure 69).

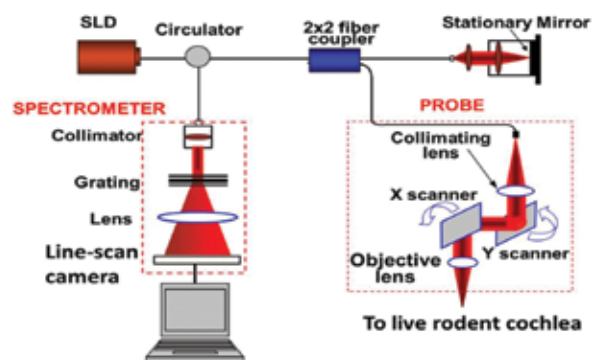


Figure 69. Optical coherence tomography.

#### 4.4.4 Life Sciences

**Studies on pest complex of major horticulture crops in Kashmir region and their possible bio-rational managements:** The study was aimed to catalogue major and emerging horticulture pests and their natural enemies, mass rearing and prolong storage of key natural enemies, evaluation of plant extract in controlling the major pests and developing farmer filed guide for pest monitoring and bio-rational management. A total of 65 fruit orchards of more than 5000 trees comprised of Apple, Almond, Apricot, Cherry, Plum, Peach, Pear and Walnut trees were surveyed and total of 1421 insect pest specimens have been collected and sorted. These mostly constitute five main orders belonging to 21 families which are responsible for major economic losses. These pests generally include Coccinellids, Syrphids, Parasitic Hymenopterans, Dipterans, and Chrysopids. Trials of several combinations of safe chemicals mostly plant extracts with dehydrating

agents and oils at various concentrations against different pests are evaluated for their anti-feeding, repellent and insecticidal activities and also statically evaluated for their further use and recommendations. Among the prominent natural enemies collected so far, some of the generalized predatory like *Adalia tetraspilota* (Hope, 1831); *Orius minutus* Linnaeus, 1758; *Anthocoris* sp. and some host specific species like *Dolichomitus* spp.; *Pachyneuron* spp.; *Encarsia* sp.; *Stethorus aptus* Kapur, 1948 have been executed for mass rearing to use as bio-control agents. During the study six pests *Cacopsylla bidens* (Šulc, 1907), *Dryomyza pakistana* (Kurahashi, 1989), *Protichneumon pisorius* (Linnaeus, 1758), *Rhamphomyia caudata* (Zetterstedt, 1838), *Myennis octupunctata* (Coquebert, 1798) and *Megamerina dolium* (Fabricius, 1805) are identified as the new distributional record to the country (Figure 70).

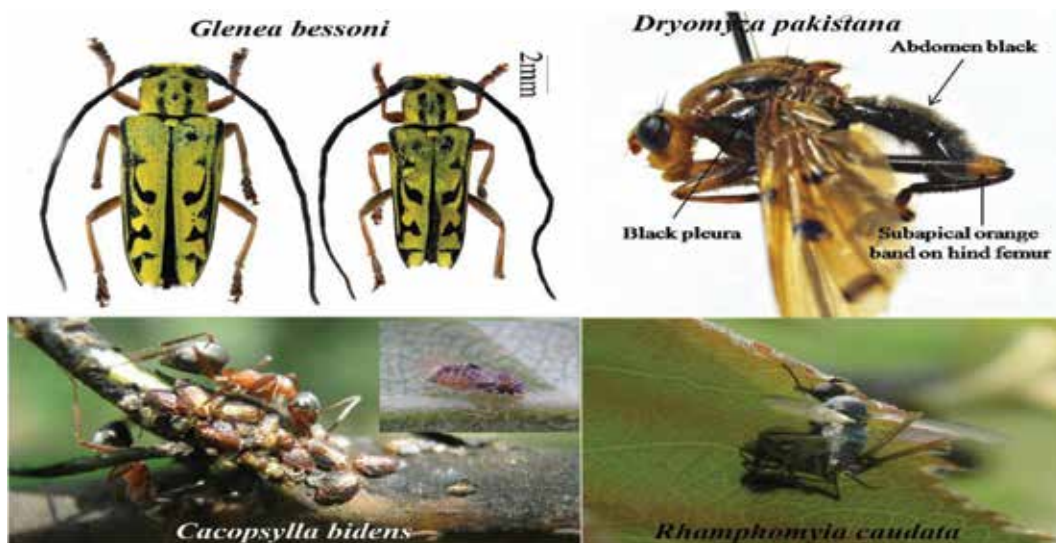


Figure 70. Host pest complex in Jammu and Kashmir.

#### 4.4.5 Physical and Mathematical Sciences

**Linear and Nonlinear Instabilities in Dusty and Quantum Plasmas:** Quantum-mechanical effects in plasma play a vital role in microelectronic devices, metallic nanostructures, dense astrophysical systems, and in laser plasmas. The presence of a plasma component has very important role in determining the shape and the

behaviour of their equilibrium configurations in astrophysical and cosmological systems. The present investigation is successfully applied to understand the collapse of ultra-cold astrophysical objects like inner core of white dwarf and neutron star. Similarly, the dispersion characteristics of hydrodynamic Rayleigh-Taylor

instability (RTI) in quantum plasma including suspended dust particles shows that in the absence of the quantum term, the relaxation frequency of the suspended particles has destabilizing effect, while the mass concentration of the suspended particles has stabilizing effect on the growth rates of RTI. The growth rate of RTI decreases faster in kinetic limit as compared to the hydrodynamic limit. The present results are capable to understand the suppression of RTI in

experimental devices like ICF also. In the case of small amplitude waves and linear instabilities, it is found that the firehose instability remains unaffected while mirror instability is modified by polytropic exponents and quantum corrections. The graphical illustrations show that quantum corrections have stabilizing influence on the mirror instability. The presence of uniform rotation stabilizes while quantum corrections destabilize the growth rate of system.

#### 4.5 SERB Overseas Postdoctoral Fellowship

To build national capacity in frontier areas of Science which are of interest to India, the board has launched an Overseas Postdoctoral Fellowship Programme. The applicant should have completed Ph.D. degree in science and engineering not earlier than the preceding two years from recognized institutions in India. The Programme admits candidates in chosen areas in identified overseas top-ranking universities

as notified by the Board from time to time. Application for support to undertake overseas postdoctoral fellowship in Institutions located in various countries other than USA is received directly by SERB. Indo-US Science and Technology Forum (IUSSTF) has made a separate call for US specific institutions. A total of 37 students were supported during the financial year.

##### Objective

The fellowship aims to build national capacity in frontier areas of Science and Engineering, which are of interest to India.

##### Features

This fellowship duration is of one year and is extendable up to one more year, subject to good performance.

Amount of fellowship is US\$ 3000 per month and a contingency/preparatory allowance of Rs. 60,000/- is also provided to each fellow.

Website links  
<http://www.serb.gov.in/opf.php>

#### 4.6 Overseas Doctoral Fellowship-Training for Indian Ph.D Scholars

This program support students registered for Ph.D in Indian Institutions to train certain duration (normally 12 months) of research in reputed overseas institutions. To and fro air fare, fellowship amount of US\$2000 pm and contingency grant

are provided. The program also has a provision for the faculty adviser of the students as well as overseas collaborator to visit each others labs. The new fellowship was approved during the year for further implementation.

## 5 Building Research Networks

Despite all good intentions, often there are times when science appears disconnected from societal needs. The need of the coming decades is to ensure that S&T research does not happen in isolation from societal realities and unmet needs. In an increasingly inter-disciplinary world, S&T innovation is essentially an outcome of teamwork within and/or across political boundaries. Over the past more than six decades, certain events have influenced international scientific and engineering R&D cooperation, throwing up new challenges and concerns in their wake. These include, but are not restricted to, capacity building, sustainability, data management, mega science cooperation, ethics, conduct of science, human rights and multilateral institutional reforms. Due to involvement of multiple processes and agencies, collaborative activities are inherently complex. Recognising this, SERB has been making constant efforts to build peer networks through its pillar "Building Research Networks (BRN)".

### 5.1 National Collaborations

#### 5.1.1 Prime Minister's Fellowship Programme for Doctoral Research

A total of 64 proposals were received & 37 were sanctioned during the financial year.

##### Objective

This scheme is aimed at encouraging young, talented, enthusiastic and result-oriented Ph.D scholars to take up industry-relevant research. The government and corporate sector have jointly developed the concept of Prime Minister's Fellowship to attract talent for doctoral research, nurture leadership qualities in scholars, provide exposure to international best practices & innovations and encourage industrial research in academic institutions.

##### Features

- The programme provides mentoring through industry and academic expert through the mechanism of annual review meetings.
- The applicant should have a valid industry partner who should be ready to support the research project financially as well as provide guidance and mentorship.
- Fifty percent fellowship each comes from the government and the partner company.
- The programme has the provision to award up to 100 new scholarships every year, of up to Rs 8.7 lakh per annum per candidate for 4 years.

##### Website links

<http://www.serb.gov.in/pmfdr.php>  
<http://www.primeministerfellowshipscheme.in/>

Name of partnership	Name of organization/ agency	No. of projects / Scholars
Prime Minister's Fellowship Scheme for doctoral research	SERB CII	108

### 5.1.2 Research & Development Scheme in Food Processing

<p><b>Objective</b> The main objective of the programme is creation of processing and preservation capacities and modernisation / expansion of existing food processing units.</p>	<p><b>Features</b></p>	<p><b>Website links</b> <a href="http://www.serb.gov.in/pdi.php">http://www.serb.gov.in/pdi.php</a> <a href="http://www.mofpi.nic.in/">http://www.mofpi.nic.in/</a></p>
<p>The R&amp;D outcomes should benefit Food Processing Industry in terms of product and process development, improved preservation, packaging, storage and distribution technologies, value addition, standardization of additives, coloring agents, preservatives, pesticide residues, etc. with focus on enhancement of production, quality, consumer safety, public health and trade.</p>		
<p>The setting up of new units and modernization/ expansion of existing units are covered under the scheme.</p>		

Name of Partnership	Name of organization/ agency	No. of projects
R&D Scheme in Food Processing	SERB MoFPI	32 projects are on-going and as per the directives received from MOFPI, new proposals are not being considered under the scheme.

### 5.1.3 Cell Tower and Mobile Radiation Programme

<p><b>Objective</b> The main objective is to study the possible impact of EMF radiation exposure from mobile towers and handsets, especially on Humans life, Living Organism, Flora &amp; Fauna &amp; Environment, and to take up related R&amp;D initiatives for next generation technologies in order to develop environmentally benign solutions for wireless and mobile communication.</p>	<p><b>Features</b></p>	<p><b>Website links</b> <a href="http://www.serb.gov.in/ctr.php">http://www.serb.gov.in/ctr.php</a></p>
<p>These studies should focus on hazard risk aspects of radiation taking into account population density; health risk quantification on human and other ecosystems.</p>		
<p>Scientific investigations are required to derive country specific norms and R&amp;D solutions for mitigating the hazard potentials and health risks through innovations.</p>		

Name of Partnership	Name of organization/ agency	No. of projects
Cell Tower and Mobile Radiation	SERB DoT	19 ongoing projects are in progress

### 5.1.4 IMPacting Research INnovation and Technology (IMPRINT) Programme

<p><b>Objective</b> The IMPRINT initiative has been launched by the Hon'ble Prime Minister in Nov. 2015 to channelize the research in premier institutions in areas that can have largest social and economic good for the Country.</p>	<p>Features</p>	<p>IMPRINT is piloted by the Ministry of MHRD and steered by Indian Institutes of Technology and Indian Institute of Science.</p> <p>This is a first-of-its-kind Pan-IIT and IISc joint initiative to lay down a Research Roadmap to address major engineering and technology challenges in ten selected domains relevant to our country's needs.</p> <p>The programme was intended to bring forth collaborative funding for the research projects that would end up creating products and patents.</p>	<p>Website links <a href="http://www.serb.gov.in/irit.php">http://www.serb.gov.in/irit.php</a></p>
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Name of Partnership	Name of organization/ agency	No. of projects
IMPRINT	SERB MHRD	One sanction ( A total of 17 sub projects were sanctioned)

S. No.	Domain (No of projects)	Total Project cost (Rs. Lakhs)	Contribution of the SERB (50%) (Rs. Lakhs)		
			Non-Recurring	Recurring	Total
1.	Advanced Materials (7 projects)	1640.214	192.585	627.522	820.107
2.	Nano-Technology Hardware (7 projects)	1557.22	174.75	603.86	778.61
3.	Environmental Science & Climate Change (1 project)	88.40	2.145	42.055	44.2
4.	Manufacturing (2 projects)	695.39	86.625	261.07	347.695
Total- 17 projects		3981.224	456.105	1534.507	1990.612

### 5.1.5 Partnering with MHRD for Uchchar Avishkar Yojana (UAY)

The MoU has been signed, for the joint action for promoting research in premier technical institutions through the UAY Scheme, between the Ministry of Human Resource Development-Department of Higher Education and the Science and Engineering Research Board.

Under UAY, the industry-sponsored, outcome oriented research projects are being funded. While MHRD will fund 50% of the project cost, industry and other participating Ministries / SERB will share the balance project cost (25% each).

## 5.2 International Linkages

### 5.2.1 S.N. Bose Scholars Programme

#### Objective

S.N. Bose Scholars Programme is a dynamic student commute program developed in partnership, for exposing Indian students to the world class R&D environment through research internship.

#### Features

This programme is for Indian and U.S. students (enrolled in Bachelors and Masters programs in Atmospheric and Earth Sciences; Chemical Sciences; Engineering Sciences; Mathematical and Computational Sciences; and, Physical Sciences) to undertake a research internship.

The duration of the internship is 10-12 weeks beginning each summer for 50 Indian students and 30 U.S. students to intern at partner universities in the U.S and recognized Indian educational institutions. .

A stipend of US\$ 2000/- for Indian student in US and Rs. 50,000 for US student in India are paid by SERB through IUSSTF.

#### Website links

<http://www.serb.gov.in/snbsp.php>  
<http://serbonline.in/SERB/snbose?HomePage=New>

Name of Partnership	Name of organization/ agency	No. of projects
SN Bose Scholars Programme	SERB IUSSTF WINStep Forward, USA	50 students have received the Internship during the year.

### 5.2.2 SERB Overseas Doctoral Fellowship

#### Objective

SERB Overseas Doctoral Fellowship (ODF) aims to build national capacity in frontier areas of Science and Engineering, by giving an opportunity to Indian students to undertake / complete doctoral work in certain overseas institutions where agreement have been signed.

#### Features

The duration of the fellowship is for 4 years and its amount is US\$2000 p.m. in addition to preparatory allowance and to/fro fare.

The overseas institution where agreement have been signed are Cambridge University, UK. Stanford University, USA. Carnegie Mellon University, USA. University of Southern California, USA. University of California, Irvine, USA. Rice University, USA. The State University of New York, University at Buffalo, USA. University of British Columbia, Canada.

#### Website links

<http://www.serb.gov.in/opf.php>

Name of Partnership	Name of organization/ agency	No. of projects
Indo-U.S. Science and Technology Forum (IUSSTF) and WINStep Forward, USA.	SERB IUSSTF WINStep Forward, USA	09 students have availed the benefit of this fellowship.

### 5.2.3 SERB Newton - Bhabha International Fellowships

<b>Objective</b> The objective of this programme is to encourage and support increase research capacity in the area of research and innovation in the field of Science, Technology, Engineering and Mathematics (STEM).	<b>Features</b>		<b>Website links</b> <a href="http://www.serb.gov.in/snbi.php">http://www.serb.gov.in/snbi.php</a>
	The applicant should hold Ph.D Degree in STEM and working with regular positions in institutions based in India.		
	The award is up to two consecutive years in length, spent in the UK undertaking research at a host university or research institute.		
	The awards will provide a stipend, research expenses and one-off relocation expenses and will provide up to £99,000 for two years.		
		The fellowship have been instituted through a MoU between SERB and the Royal Society.	

Name of Partnership	Name of organization/ agency	No. of students supported
SERB Newton - Bhabha International Fellowships	SERB The Royal Society	One sanction for 13 students.

### 5.2.4 Partnerships for International Research and Education (PIRE)

SERB has entered into an understanding with NSF to partner the programme. The programme is administered through the binational IUSSTF. In PIRE scheme, the Indian applicant(s) have to apply through their US collaborator(s) by way of a complete and composite application, including the portion of Indian partner(s), directly to NSF.

The funding under the PIRE grants is provided under the budget heads applicable for regular DST / SERB grants, namely, manpower, equipment, consumables, travel, contingency and institute overheads. The extent of head-wise allocation as well as any special requirement is considered on case-to-case basis.

<b>Objective</b> The main objective of PIRE is to support high quality projects which are in need of international collaborations and whose requirement could not be fulfilled without external involvement.	<b>Features</b>		<b>Website links</b> <a href="http://www.serb.gov.in/pire.php">http://www.serb.gov.in/pire.php</a> <a href="https://www.nsf.gov/funding/pgm_summ.jsp?piims_id=505038">https://www.nsf.gov/funding/pgm_summ.jsp?piims_id=505038</a>
	All areas of science and engineering are eligible for support under the programme.		
	Grants of size up to INR 5 Crore could be provided over a period of 5 years.		

Name of Partnership	Name of organization/ agency	No. of projects
Partnerships for International Research and Education (PIRE)	SERB NSF, USA	One sanction for six students



### 5.2.5 Indo-US Grand Challenge

#### Objective

The main objective of Indo-US Grand Challenge Programme is to develop durable, reliable and affordable blood pressure measuring technologies for either passive or active monitoring of hypertension. The innovations resulting from the SERB, National Institute of Biomedical Imaging and Bioengineering (NIBIB) and NIH(USA) are intended to focus on the clinical needs of not only the underserved population of USA and India, but are also expected to be more broadly applicable to the general population globally.

#### Features

Two broad approaches are (i) High end systems that can measure and record the blood pressure of a large population quickly, integrated into a routine activity (ii) Minimal interaction devices meant for individual usage in home environment having low cost, consistent with personal use.

The guiding criteria for acceptability is reliability, simplicity and affordability. This implies that such systems may involve complex sophisticated technology at the back end, but the front user end should be as simple as possible.

It also means that while the cost of some of such systems may be significantly high in absolute terms, as in the case of high throughput devices, the overall cost per unit measurement should still be very low.

The project work is conducted by a consortium having knowledge and experience to undertake high-quality collaborative research programmes. These consortia consists of entities or individuals from academia, national laboratories, non-governmental institutions, industry and others as applicable.

#### Website links

<http://www.serb.gov.in/iusa.php>  
<http://www.iusstf.org/story/53-60-Indo-US-Grand-Challenge.html>

Name of Partnership	Name of organization/agency	No. of projects
India-U.S. Grand Challenge	SERB NIBIB NIH, USA	10 ongoing projects

### 5.2.6 Graduate Research Opportunities Worldwide (GROW)

Objective	Features	Website links
<p>The main objective of this programme is to provide NSF graduate research fellows with opportunities to enhance their professional skills through research collaborations at top-caliber science and engineering research sites in India. It aims to pave way for the next generation scientists and technologists from the United States to interact with their Indian peers.</p>	<p>The program is divided into two tracks: GROW and GROW with US Agency for International Development (USAID). The standard GROW track offers research opportunities in the partner countries: Australia, Austria, Brazil, Chile, Denmark, Finland, France, India, Ireland, Japan, Korea, the Netherlands, Norway, Singapore, Sweden, and Switzerland. Through a partnership between NSF and the USAID, the GROW with USAID track provides opportunities to NSF Graduate Fellows to conduct research in developing countries, which includes Brazil, Colombia, India, Indonesia, Philippines, Senegal, and South Africa.</p> <p>The research fellows must be enrolled at U.S. institutions, making satisfactory progress towards their degrees, and have fulfilled all Graduate Research Fellowship Program (GRFP) reporting requirements. The competition is open to MS- and PhD-seeking Fellows.</p> <p>GROW offers funding for international stays 3-12 months, with the duration varying by country and partner organization.</p>	<p><a href="http://www.serb.gov.in/grow.php">http://www.serb.gov.in/grow.php</a></p>

Name of Partnership	Name of organization/ agency	No. of projects
GROW	SERB NIF	02 ongoing projects

### 5.3. Global Research Council Meeting

Under the patchwork of international institutions, be it United Nation’s umbrella or host of other mechanisms, the advancement of Science and Technology has progressively moved forward over the years, yet these international structures seem to be less than sufficient, to provide for the solutions of long term issues, in particularly those of the developing countries, in an ever changing world order of relations. This has necessitated the role of non-governmental organisations, particularly that of the international councils. One of such kind organisation is Global Research Council (GRC). The GRC is a virtual organisation comprised of the Heads of Research Councils from around the world, dedicated to promoting the sharing of data and best practice for high-quality collaboration among research funding agencies globally. The GRC is a forum for debate and recommendations on key issues affecting research and development, though it does not fund or facilitate the research. The members of GRC are either the heads or key

members of top funding agencies of different countries. The forum consisting of over 60 Heads of Councils is an appropriate body to discuss various issues facing the global funding agencies. 2016 is the fifth year that the GRC has held an Annual Meeting to bring together the Heads of the Research Councils, and each year, two GRC participants bid to co-host the Annual Meeting. This year, the Indian R&D funding agency SERB co-hosted the GRC 2016 Annual Meeting with Research Councils UK (RCUK) in New Delhi. More than 100 delegates attended the event at the Taj Palace Hotel, with Heads of Research Councils from 44 countries participating. This year’s annual gathering from 25 to 27 May debated on global approaches to interdisciplinarity and the equality and status of women in research.

For this meeting, SERB and RCUK commissioned an independent report on each topic from external consultants. These included: an overview of

current literature on each topic; information on GRC participants' policies and practices; analysis of relevant data; and recommendations for GRC participants based on the evidence presented in the reports. The reports acted as a catalyst for discussion at the Annual Meeting, to complement the Position Statement and Action Plan, which have been developed from GRC Regional Meetings. The external consultant reports on the two themes – "Interdisciplinarity" prepared by "DJS Research" ([djsresearch.co.uk](http://djsresearch.co.uk)) and "equality and status of women in research", prepared by "Vitae" ([vitae.ac.uk](http://vitae.ac.uk)) are also available at websites of GRC, SERB and RCUK. The GRC regional meetings mentioned here were held in Africa, the Americas, the Asia Pacific Region, Europe, and the Middle East/North Africa between November 2015 and January 2016.

The first day, that is 25 May 2016 was mainly marked by a parallel meeting by the group of African nations organised by National Research Foundation, South Africa. The group deliberated upon the theme "Exploring Practical Approaches to Applying the Gender Lens in Science, Technology and Innovation in Africa", and took resolve and commitment to common goals and targets. This day also saw the conduct of Executive Support Group (ESG) & Governing Board (GB) meetings as well as election meetings of the regional GB elections (Europe & Asia Pacific). The main meeting got on the wheels with Dr R Brakaspathy, Secretary, SERB welcoming the delegates during the evening reception hosted for the purpose, wherein Professor Rick Rylance, former chair, RCUK and Sir Dominic Asquith, British High Commissioner to India and Dr T Ramasami, former Secretary, DST shared their views on the importance of GRC in bringing the major R&D funding agencies together on a common platform and also briefly touched upon the need and relevance of deliberations on the two chosen themes.

The second day, that is 26 May 2016, in the main meeting comprising of all 44 nations, after the opening remarks by Professor Ashutosh Sharma, Secretary DST and both the co-hosts Dr R Brakaspathy and Rick Rylance, the floor was declared open for series of presentations, talks by key identified speakers, deliberations, discussions, breakout sessions and other related activities planned during the next two days. Professor Ashutosh expressed that R&D funding is becoming globally convergent and we must critically examine the process of delivery and look into deliverables. He commented that through sharing practice and experience, both good and not so good, we can become more efficient, not repeating the others mistakes and adopting approaches that work well. He also stressed upon the need of looking into the issue of "Scaling Up", because it concerns

almost every funding agency. He highlighted the importance of Interdisciplinarity and said that one cannot afford to be too centric to his own field to find out solutions towards the problems of the mankind in today's era and observed that we need to ensure that we put people at technology centres and not otherwise. He also felt that in a diverse country like India, we should have funding streamlined in a way that meets our diversified needs. He observed that "Make in India and Swachh Bharat Abhiyan – the key campaigns of the union government of India, in a way are a matter of Inter-disciplinarity". "We have to bring in engineers, social scientists and the participation of people for these missions to succeed," he said. He apprised the house on various substantial programmes undertaken by DST, SERB and other governmental and non-governmental agencies towards supporting the woman in research, but felt that a lot more could be done through systems approach.

On the last day of the conference, that is 27 June 2016, after the deliberations on World Economic Forum Report, final discussions led to the generation of final set of statements of principles and action plans. A Statement of Principles on Interdisciplinarity and a Statement of Principles and Actions Promoting the Equality and Status of Women in Research were discussed and endorsed by participants representing the global research community. This was followed by the formal announcement of co-hosts for GRC 2017 - Canada and Peru, the venue as Ottawa.

A press conference was held immediately after the event with a number of key journalists from Indian media. Professor Ashutosh Sharma chaired the press conference panel. "We are not even maximising the talent and capabilities of half of the population across the globe," B. Mario Pinto, president, NSERC said on the occasion. Yuichiro Anzai, president, Japan Society for the Promotion of Science, said "We want to use all the talent in science. Let there be no one left behind due to discrimination or other reasons." Rick Rylance said: "As the best science is becoming global, a lot of things are changing. But we are yet to use every talent out there. It's true that the aim of any research is the outcome irrespective of the gender of the scholar. But just imagine the outcome when we will be able to use all that talent which goes undetected or untapped". Gisella Orjeda, president, National Council of Science and Technology, Peru, stressed on capacity building, the topic for next annual GRC meeting scheduled in May in Canada. Professor Ashutosh Sharma said that challenges are truly global: what concerns India concerns the world. Some of the moments captured during the GRC meeting are at Figure 71.



Figure 71. GRC 2016 - few Glimpses.

5.4 National Collaborations and International Linkages at a Glance

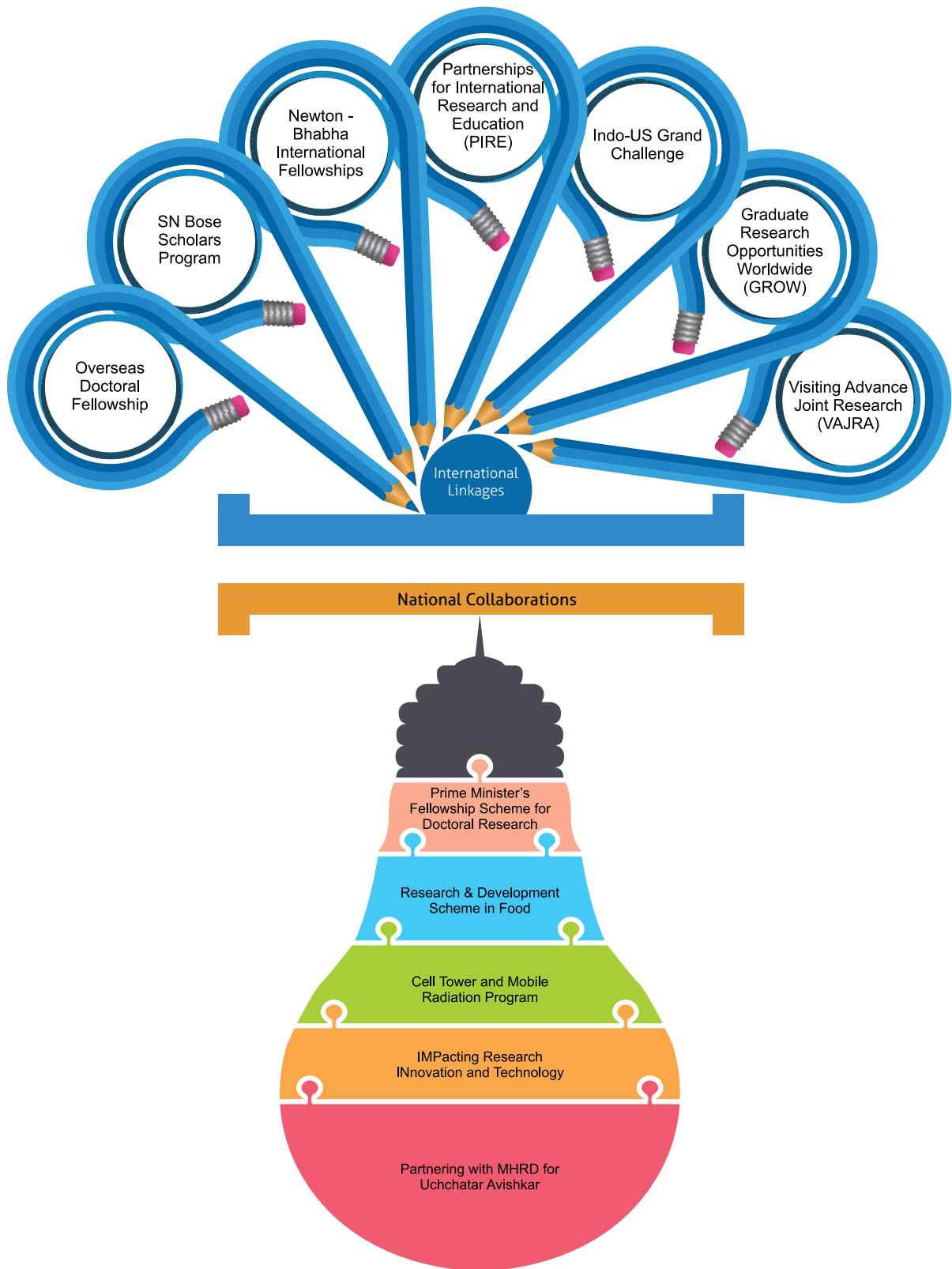


Figure 72. National Collaborations and International Linkages at a Glance.

## 6 Strengthening Linkages with Society

This pillar "Strengthening Linkages with Society (SLS)" is aimed at providing research support to scientists belonging to weaker sections, focusing on the programmes that have direct societal implications as well as garnering and leveraging the social responsibility of scientific community.

### 6.1 Empowerment and Equity Opportunities for Excellence in Science (EMEIQ)

This programme was launched in 2013 to encourage researchers of weaker section of our society. The details of the project for financial year 2016-2017 are given in Table 4.

#### Objective

To provide research support to scientists belonging to the Scheduled Caste and Scheduled Tribe category in undertaking research in newly emerging and frontier areas of science and engineering and thus to involve them in the National Science and Technology development process.

#### Features

The applicant(s) who are an active researcher belonging to the Scheduled Caste and Scheduled Tribe category working on regular basis in academic institutions/national labs or any other recognized R&D institutions in the field of Science and Engineering.

Tenure of a project is 3 years and ceiling amount is ~Rs. 50 lakh.

#### Website links

[http://serbonline.in/SERB/Weaker\\_section](http://serbonline.in/SERB/Weaker_section)  
<http://www.serb.gov.in/emeiq.php>

**Table 4: Projects details of EMEIQ**

S. No.	Broad Area	Sub Area	Number of projects sanctioned (Online)	Number of projects sanctioned (Offline)
1.	Chemical Sciences (25)	Inorganic Chemistry	7	2
		Organic Chemistry	10	3
		Physical Chemistry	9	4
2.	Physical Sciences (10)	Condensed Matter Physics & Materials Science	9	1
		Lasers, Optics, Atomic and Molecular Physics	1	Nil
		Plasma, High Energy, Nuclear Physics, Astronomy & Astrophysics and Nonlinear Dynamics	Nil	1
3.	Life Sciences (84)	Animal Sciences	6	1
		Plant Sciences	34	10
		Health Sciences	24	5
		Biophysics, Biochemistry, Molecular Biology and Microbiology	20	Nil

4.	Engineering Sciences (50)	Chemical Engineering	10	1
		Electrical, Electronics & Computer	23	1
		Mining, Mineral & Materials	6	Nil
		Mechanical & Manufacturing Engineering and Robotics	6	3
		Civil & Environmental Engineering	5	2
5.	Earth & Atmospheric Sciences (9)	Earth Sciences	7	4
		Atmospheric Sciences	2	Nil
6.	Mathematical Sciences (6)	Mathematical Sciences	6	Nil
<b>Total</b>			<b>185</b>	<b>38</b>
<b>Grand Total</b>			<b>223</b>	

## 6.2 Ayurveda Biology (AB)

Ayurveda transcends the practice of medicine, and is identified with India's traditional system of medicine in vogue since the Buddhist era. It continues to serve 70% of India's rural population. AB program is designed to highlight scientific underpinnings of concepts, procedures and products of Ayurveda in terms of modern sciences such as Molecular biology, Immunology and Chemistry.

### Objective

To promote human resource development and collaborative research in Ayurveda Biology and related areas by offering fellowships, training opportunities, providing support to scientific meetings and workshops.

### Features

Project proposals should emanate from the concepts, procedures or products of Ayurveda.

The project should be a joint effort of scientists and Ayurvedic experts

Website links  
<http://www.serb.gov.in/ayurved.php>

**Table 5. Projects details of Ayurveda Biology**

S. No.	Name of disciplines/sub-disciplines	Number of projects sanctioned during the year.
1.	Ayurveda Biology/ Prakriti and human genomics.	02
2.	Ayurveda Biology/ Rasayana and degenerative diseases especially of the central nervous and musculo skeletal systems	02

## 6.3 Scientific Social Responsibility

The need of bridging scientific knowledge and social responsibility can not be ever underestimated. An issue based learning in science and technology w.r.t society and its scientific implications has always been the need of the hour. An attempt has been recently

initiated in SERB to develop the "Scientific Social Responsibility Programme", where in the scientist across all ages/spectrum from various institution/laboratories/ organizations would be involved to participate for the noble cause.

## 7 Awards and Recognitions

Awards and Recognitions (A&R ) pillar of SERB has been centred around a number of awards and recognitions for the active as well as superannuated scientists, professors, and engineers for their extraordinary contributions in the field of Science and Technology. The objective is to motivate the scientists to aspire for excellence in scientific R&D.

### 7.1 J C Bose Fellowship

The Fellowships are scientist specific and very selective. During this year a total 22 fellows were awarded with J C Bose fellowship and based on the performance of these J C fellows in their previous term, few were recommended to continue their subsequent term (Table 6). A total of 331 J C Bose fellowships have been awarded so far by SERB. The details of the number of fellowship awarded during the last five years is given at Figure 73. Nearly 1800 journal publications of international repute along with 225 useful patents are being contributed and 300 PhD are being produced per year by J C Bose fellows. The scientific contributions of the fellows done under J C Bose fellowship have been well recognized all over the globe and published by the internationally reputed publishers such as ACS, APS, WILEY, Elsevier, RSC, AIP, Nature, IEEE, Springer, IOP Science, etc.

#### Objective

The J.C. Bose National Fellowship is meant to recognize active, performing scientists and engineers for their outstanding performance and contribution.

#### Features

Proposer should be an Indian active scientist with a record of outstanding performance apparent from the recognitions like SS Bhatnagar Award and/ or fellowship of science academies (including engineering, agriculture and medicine).

Should be in service at the time of nomination to this fellowship.

Initial duration of the fellowship is for five years.

The J.C. Bose Fellows are provided with a fellowship of Rs. 25,000/- per month and contingency grant of Rs. 15 lakhs per annum towards research expenses. And Overhead expenses Rs. 1,00,000 per annum to host institute.

#### Website links

<http://www.serb.gov.in/jcfn.php>  
[http://serbonline.in/SERB/jcbose\\_fellowship?HomePage=New](http://serbonline.in/SERB/jcbose_fellowship?HomePage=New)

**Table 6. J C Bose Fellowships awarded and renewed during the year 2016-17**

S. No.	Name	Affiliation	Subject Area
1	Dr. Yogendra Singh	CSIR- Institute of Genomics and Integrative Biology, New Delhi	Life Sciences
2	Prof. Nahid Ali	CSIR- Indian Institute of Chemical Biology, Kolkata	Life Sciences
3	Prof. Rakesh Bhatnagar	Jawaharlal Nehru University, New Delhi	Life Sciences
4	Dr. Rajesh S. Gokhale	CSIR- Institute of Genomics and Integrative Biology, New Delhi	Life Sciences



S. No.	Name	Affiliation	Subject Area
5	Dr. Anuradha Dube	CSIR- Central Drug Research Institute, Lucknow	Life Sciences
6	Prof. R. Sowdhamini	Tata Institute of Fundamental Research, Bangalore	Life Sciences
7	Dr. Imran Siddiqi	Centre for Cellular and Molecular Biology, Hyderabad	Life Sciences
8	Prof. Amlan J. Pal	Indian Association for the cultivation of Science, Kolkata	Physical Sciences
9	Prof. C. Siva Ram Murthy	IIT Madras, Chennai	Engineering Sciences
10	Dr. Rakesh Mishra	Centre for Cellular and Molecular Biology, Hyderabad	Life Sciences
11	Prof. Renee Borges	Indian Institute of Sciences, Bangalore	Life Sciences
12	Dr. Rajendra P. Roy	National Institute of Immunology, New Delhi	Life Sciences
13	Dr. Pradeep Das	Rajendra Memorial Research Institute of Medical Sciences, Patna	Life Sciences
14	Prof. Debashish Goswami	Indian Statistical Institute, Kolkata	Mathematical Sciences
15	Prof. Upinder S. Bhalla	National Centre for Biological Sciences, TIFR, Bangalore	Life Sciences
16	Prof. K.N Balaji	Indian Institute of Sciences, Bangalore	Life Sciences
17	Prof. Sanghamitra Bandyopadhyay	Indian Statistical Institute, Kolkata	Engineering Sciences
18	Prof. Rengaswamy Ramesh	Physical Research Laboratory, Ahmedabad	Earth & Atmospheric Sciences
19	Prof. Syed Aftab Haider	Physical Research Laboratory, Ahmedabad	Earth & Atmospheric Sciences
20	Prof. Pradip Dutta	Indian Institute of Science, Bangalore	Engineering Sciences
21	Prof. Joyoti Basu	Bose Institute, Kolkata	Life Sciences
22	Dr. Pushkar Sharma	National Institute of Immunology, New Delhi	Life Sciences
23	Prof. Indranil Dasgupta	University of Delhi, New Delhi	Life Sciences
24	Prof. Gautam Bhattacharyya	Saha Institute of Nuclear Physics, Kolkata	Physical Sciences
25	Prof. B.V. Rajarama Bhat	Indian Statistical Institute, Bangalore	Mathematical Sciences
26	Prof. Subrata Sinha	National Brain Research Centre (NBRC), Gurgaon	Life Sciences
27	Dr. Poonam Salotra	National Institute of Pathology-ICMR, New Delhi	Life Sciences
28	Dr. M.R.N. Murthy	Indian Institute of Science, Bangalore	Life Sciences
29	Prof. Biman Bagchi	Indian Institute of Science, Bangalore	Chemical Sciences
30	Prof. Dipankar Das Sarma	Indian Institute of Science, Bangalore	Chemical Sciences
31	Prof. H.R. Krishnamurthy	Indian Institute of Science, Bangalore	Physical Sciences
32	Prof. K. Muniyappa	Indian Institute of Science, Bangalore	Life Sciences
33	Dr. Ashutosh Sharma	Indian Institute of Technology Kanpur, Kanpur	Engineering Sciences
34	Dr. K. VijayRaghavan	Tata Institute of Fundamental Research, Bangalore	Life Sciences

S. No.	Name	Affiliation	Subject Area
35	Dr. Arup Kumar Raychaudhuri	S.N. Bose National Center for Basic Sciences, Kolkata	Physical Sciences
36	Dr. Gautam R. Desiraju	Indian Institute of Science, Bangalore	Chemical Sciences
37	Dr. Manindra Agrawal	Indian Insitute of Technology Kanpur, Kanpur	Mathematical Sciences

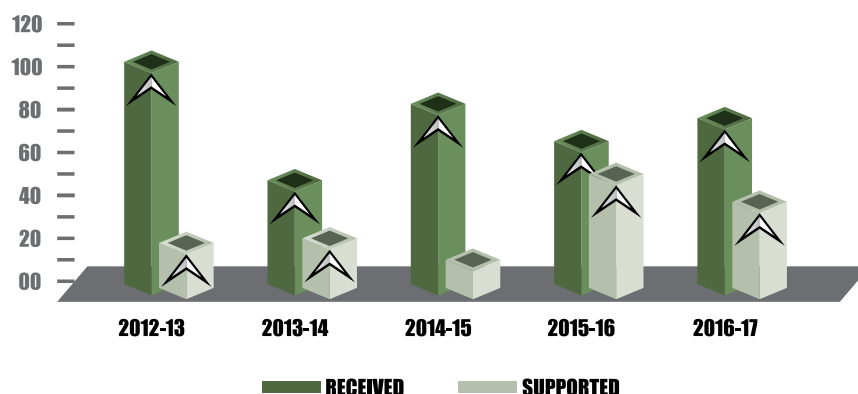


Figure 73. J C Bose Fellow application received and supported during the year 2012-17.

## 7.2 Ramanujan Fellowship

Ramanujan Fellowship is for brilliant scientists and engineers from all over the world to take up scientific research positions in India. During the year a total of 36 fellows were awarded with Ramanujan fellowship (Table 7). Till date, total 417 Ramanujan fellowships have been offered in different subject areas. The details of Ramanujan fellows during last five years are given at Figure

74. The awarded fellows have published several research articles on their scientific investigation in peer reviewed reputed journals of high impact factor. The research contributions of these fellows were published by the internationally reputed publishers such as ACS, APS, AIP, Nature, RSC, WILEY, Elsevier, IEEE, Springer, IOP Science.

### Objective

To encourage our Indian scientist working abroad to return back to the country.

### Features

This fellowship is open to scientists and engineers below the age of 55 years.

Ramanujan Fellowship are only for those candidates who are doing Post-Doctoral abroad and not for the people who already have permanent position in a scientific organization in the country.

Initial duration of the fellowship is for five years.

The value of the fellowship is Rs. 85,000/- per month for the duration of 5 years.

Each Fellow, in addition, receives a research grant of Rs. 7.00 lakh per annum.

### Website links

<http://www.serb.gov.in/rmf.php>  
[http://serbonline.in/SERB/Ramanujan\\_fellowship?HomePage=New](http://serbonline.in/SERB/Ramanujan_fellowship?HomePage=New)

**Table 7. List of Ramanujan Fellows awarded during the year 2016-17**

S. No.	Name	Affiliation	Subject Area
1	Dr. Pranjal Chandra	Indian Institute of Technology, Guwahati	Life Sciences
2	Dr. Jayamurugan Govindasamy	Institute of Nano Science and Technology, Mohali	Chemical Sciences
3	Dr. Gnanesh B Nanjappa	Central Sericultural Research and Training Institute, Mysore	Life Sciences
4	Dr. Raghunath Chelakkot	Indian Institute of Technology Bombay, Mumbai	Physical Sciences
5	Dr. Bagganahalli S. Somashekar	CSIR-Central Food Technological Research Institute, Mysore	Life Sciences
6	Dr. Ritam Mallick	Indian Institute of Science Education & Research, Bhopal	Physical Sciences
7	Dr. Goreti Rajendar	Indian Institute of Science Education & Research (IISER) - Thiruvananthapuram	Chemical Sciences
8	Dr. Neha Garg	Indian Institute of Technology Mandi, Mandi	Life Sciences
9	Dr. Santosh Kumar	All India Institute of Medical Sciences, Patna	Life Sciences
10	Dr. Arnab Dutta	Indian Institute of Technology Gandhinagar, Ahmedabad	Chemical Sciences
11	Dr. Upasana Ray	Indian Institute of Technology, Kharagpur	Life Sciences
12	Dr. Siddharth Barman	Indian Institute of Science, Bangalore	Engineering Sciences
13	Dr. Hem Chandra Jha	Indian Institute of Technology, Indore	Life Sciences
14	Dr. Siddharth Jhunjhunwala	Indian Institute of Science, Bangalore	Engineering Sciences
15	Dr. Somnath Dutta	Indian Institute of Science, Bangalore	Life Sciences
16	Dr. Prem Prakash	PGIMER, Chandigarh	Life Sciences
17	Dr. Animesh Samanta	National Institute for Interdisciplinary Science & Technology, Thiruvananthapuram	Chemical Sciences
18	Dr. Shalini Datta	Indian Statistical Institute, Kolkata	Life Sciences
19	Dr. Gopal Dixit	Indian Institute of Technology Bombay, Mumbai	Physical Sciences
20	Dr. Vijaya Kumar M S	University of Mysore, Mysore	Chemical Sciences
21	Dr. M. Tanveer	Indian Institute of Technology Indore, Indore	Mathematical Sciences
22	Dr. Shahnaz Rahman Lone	Central University of Punjab, Bathinda	Life Sciences
23	Dr. Gopala Krishna Darbha	NIT Andhrapradesh, Tadepalligudem	Earth & Atmospheric Sciences
24	Dr. C.Edward Raja	Madurai Kamaraj University, Madurai	Life Sciences
25	Dr. Rajesh Kumar Yadav	Defence Institute of Advanced Technology, Pune	Chemical Sciences
26	Dr. Santanu Karan	CSIR- Central Salt & Marine Chemicals Research Institute, Bhavnagar	Physical Sciences
27	Dr. Haridas Pai	Saha Institute of Nuclear Physics, Kolkata	Physical Sciences
28	Dr. Rajeev Singh	Indian Institute of Technology (BHU), Varanasi	Physical Sciences
29	Dr. Sagram Keshari Samal	Indian Institute of Science, Bangalore	Engineering Sciences
30	Dr. T. Ramesh	Salim Ali Centre For Ornithology and Natural History, Coimbatore	Life Sciences
31	Dr. G. Aneeshkumar Arimbasseri	National Institute of Immunology, New Delhi	Life Sciences
32	Dr. Ajaya Kumar Nayak	National Institute of Science Education and Research Bhubaneswar, Bhubaneswar	Physical Sciences
33	Dr. Sajal Dhara	Indian Institute of Technology Kharagpur, Kharagpur	Physical Sciences

S. No.	Name	Affiliation	Subject Area
34	Dr. Manas Kulkarni	International Centre for Theoretical Sciences-TIFR, Bengaluru(North)	Physical Sciences
35	Dr. Arabinda Halder	Indian Institute Technology Hyderabad, Sangareddy	Physical Sciences
36	Dr. Sandeep Kumar Singh	Indian Institute Technology Hyderabad, Sangareddy	Life Sciences

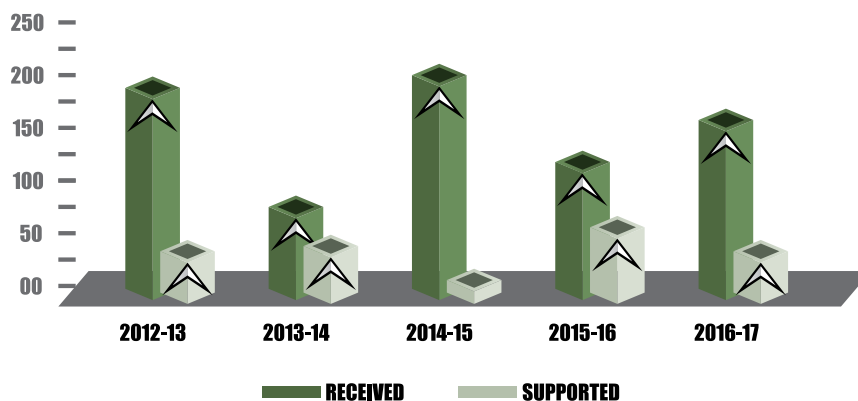


Figure 74. Ramanujan Fellowship application received and supported during 2012-17.

### 7.3 SERB Distinguished Fellowship

Many active senior scientist who are passionate in research find it extremely difficult to continue their research after superannuation and, forced to stop doing research against their choice. The great amount of knowledge and more importantly the experience that they have accumulated over many years, which may be considered a non-replaceable treasure, can be lost if some avenues

are not made available to them. In order to support research of eminent scientists who do not hold any administrative roles and functions but are active and performing, SERB has instituted Distinguished SERB Fellowship Award. The list of fellows recommended for award during the year 2016 – 2017 in the above-mentioned fellowship/ awards are given at Table 8.

#### Objective

SERB Distinguished Fellowship Scheme is meant for eminent and performing senior scientists to continue active research even beyond their superannuation.

#### Features

The nominee should be a superannuated but an active resident Indian scientist/ academician who is associated with any recognized Indian laboratory / institute / university and should not hold any administrative position.

Should have outstanding contribution in Science, technology Engineering & Mathematics (STEM) in last decade with excellent research output in last five years.

The duration of the fellowship is initially for five years.

The Scheme offers a fellowship amount of Rs. 60,000/- per month and a research grant of Rs. 5 lakhs per annum.

Website links

<http://www.serb.gov.in/sdf.php>

**Table 8. List of SERB Distinguished Fellow's recommended during the year 2016-17**

S N	Name	Affiliation	Research Interest
1.	Prof. M. Lakshmanan	Prof. of Eminence, Centre for Nonlinear Dynamics, Bharathidasan University, Tiruchirapalli	Nonlinear dynamics of novel physical and mathematical systems
2.	Prof. Lalji Singh	Managing Director, Genome Foundation, Hyderabad	Genetic diversity in Indian populations and its health implications
3.	Prof. H. R. Krishnamurthy	Department of Physics, Indian Institute of Science, Bangalore	Theoretical condensed Matter Physics especially Quantum impurity physics, and correlation phenomenon theories in solid.
4.	Prof. Amitabha Chattopadhyay	Centre for Cellular and Molecular Biology (CCMB), Hyderabad	Membrane structure, function and dynamics, Spectroscopic Techniques, Fluorescence, membrane hydration
5.	Prof. G. Sundararajan	International Advanced Research Centre for Powder Metallurgy & New Materials (ARCI), Hyderabad -Telangana	Metallic Minerals, Cold sprays coatings, Electro spark, Laser surface modifications.

## 7.4 SERB Women Excellence Award

SERB Women Excellence Award is a one-time award given to women scientists below 40 years of age, and who have received recognition from

the any of the national academics in science and engineering. During the year 15 women researchers have been awarded (Table 9).

### Objective

To recognize and honour extraordinary women of outstanding professional excellence across the country for their remarkable contribution in science and engineering.

### Features

- The research grant is Rs.5.00 lakh per annum for a period of 3 years.
- Applicant age should be below 40 at the time of application.

Website links

<http://www.serb.gov.in/weea.php>

**Table 9. List of Women Excellence Award fellows/awarded during the year 2016-17**

S. N.	Name	Affiliation	Research Interest
1.	Dr. (Ms.) Arpita Patra	Department of Computer Science & Automation, Indian Institute of Sciences, Bangaluru - Karnataka	Secure multi-party computation: Feasibility and efficiency.
2.	Dr.(Ms.) Mahak Sharma	Department of Biological Sciences, Indian Institute of Science Education and Research - Mohali, Mohali	Understanding the role of Arf-like small GTPase 8 in regulating lysosome motility and trafficking
3.	Dr. (Ms.) K. N. Uma	Space Physics Laboratory, Vikram Sarabhai Space Centre, Indian Space Research Organization, Trivandrum -	Quantitative and qualitative estimation of Carbon-di-oxide (CO <sub>2</sub> ) over the Indian Region.

S. N.	Name	Affiliation	Research Interest
4.	Dr. (Ms.) Abha Misra	Department of Instrumentation and Applied Physics, Indian Institute of Science, Bangalore	Bio-inspired carbon nanotubes based photonic crystals for strain sensing.
5.	Dr. (Ms.) Gayathri Pananghat	Department of Biology, Indian Institute of Science Education and Research - Pune	Biochemical and structural studies of SofG, a GTPase involved in Myxococcus motility
6.	Dr.(Ms.) Sharmistha Sinha	Institute of Nano Science and Technology, Habitat Centre, Mohali	Cellulosr-protein binary conjugates for metal detoxification
7.	Dr. (Ms.) Premalata Jena	Assistant Professor, Department of Electrical Engineering, Indian Institute of Technology, Roorkee	Design, implementation and validation of new islanding detection algorithms for a smart microgrid system using a Hardware-in-the-loop (HIL) test bed.
8.	Dr. (Ms.) Subhra Jana	Department of Chemical, Biological & Macro-molecular Sciences, S.N.Bose National Centre for Basic Sciences, Kolkata	Low temperature synthesis of multi-metallic inorganic nanostructures for catalysis and chemical sensing
9.	Dr. (Ms.) Ranjani Viswanatha	International Centre for Material Science, JNCASR, Bangalore	Copper doping to study the electronic structure of host semiconductor
10.	Dr. (Ms.) Sameena Khan	Drug Discovery Research Centre, Translational Health Science and Technology Institute (THSTI), NCR Biotech Science Cluster, Faridabad	Illuminating the structural aspect of Trim72E3 ligase in metabolic syndrome
11.	Dr. (Ms.) Rohini Garg	Department of Life Sciences School of Natural Sciences Shiv Nadar University Gautam Buddha Nagar Uttar Pradesh	Understanding the role of DNA methylation under water deficit stress in chickpea
12.	Dr. (Ms.) G. Seghal Kiran	Assistant Professor, Food Science & Technology, Pondicherry University, Puducherry	Elucidation of degradation intermediates of poly-hydroxy butyrate inhibits expression of virulence cascade in luminescent Vibrios
13.	Dr. (Ms.) Radhakrishnan Mahalakshmi	Department of Biological Sciences, Indian Institute of Science Education nad Research (IISER), Bhopal	Physical principles governing membrane protein interface: Energetics of side chain adaptation.
14.	Dr. (Ms.) R. S. Swathi	School of Chemistry, IISER Thiruvananthapuram	Tunable azacrown -based graphene nanomeshes for gas separation
15.	Dr. (Ms.) L. Divya	Department of Animal Sciences, School of Biological Sciences, Central University of Kerala	ROS modulation of development and polyphenism in Oecophylla smaragdina (Fabricius 1775) (Hymenoptera: Formicidae).



## Support for Science & Technology Events

Expanding the understanding of science related issues and challenges requires consistent and focused interaction among multiple disciplines and institutions, of the country and the world. The pillar "Support for Science & Technology Events (SSTE)" provides support through two of its major component ITS and SS, for the events pertaining to science and technological development in the country, or abroad, organized by academic institutes/ national research & development labs or other professional bodies.

### 8.1 International Travel Support (ITS) Scheme

As many as 1328 Young Scientists & 536 Senior Scientists have been selected out of 5266 applicants for presenting their scientific and technical findings Table 10.

Objective	Features	Website links
<p>The ITS Scheme provides an opportunity to the Indian young and senior scientists to interact with their counterparts in various places across the world.</p>	<p>The support is also provided to young scientists for attending training programmes and short-term schools/ workshops/courses.</p> <p>Economy class air-fare by shortest route, airport-tax and visa fees are provided under the scheme. Registration Fee is provided to young scientist in addition to the support.</p>	<p><a href="http://serbonline.in/SERB/its">http://serbonline.in/SERB/its</a>  <a href="http://serb.gov.in/its.php">http://serb.gov.in/its.php</a></p>

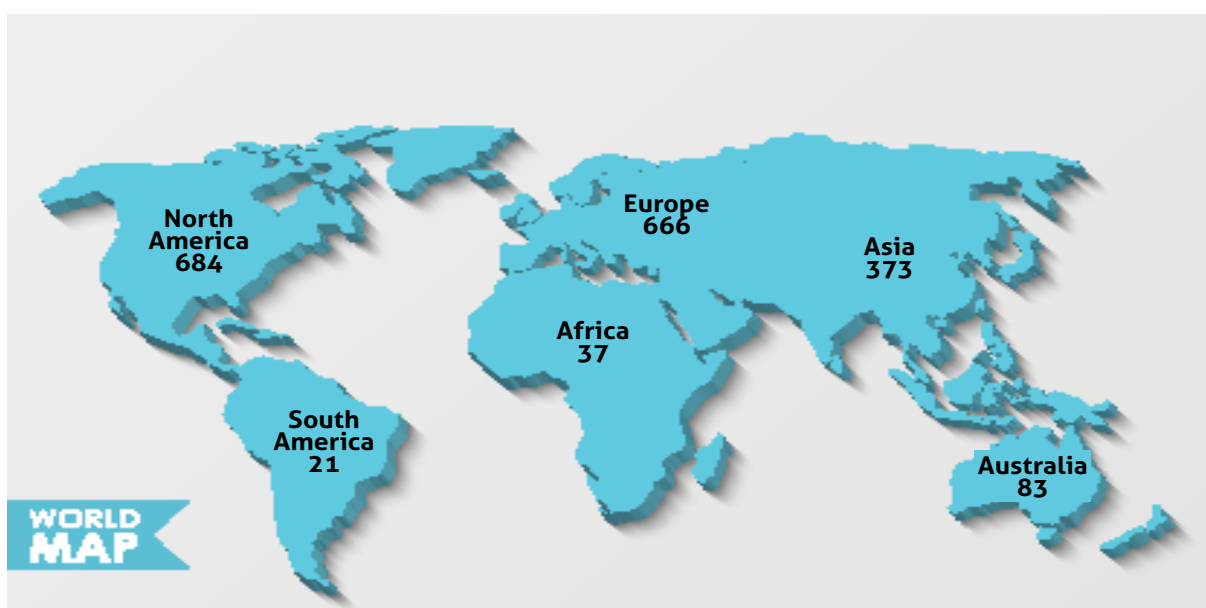


Figure 75. ITS grant support-country wise.

## Conferencewise Data of ITS Proposals (2016-17)

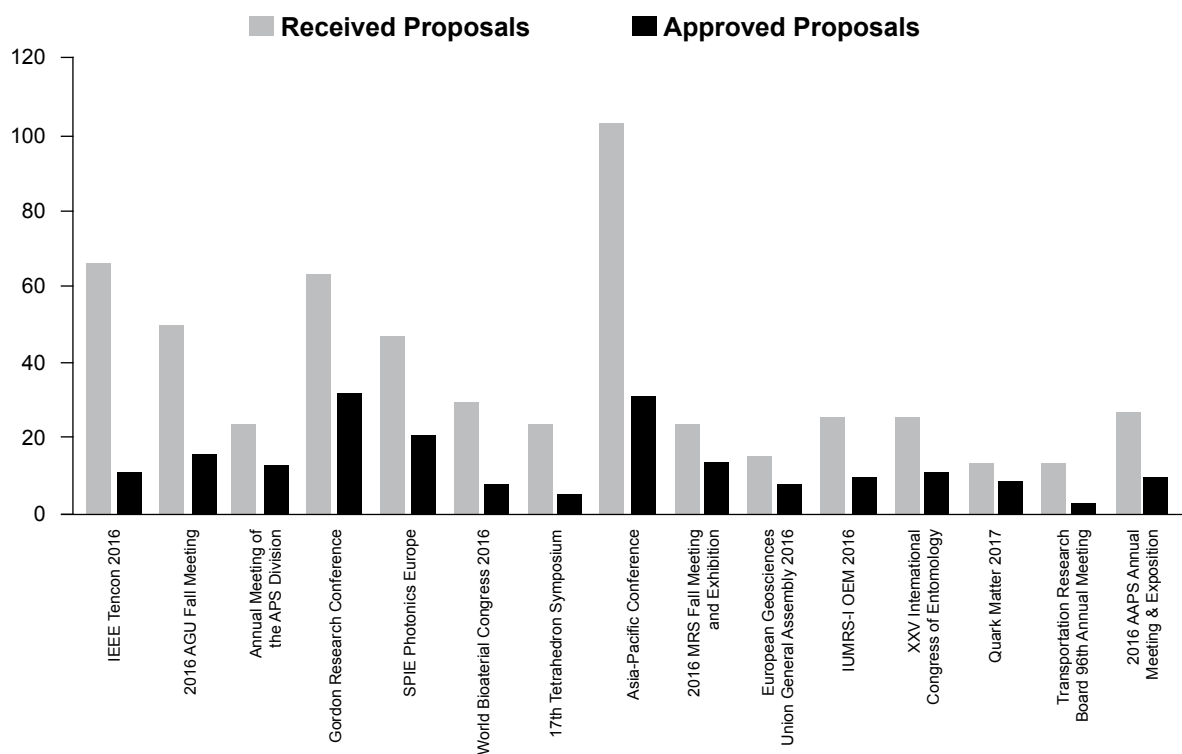


Figure 76. ITS grant - Conference wise (only those conferences included where 10 or more proposals received).

Table 10. Discipline wise ITS grant during the year 2016-17

Name of discipline	Received Proposals	Approved Proposals	Category		Gender	
			Senior Scientists (more than 35 years)	Young Scientists (Less than 35 years)	M	F
Engineering	1543	459	132	327	365	94
Life Science	2117	675	197	478	395	280
Chemical Sciences	370	162	47	115	113	49
Physical Sciences	694	348	81	267	239	109
Earth & Atmospheric Sciences	317	137	51	86	97	40
Mathematical Sciences	225	83	28	55	54	29
Total	5266	1864	536	1328	1263	601



## 8.2 Assistance To Professional Bodies & Seminars/Symposia

Out of 2339 applications received, 713 were supported. In addition, partial financial support was extended to 22 organisations Professional Bodies / Institutes / Societies for publication of Journals. The broad subject area-wise distribution of activities is shown in Figure 77. Organisation-wise activities (received and supported) are shown in Figure 78.

Objective	Features	Website links
To support and popularise scientific events/ activities across the country.	<p>Provides a platform to science professionals from academic/ R&amp;D/industrial institutions to have a dialogue on S&amp;T issues of national and international importance.</p> <p>Program also extends support to professional bodies for publishing their work.</p>	<a href="http://www.serb.gov.in/apbs.php">http://www.serb.gov.in/apbs.php</a>

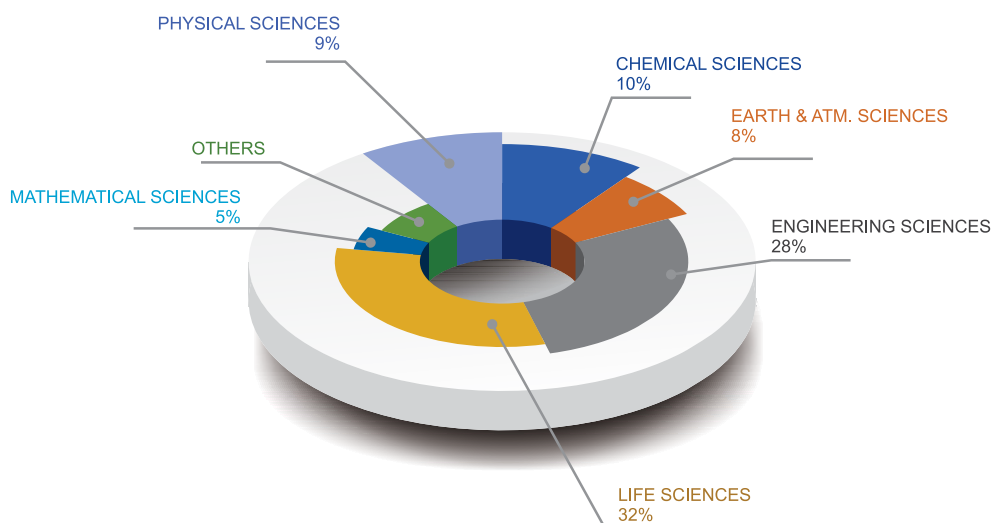


Figure 77. Broad subject area-wise distribution of received & supported proposals.

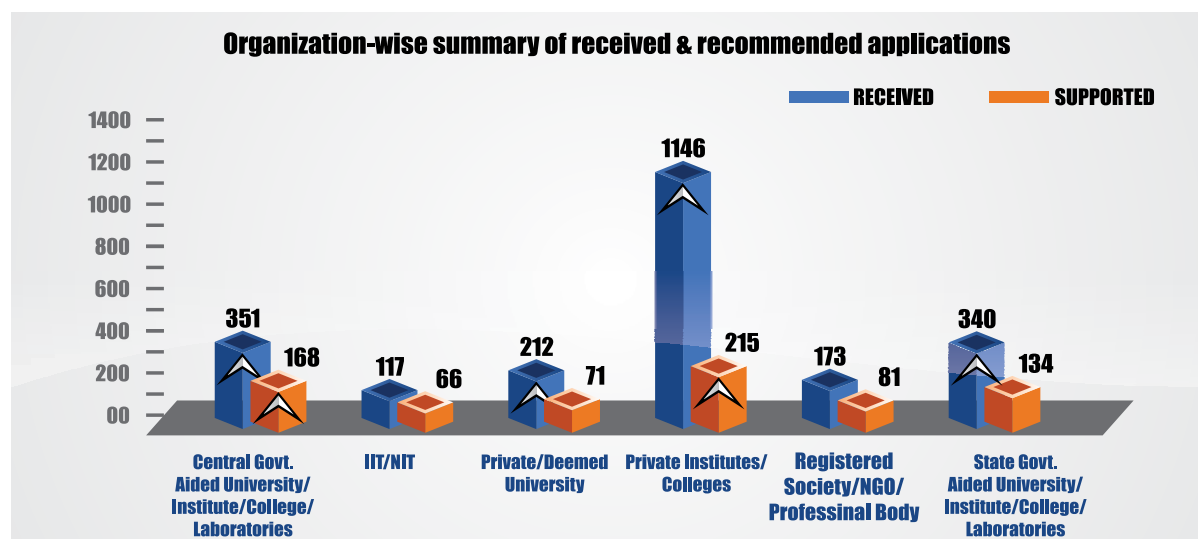


Figure 78. Organization-wise summary of received & supported proposals.

## 9 Patents and Publications

A large number of projects have been funded by the board during the year. The endeavor also has been to capture the outcomes of these projects. Patents and publications that have come out from some of the funded projects during the year, are detailed as under:

### 9.1 Patent Applications/Granted Patents

- Jain R, Panda PR, Subramoney S (2017). Dynamic Cache Co-partitioning by Machine Learned Caches. Filed in March 2017 by Intel Technologies at US Patent and Trademark Office.
- Jain R, Panda PR, Subramoney S (2016). Reinforcement Learning based Adaptive Co-optimization of Cores, LLC and On-chip Network. Filed in March 2016 by Intel Technologies at US Patent and Trademark Office.
- Krishnan A, Raja VS, Vaidya SM (2016). A four-step thermal aging for improving the environmentally assisted cracking of 7xxx series aluminum alloys. Europe Patent PCT/IN2016/000,280.
- Nazni P. (2016) Modified foxtail millet based cookies for diabetes patent No 201641028124.
- Puzari P, Dutta RR, Borah H, Gogoi S (2016). Enhancement of stability of acetylcholinesterase in ethyl acetate through the use of lipase and L-serine and hence a method for pesticide bio sensing in quechers extract Patent No 201631008813 A.
- Kamalanathan K, Ramshekhar N. Menon, Sachin J. Shenoy, Renuka R. Nair, Chandra P. Sharma (2016). A catheter assisted drug delivery device to deliver required doses of soft therapeutic/ Diagnostic agents to lumen of biological vessel, tube or tubule at the site of action Indian Patent 2138/CHE/2013 A.
- Garani SS, Reddy B, Modak E (2016), Method and Apparatus for Interpolative Timing Recovery for Two-Dimensional Magnetic Recording systems (Patent to be filed by khurana and khurana, Approved by IISc)
- Damodaran V, Nilesch J. Vasa, R. Sarathi (2016). Quadratic electro-optic based deflection-free wide path-length modulation and lateral scanning device for Time Domain Optical Coherence Tomography, Application No. 201641026337 / 2016-CHE filed on 2/8/2016
- Gaikar V G (2017). Photocatalytic method for reduction of CO and method for preparation thereof, Indian Patent filed-451/ MUM/ 2017.
- Hazarika S, Bharali P, Borah H J, Das I, Borthakur S, Bora M M, Konwar D (2016). An improved membrane for separation of Co<sub>2</sub> 0082NF2016/IN
- Babitha S (2016). A Btrilayer scaffold for developing a tissue engineered skin construct incorporating hair follicle stem cells and a process for the preparation and thereof. Institutional IPC Ref No: IPTRT086.Y16.
- Babitha S (2016) A Bilayered polymeric scaffold with arrayed micropits for full thickness skin construct. Institutional IPC Ref No: IPTRT085.Y16.

### 9.2 Publications

A large number of papers have been published during the year. A cumulative list for all the disciplines is given below at Table 11.

**Table 11. Publication in SERB funded project during the year 2016-17**

S. No	Disciplines	Number of publications
1.	Chemical Sciences (SCRI)	1037
2.	Life Sciences (SCRI)	434
3.	E&A Sciences (SCRI)	37
4.	Physical Sciences (SCRI)	81
5.	Mathematical Sciences (SCRI)	90
6.	Engineering Sciences	77
7.	Award and fellowship/ National linkages	90

# 10 Capacity Building

Capacity building is the bedrock on which success in any human endeavor rests. SERB has been constantly striving to design and implement HRD modules that help bring S&T professionals update themselves speed with latest developments in frontier areas of science and technology. Another objective of SERB's capacity building efforts is to improve the ability to evaluate and address crucial questions related to policy choices and modes of implementation of SERB's programmes.

## 10.1 Human Resource Development

HRD initiatives undertaken through financial support, scholarships and training schemes of SERB are detailed Table 12 & 13.

**Table 12: Capacity building/ Manpower in different schemes/programmes during the year 2016-17**

S.No.	Number of PhDs' produced	Number of JRF	Number of SRF	Staff other than JRF/SRF
1.	222	637	99	312

**Table 13. Training/Schools during the year 2016-17**

S. N.	Name of training/ Schools	Place of training/ Schools	Number of Participants	Level of participants
1.	8th Summer School on Tribology	Indian Institute of Science Bangalore	53	Faculty in Mechanical Engineering teaching tribology or machine design and research scholars pursuing PhD in Tribology
2.	2nd SERB School on Robotics	Indian Institute of Technology Madras	48	Faculties, PhD students, Scientists from R&D labs and Engineers from industry.
3.	1st SERB School on Noise & Vibration	Indian Institute of Technology Bhubaneswar	37	Faculties from universities and colleges, Research students
4	"Field Training Course in Glaciology"	Hamtah glacier, Chandra basin, Lahaul & Spiti districts, H.P.	17	M.Sc., M.Phil., Ph.D., Research Scholar, Group A officer etc.
5	"Geophysical Software Practices for Subsurface Imaging"	Indian Institute of Technology (ISM), Dhanbad	30	Post Graduate students, Research Scholars, Scientist's, Junior and Senior Engineers and Assistant Professor from all over India including two International participants (one from Nepal and another from Nigeria who are pursuing their PhD in India).
6	"Best practices in coal bed methane exploration and production"	CSIR-Central Institute of Mining and Fuel Research (CSIR-CIMFR), Barwa Road, Dhanbad	25	Researchers and senior/mid-level professionals from industry and academia with bachelor's degree in petroleum/ reservoir/mining/mechanical/ chemical engineering or master's degree in geology/ geophysics/physics/ chemistry.

## 10.2 Brainstorming Sessions

### 10.2.1 Brainstorming session on Environmental Geotechnics

To enthuse and encourage researchers and teachers across India to submit relevant and quality proposals to SERB related to various areas of Environmental Geotechnics, one-and-a half day brain-storming session was organized in Goa during January 24-25, 2017. The key agenda of the event was to identify areas of research and applications

### 10.2.2 Brainstorming session on Grand Challenges in Chemical Science Research for Energy, Environment and Life Sciences: A SERB India Initiative

An International Brain storming session was conducted in Kolkata at 10 January 2017. The Committee members of Inorganic & Physical Chemistry PAC interacted with top-notch world class researchers and discussed the grand challenges in the areas of energy, environment and life sciences.

Recommendations:

- a. The need for special calls on the following.

- $N_2$  and  $CO_2$  Fixation: small molecule and enzyme catalysis
  - (Thematic Area: Sustainable environment)
  - Biochemistry and molecular biology or redox active metalloenzymes involved in health. (Thematic Area: Personalized medicine/ Human disease)
- b. National Centre for Spectroscopy (Capacity building for analytical techniques).
  - c. Development of Collaborative Research Centre (cross-disciplinary research program).
  - d. Focus on translational research (eradicate the current gap between industry and academia).

### 10.2.3 Brainstorming session on Plant microbes' interaction under plant sciences

A brain storming session was organised on "Plant microbiome" to promote the research on the microbes and their role in plant, agriculture, soil and biodegradation management etc. at VIT Chennai on 30<sup>th</sup> Nov 2016. A total of 27 scientists (experts' speakers and participants) participated during the session.

## 11 Administration

The administration for any organization plays a vital role in meeting its objectives. All efforts are made to ensure that SERB gets the institutionalized environment for producing the desired results and targets.

### 11.1 Administration and Recruitment

Dr. R. Brakaspathy, Scientist 'G' (DST) was having additional charge of the post of Secretary during the beginning of year 2016. Consequent upon him attaining the age of superannuation, w.e.f 28.02.2017, Dr. Rajiv Sharma, Scientist 'G' and Head, Technology Mission Division, DST was assigned the additional charge of the post of Secretary, SERB w.e.f 01.03.2017.

In anticipation that the post of Secretary, SERB would be falling vacant w.e.f 01.01.2016, an advertisement was given for filling up of the post of Secretary, SERB. The meeting of Search cum Selection Committee (SCC) to select a candidate was held on 07.03.2016. The SSC recommended for the modifications/revisions of Recruitment Regulations (R/R's), in so far as they relate to the increase in prescribed maximum age limit. A proposal for revision/modification in R/R's is under process.

Out of the 5 sanctioned posts of Scientist 'G', 3 posts have already been filled up by the end of February 2016 on the basis of the interview held in December 2015. Hence, 2 posts of Scientist 'G' are lying vacant in SERB. The recruitment process for filling up of 2 posts of Scientist 'G' has already been initiated by giving a brief advertisement in two leading National (All India Publication) and in the Employment News on 18.02.2017.

### 11.2 Implementation of Official Language

SERB, since its inception has been implementing the guidelines issued by the Department of Official Language, Ministry of Home Affairs. Hindi Fortnight was celebrated from 14.09.2016 to 29.09.2016. Various activities were organized for the staff/officers, both Hindi speaking and Non-Hindi speaking to promote the official language. At the end of the Hindi Fortnight, a closing ceremony was held under the Chairmanship of





Figure: 79 Hindi workshops organised by SERB during the year.

Secretary, SERB, wherein the senior officers and staff of SERB were present in large number. The winners were awarded cash prizes, certificates and Hindi books by Secretary, SERB (Figure 79).

Further, three Hindi workshops were also conducted on 15.03.2016, 03.08.2016 and 26.12.2016 to enhance the knowledge of the officers/staff for the maximum use of Hindi language in official work. Quarterly meetings of Official Language Implementation Committee to review the progress of the use of Hindi language in SERB were held and the quarterly reports were sent to DST as per schedule.

### 11.3 Audited Annual Statement of Accounts

As per the provisions laid down in Section 13 of the SERB Act, 2008, the Annual Accounts of the Board are required to be maintained in the prescribed formats and audited by the Comptroller and Auditor General of India (C&AG) or by their

appointed auditors annually. Accordingly, the Annual Accounts for the Financial Year 2016-17 have been prepared and audited by a team of Auditors deputed by C&AG. The duly audited Financial Statements and Annual Accounts for the Financial Year 2016-17 form the part of this Annual Report.

### 11.4 Right to Information Act, 2005 (RTI)

Forty-five (45) RTI applications were received during the Financial Year 2016-17. Out of which four (4) were received as transfer from DST, one (1) was electronically transferred from Other Public Authority and forty (40) were received directly. The appropriate information was provided to all the forty-five (45) applicants. Two appeals were also received during the year and disposed of by the appellate authority. The total fee of Rs.942/- (Rupees nine hundred forty-two only) was received by SERB for providing information under RTI Act, 2005.

# Financial Statements

**Balance Sheet**

as at 31.03.2017

Amount in Rs.

	Schedule	Current Year	Previous Year
<b>CORPUS / CAPITAL FUND &amp; LIABILITIES</b>			
Corpus / Capital Fund	Schedule 1	518,580,464.83	478,092,874.45
Reserves and Surplus	Schedule 2	-	-
Earmarked / Endowment Funds	Schedule 3A, 3B & 3C	240,793,367.00	42,800,721.00
Secured Loans / Borrowings	Schedule 4	-	-
Unsecured Loans /Borrowings	Schedule 5	-	-
Deferred Credit Liabilites	Schedule 6	-	-
Current Liabilites and Provisions	Schedule 7	40,648,150.00	37,555,459.00
<b>Total</b>		<b>800,021,981.83</b>	<b>558,449,054.45</b>
<b>Assets</b>			
Fixed Assets (Net)	Schedule 8	27,695,814.00	27,496,749.00
Investments-From Earmarked / Endowment Funds	Schedule 9	-	-
Investments-Others	Schedule 10	-	-
Current Assets, Loans, Advances etc.	Schedule 11	772,326,167.83	530,952,305.45
Miscellaneous Expenditure (to the extent not written off or adjusted)			
<b>Total</b>	-	<b>800,021,981.83</b>	<b>558,449,054.45</b>
Significant Accounting Policies	Schedule 26		
Contingent Liabilities and Notes to Accounts	Schedule 27		

For Science and Engineering Research Board



Secretary  
SERB

Date : 27-06-2017

Place : New Delhi



Director-Finance  
SERB

For ASPG &amp; Associates

Chartered Accountants

F.R.N. 022888N

CA Avinash Gupta

Partner

M. No. 085799

Date : 28.09.2017





## Income & Expenditure Account

as at 31.03.2017

Amount in Rs.

	Schedule	Current Year	Previous Year
<b>Income</b>			
Income from Sales / Services	Schedule 12		-
Grants / Subsidies *	Schedule 13	7,657,044,309.00	6,585,781,760.00
Fees / Subscriptions	Schedule 14	-	-
Income from Investments	Schedule 15	-	-
Income from Royalty, Publication etc	Schedule 16	-	-
Interest Earned	Schedule 17	116,380,682.32	71,353,502.93
Other Income	Schedule 18	12,757,356.00	12,524,528.00
Increased/(Decrease) in stock of Finished Goods & Works-in-Progress	Schedule 19	-	-
<b>Total (A)</b>		<b>7,786,182,347.32</b>	<b>6,669,659,790.93</b>
<b>Expenditure</b>			
Establishment Expenses	Schedule 20	61,891,346.00	40,914,100.00
Other Administrative Expenses	Schedule 21	86,277,681.55	71,297,202.62
Expenditure on Grant, Subsidies etc	Schedule 22	7,686,163,096.12	6,351,887,862.00
Interest	Schedule 23	-	-
Depreciation (Net Total at the Year end)	Schedule 8	12,756,626.00	12,522,354.00
<b>Total (B)</b>		<b>7,847,088,749.67</b>	<b>6,476,621,518.62</b>
Excess of Income over Expenditure (A-B) (Before PPI & PPE)		(60,906,402.35)	193,038,272.31
Excess of Expenditure over Income (A-B) (Before PPI & PPE)		-	-
Prior Period Income	Schedule 24	102,196,700.73	72,497,940.81
Prior period Expenditure	Schedule 25	1,001,773.00	1,025,218.00
Excess of Income over Expenditure (A-B) (After PPI & PPE)		40,288,525.38	264,510,995.12
Excess of Expenditure over Income (A-B) (After PPI & PPE)		-	-
Transfer to Special Reserve (Specity each)		-	-
Transfer to / from General Reserve		-	-
Balance Being Surplus (Deficit) carried to Corpus/Capital Fund		40,288,525.38	264,510,995.12
Significant Accounting Policies	Schedule 26		
Contingent Liabilities and Notes to Accounts	Schedule 27		

\* CY- This amount reflect total grant received by SERB of Rs. 7,670,000,000/- less Fixed Assets purchased of Rs. 12,955,691/- (transferred to Corpus Fixed Assets Sch. 1)

\* PY- This amount reflect total grant received by SERB of Rs. 6,600,000,000/- less Fixed Assets purchased of Rs. 14,218,240/- (transferred to Corpus Fixed Assets Sch. 1)

For Science and Engineering Research Board



Secretary  
SERB



Director-Finance  
SERB

For ASPG & Associates

Chartered Accountants

F.R.N. 022888N



CA Avinash Gupta

Partner

M. No. 085799

Date : 28.09.2017



Date : 27.06.2017

Place : New Delhi

## Schedules Forming Part of Balance Sheet

as at 31.03.2017

Amount in Rs.

<b>Schedule 1 - Corpus / Capital Fund</b>		
<b>Particulars</b>	<b>Current Year</b>	<b>Previous Year</b>
Corpus Balance at the beginning of the year	450,596,125.4	160,926,265.33
Prior Period Adjustment as per As-12	-	25,156,743.00
Fixed Asset Sale FY 2015-16	-	2,122.00
Add/(Deduct) : Balance of net income/(Expenditure) transferred from the Income & Expenditure Account	40,288,525.38	264,510,995.12
Corpus Balance at the end of the year (A)	490,884,650.83	450,596,125.45
Corpus (Fixed Assets) Balance at the beginning of the year	27,496,749.0	50,959,728.00
Add: Contributions towards Corpus/Capital Fund (Fixed Assets)		
FY 2015-16	-	14,218,240.00
FY 2016-17	(12,955,691.0)	
Prior Period Adjustment as per As-12	-	(25,156,743.00)
Fixed Asset Sale FY 2015-16	-	(2,122.00)
Deferred Revenue Grant for FY 2015-16	-	(12,522,354.00)
Deferred Revenue Grant for FY 2016-17*	(12,756,626.00)	-
Corpus (Fixed Assets) Balance at the end of the year (B)	27,695,814.00	27,496,749.00
<b>Total of Corpus &amp; Corpus (Fixed Assets) (A) + (B)</b>	<b>518,580,464.83</b>	<b>478,092,874.45</b>
Refer Point No. 12 In Schedule 26 Significant Accounting Policies		

## Schedules Forming Part of Balance Sheet

as at 31.03.2017

Amount in Rs.

<b>Schedule 2 - Reserve and Surplus</b>			
<b>Particulars</b>	<b>Current Year</b>		<b>Previous Year</b>
1. Capital Reserves :			
As Per Last Account	-	-	-
Addition during the year	-	-	-
Less : Deductions during the year	-	-	-
2. Revaluation Reserves :			
As Per Last Account	-	-	-
Addition during the year	-	-	-
Less : Deductions during the year	-	-	-
3. Special Reserve :			
As Per Last Account	-	-	-
Addition during the year	-	-	-
Less : Deductions during the year	-	-	-
4. General Reserve :			
As Per Last Account	-	-	-
Addition during the year	-	-	-
Less : Deductions during the year	-	-	-
<b>Total</b>		-	-

## Schedules Forming Part of Balance Sheet

as at 31.03.2017

Amount in Rs.

<b>Schedule 3A - Earmarked/Endowment Funds MFPI</b>		
<b>Particulars</b>	<b>Current Year</b>	<b>Previous Year</b>
a) Opening Balance of the Funds	8,625,676.00	3,700,091.00
b) Additions to the funds		
i) Donations / Grants		-
Grant in Aid (MFPI- General)	42,784,535.00	61,823,508.00
ii) Income from Investments made on account of Funds	-	-
iii) Other Additions	-	-
Interest from SERB on Saving Balance	480,001.00	253,879.00
Refund from previous year Grant FY 2012-13 (Annexure 1 & 1A)	186.00	135,393.00
Refund from previous year Grant FY 2013-14 (Annexure 2 & 2A)	166,737.00	127,693.00
Refund from previous year Grant FY 2014-15 (Annexure 3 & 3A)	231,612.00	171,399.00
Refund from previous year Grant FY 2015-16 (Annexure 4 & 4A)	3,731,313.00	-
<b>Total (a+b)</b>	<b>56,020,060.00</b>	<b>66,211,963.00</b>
c) Utilization / Expenditure towards objectives of funds		
i) Capital Expenditure	-	-
Fixed Assets	-	-
Other Additions	-	-
Grant-in-aid (MFPI- Capital) (Annexure 5 & 5A)	13,340,227.00	38,833,251.00
ii) Revenue Expenditure		
Salary, Wages and allowance etc	-	-
Rent	-	-
Other Administrative Expenditure		
Grant-in-aid (MFPI- General) (Annexure 6 & 6A)	24,041,949.00	18,753,036.00
<b>Total (c)</b>	<b>37,382,176.00</b>	<b>57,586,287.00</b>
Net Balance as at the year end (a+b-c)	18,637,884.00	8,625,676.00

## Schedules Forming Part of Balance Sheet

as at 31.03.2017

Amount in Rs.

<b>Schedule 3B - Earmarked/Endowment Funds S &amp; T Programme</b>		
<b>Particulars</b>	<b>Current Year</b>	<b>Previous Year</b>
a) Opening Balance of the Funds	34,175,045.00	1,841,934.00
b) Additions to the funds		
i) Donations / Grants	-	-
Grant in Aid (S & T Programme - Schedule Castes)	-	100,000,000.00
Grant in Aid (S & T Programme - Schedule Tribe)	-	-
ii) Income from Investments made on account of Funds	-	-
iii) Other Additions	-	-
S & T SC-Interest from SERB on Saving Balance	1,162,362.00	1,288,982.00
S & T ST-Interest from SERB on Saving Balance	52,517.00	48,596.00
S & T SC- Refund from previous year Grant FY 2013-14 (Annexure 7 & 7A)	166,451.00	1,425,124.00
S & T ST- Refund from previous year Grant FY 2013-14 (Annexure 8 & 8A)	21,985.00	91,642.00
S & T ST- Refund from previous year Grant FY 2014-15(Annexure 9 & 9A)	145,913.00	-
S & T - Interest on Refund -SC	30,900.00	23,274.00
<b>Total (a+b)</b>	<b>35,755,173.00</b>	<b>104,719,552.00</b>
c) Utilization / Expenditure towards objectives of funds		
i) Capital Expenditure	-	-
Fixed Assets	-	-
Other Additions	-	-
Grant-in-aid (S & T- Schedule Castes - Capital) (Annexure 10 & 10A)	-	47,044,507.00
Grant-in-aid (S & T- Schedule Tribe - Capital)	-	-
ii) Revenue Expenditure		
Salary, Wages and allowance etc	-	-
Rent	-	-
Other Administrative Expenditure	-	-
Grant-in-aid (S & T- Schedule Castes - General) (Annexure 11 & 11A)	28,876,381.00	23,500,000.00
Grant-in-aid (S & T- Schedule Tribe - General)	-	-
ii) Refund to S & T from SERB	-	-
<b>Total (c)</b>	<b>28,876,381.00</b>	<b>70,544,507.00</b>
Net Balance as at the year end (a+b-c)	6,878,792.00`	34,175,045.00

## Schedules Forming Part of Balance Sheet

as at 31.03.2017

Amount in Rs.

<b>Schedule 3c - Earmarked/Endowment Funds AISTDF</b>		
<b>Particulars</b>	<b>Current Year</b>	<b>Previous Year</b>
a) Opening Balance of the Funds	-	-
b) Additions to the funds		
i) Donations / Grants	-	-
Grant in Aid- General (AISTDF)	214,396,671.00	-
ii) Income from Investments made on account of Funds	-	-
iii) Other Additions	-	-
Interest earned on Saving Account	880,020.00	-
<b>Total (a+b)</b>	<b>215,276,691.00</b>	<b>-</b>
c) Utilization / Expenditure towards objectives of funds		
i) Capital Expenditure		-
Fixed Assets	-	-
Other Additions	-	-
ii) Revenue Expenditure		-
Salary, Wages and allowance etc	-	-
Rent	-	-
Other Administrative Expenditure	-	-
<b>Total (c)</b>		
Net Balance as at the year end (a+b-c)	215,276,691.00	-

## Schedules Forming Part of Balance Sheet

as at 31.03.2017

Amount in Rs.

### Schedule 4 - Secured Loans and Borrowings

Particulars	Current Year		Previous Year	
1. Central Government	-	-	-	-
2. State Government	-	-	-	-
3. Financial Institutions				
a) Term Loans	-	-	-	-
b) Interest accrued & dues	-	-	-	-
4. Banks :				
a) Term Loans	-	-	-	-
Interest accrued and due	-	-	-	-
b) Other Loans	-	-	-	-
Interest accrued and due	-	-	-	-
5. Other Institutions and Agencies	-	-	-	-
6. Debentures and Bonds	-	-	-	-
7. Others	-	-	-	-
<b>Total</b>				

### Schedule 5 - Unsecured Loans and Borrowings

Particulars	Current Year		Previous Year	
1. Central Government	-	-	-	-
2. State Government	-	-	-	-
3. Financial Institutions	-	-	-	-
4. Banks :				
a) Term Loans	-	-	-	-
b) Other Loans	-	-	-	-
5. Other Institutions and Agencies	-	-	-	-
6. Debentures and Bonds	-	-	-	-
7. Fixed Deposites	-	-	-	-
8. Others	-	-	-	-
<b>Total</b>				

### Schedule 6 - Deferred Credit Liabilities

Particulars	Current Year		Previous Year	
a) Acceptances secured by Hypothecation of Capital Equipment & other assets			-	-
b) Others			-	-
<b>Total</b>				

## Schedules Forming Part of Balance Sheet

as at 31.03.2017

Amount in Rs.

### Schedule 7 - Current Liabilities And Provisions

Particulars	Current Year		Previous Year	
A) Current Liabilities				
1. Acceptances	-	-	-	-
2. Sundry Creditors	-	-	-	-
a) For Goods	-	-	-	-
b) Others	-	-	-	-
Dignus Services	-	-	51,590.00	-
Ghandhari Bhalla & Kamlesh Bhalla	-	-	54,000.00	-
Global Computer & Communication, New Delhi	89,580.00	-	-	-
Shree Bhagatrams, New Delhi	25,814.00	-	-	-
Uneecops Technologies Ltd., New Delhi	6,189.00	-	-	-
Suresh Malik & Co.	538,200.00	-	490,720.00	-
National Mission on Bamboo Application	1,080,145.00	-	1,080,145.00	-
Anil Ram Kumar & Co.	-	-	253,000.00	-
RAG & Associates	-	-	368,000.00	-
B4 Integrated Facility Management Private Limited	-	-	59,784.00	-
B4 Security Private Limited	-	-	42,593.00	-
Gobind Computers Private Limited	-	-	2,046.00	-
Mansarover Industrial Corporation, New Delhi	2,350.00	-	2,350.00	-
Sonu Printing Press Pvt. Ltd.	4,857.00	-	-	-
Suncity Projects Private Limited, New Delhi	92,981.00	-	100,560.00	-
Balmer Lawrie & Co. Ltd., New Delhi	251,986.00	-	172,367.00	-
Dinesh Singh Tomer, New Delhi	2,647.00	-	1,044.00	-
J S International	-	-	14,775.00	-
K B Enterprises	36,554.00	-	14,200.00	-
Shalu Tour And Travels, New Delhi	92,941.00	-	66,425.00	-
R S Travels Solution Private Limited	223,273.00	-	210,170.00	-
Sonpal	10,620.00	-	8,700.00	-
Sr. Post Master Sarojini Nagar, H.P.O.	6,101.00	-	16,992.00	-
Deldsl-Digital NTC	73,255.00	-	68,231.00	-
Digital NTC-New Delhi	22,540.00	-	22,442.00	-
Airtel	35,190.00	-	25,762.00	-
National Informatics Centre Service INC., New Delhi	-	-	45,235.00	-
NSDL E Governanace Infrastructure Limited	1,387.00	-	1,139.00	-
Net Creative Mind Solutions Private Limited	43,950.00	2,640,560.00	40,560.00	3,212,830.00
3. Advances Received	-	-	-	-
4. Interest accrued but not due on :				
a) Secured Loans / Borrowings	-	-	-	-
b) UnSecured Loans / Borrowings	-	-	-	-
5. Statutory Liabilities				
a) Over Due	-	-	-	-
b) Others : TDS on Contractor	10,030.00	-	10,624.00	-
TDS on Salary	454,516.00	464,546.00	360,866.00	371,490.00
<b>Total (1)</b>		<b>3,105,106.00</b>	<b>-</b>	<b>3,584,320.00</b>



## Schedules Forming Part of Balance Sheet

as at 31.03.2017

Amount in Rs.

Schedule 7 - Current Liabilities And Provisions				
Particulars	Current Year		Previous Year	
6. Other Current Liabilities				
Expenses Payable				
Salary Payable	4,273,838.00	-	3,360,782.00	-
Wages Payable	90,695.00	-	-	-
EPF Payable Employee Contribution	108,000.00	-	91,800.00	-
EPF Payable Employer Contribution	120,350.00	-	102,328.00	-
NPS Contribution Payable	440,139.00	-	362,828.00	-
Labour Charges Payable	-	-	-	-
Audit Fee Payable	459,250.00	-	195,000.00	-
Telephone Expenses Payable (Reimbursement)	27,778.00	-	6,082.00	-
Newspaper Expenses Payable (Reimbursement)	11,741.00	-	-	-
Medical Expenses Payable (Reimbursement)	75,892.00	-	-	-
School Fee Reimbursement Payable	-	-	18,000.00	-
Leave Encashment & Pension Payable (DST-Satish Marar)	-	-	62,475.00	4,199,295.00
Honorarium Expenses Payable (Non-Official)	35,000.00	5,642,683.00	-	-
Expenses Current Liabilities Staff				
Prahlad Ram	1,000.00	-	-	-
Dr. G. Harish Kumar	751.00	-	751.00	-
Praveen Kumar S	418.00	2,169.00	418.00	1,169.00
Time barred cheques taken back (FY 2011-12) (Annexure 12 & 12A)	-	3,44,235.00	-	3,44,235.00
Time barred cheques taken back (FY 2012-13) (Annexure 13 & 13A)	-	11,933,916.00	-	11,933,916.00
Time barred cheques taken back (FY 2013-14) (Annexure 14 & 14A)	-	16,251,065.00	-	16,251,065.00
Time barred cheques taken back (FY 2014-15) (Annexure 15 & 15A)	-	222,593.00	-	222,593.00
Total (2)	-	34,396,661.00	-	32,952,273.00
<b>Total (A) = (1) + (2)</b>	-	<b>37,501,767.00</b>	-	<b>36,536,593.00</b>
B. Provision				
1. For Taxation	-	-	-	-
2. Gratuity	-	-	-	-
3. Superannuation / Pension	-	-	-	-
4. Accumulated Leave Encashment	-	3,146,383.00	-	1,018,866.00
5. Trade Warranties / Claims	-	-	-	-
6. Others	-	-	-	-
<b>Total (B)</b>		<b>3,146,383.00</b>		<b>1,018,866.00</b>
<b>Total (A+B)</b>		<b>40,648,150.00</b>		<b>37,555,459.00</b>

## Schedules Forming Part of Balance Sheet

as at 31.03.2017

(Amount – Rs)

SCHEDULE 8-FIXED ASSETS	Rate of Depreciation	GROSS BLOCK			DEPRECIATION				NET BLOCK			
		Cost / valuation as at beginning of the year	Additions during the year	Deductions during the year	Cost / valuation at the year end	As at the beginning of the year	On Opening balance	On Additions during the year	On Deductions during the year	Total up to the year end	As at the current year end	As at the previous year end
A. FIXED ASSETS												
1. LAND												
a) Freehold	-	-	-	-	-	-	-	-	-	-	-	-
b) Leasehold	-	-	-	-	-	-	-	-	-	-	-	-
2. BUILDING												
a) On Freehold Land	-	-	-	-	-	-	-	-	-	-	-	-
b) On Leasehold Land	-	-	-	-	-	-	-	-	-	-	-	-
c) Ownership Flats/Premises	-	-	-	-	-	-	-	-	-	-	-	-
d) Interior work	10%	17,932,323.00	504,650.00	-	18,436,973.00	6,887,483.00	1,104,484.00	31,848.00	-	8,023,815.00	10,413,158.00	11,044,840.00
3. PLANT & MACHINERY	15%	653,288.00	-	-	653,288.00	161,967.00	73,698.00	-	-	235,665.00	417,623.00	491,321.00
4. VEHICLES												
5. FURNITURE & FIXTURES	10%	7,887,860.00	1,840,855.00	-	9,728,715.00	2,505,078.00	538,280.00	191,982.00	-	3,235,340.00	6,493,375.00	5,382,782.00
6. OFFICE EQUIPMENT	15%	2,980,080.00	749,813.00	-	3,729,893.00	1,027,498.00	292,932.00	58,978.00	-	1,379,108.00	2,350,785.00	1,952,882.00
7. COMPUTER/PERIPHERALS												
a) Computer Softwares	60%	26,515,236.00	7,578,500.00	-	34,093,736.00	20,089,813.00	3,855,255.00	4,547,100.00	-	28,492,168.00	5,601,568.00	6,425,423.00
b) Peripherals	60%	228,628.00	384,126.00	-	612,754.00	162,538.00	39,654.00	190,193.00	-	392,385.00	220,369.00	66,090.00
c) Printers/Scanners	60%	1,717,234.00	437,942.00	-	2,155,176.00	1,365,452.00	211,069.00	152,677.00	-	1,729,198.00	425,978.00	351,782.00
d) Computers	60%	6,148,644.00	1,001,217.00	-	7,149,861.00	4,885,337.00	757,985.00	484,388.00	-	6,127,710.00	1,022,151.00	1,263,307.00
8. ELECTRIC INSTALLATIONS	15%	195,669.00	100,978.00	-	296,647.00	75,004.00	18,100.00	100,978.00	-	194,082.00	102,565.00	120,665.00
9. LIBRARY BOOKS	100%	10,211.00	7,610.00	-	17,821.00	10,211.00	-	7,610.00	-	17,821.00	-	-
10. TUBEWELL & W. SUPPLY												
11. INTANGIBLE ASSETS												
a) Website Development	2.5%	449,440.00	-	-	449,440.00	283,533.00	41,477.00	-	-	325,010.00	124,430.00	165,907.00
b) Logo	2.5%	412,000.00	-	-	412,000.00	180,250.00	57,938.00	-	-	238,188.00	173,812.00	231,750.00

## Schedules Forming Part of Balance Sheet

as at 31.03.2016

SCHEDULE 8-FIXED ASSETS	GROSS BLOCK			DEPRECIATION			NET BLOCK				
TOTAL OF CURRENT YEAR (A)	65,130,613.00	12,605,691.00	-	77,736,304.00	37,633,864.00	6,990,872.00	5,765,754.00	-	50,390,490.00	27,345,814.00	27,496,749.00
PREVIOUS YEAR	50,959,728.00	14,218,240.00	47,355.00	65,130,613.00	25,156,743.00	6,012,384.00	6,509,970.00	45,233.00	37,633,864.00	27,496,749.00	25,802,985.00
B.CAPITAL WORK IN PROGRESS	-	350,000.00	-	350,000.00	-	-	-	-	-	350,000.00	-
<b>TOTAL (A+B)</b>	<b>65,130,613.00</b>	<b>12,955,691.00</b>	<b>-</b>	<b>78,086,304.00</b>	<b>37,633,864.00</b>	<b>6,990,872.00</b>	<b>5,765,754.00</b>	<b>-</b>	<b>50,390,490.00</b>	<b>27,695,814.00</b>	<b>27,496,749.00</b>

## Schedules Forming Part of Balance Sheet

as at 31.03.2017

Amount in Rs.

### Schedule 9 - Investments from Earmarked/Endowment Funds

Particulars	Current Year	Previous Year
1. In Government Securities	-	-
2. Other approved Securities	-	-
3. Shares	-	-
4. Debentures and Bonds	-	-
5. Subsidiaries and Joint Ventures	-	-
6. Others (to be Specified)	-	-
<b>Total</b>	<b>-</b>	<b>-</b>

### Schedule 10 - Investments - Others

Particulars	Current Year	Previous Year
1. In Government Securities	-	-
2. Other approved Securities	-	-
3. Shares	-	-
4. Debentures and Bonds	-	-
5. Subsidiaries and Joint Ventures	-	-
6. Others	-	-
<b>Total</b>	<b>-</b>	<b>-</b>

## Schedules Forming Part of Balance Sheet

as at 31.03.2017

Amount in Rs.

Schedule 11 - Current Assets, Loans, Advances Etc				
Particulars	Current Year		Previous Year	
	A) Current Assets			
1. Inventories :				
a) Stores and Spares (Stationery Stock)	-	67,721.00	-	136,893.00
b) Loose Tools	-	-	-	-
c) Stock-in-Trade				
Finished Goods	-	-	-	-
Work-in-Progress	-	-	-	-
Raw Material	-	-	-	-
2. Sundry Debtors :				
a) Debts outstanding for a period exceeding six months	-	-	-	-
b) others:	-	-	-	-
3. Cash Balances in Hand (including Cheques / Drafts and Imprest)				
Petty Cash Account	20,000.00	-	20,000.00	-
Cash Advance- V K Agarwal	-	20,000.00	25,000.00	45,000.00
4. Bank Balances :				
a) With Scheduled Banks :				
On Current Accounts			-	
On Deposit Accounts			-	
On Savings Accounts (UBI)	530,512,306.83	--	513,710,026.45	-
SERB EPFO Account (UBI)			-	-
SERB RTI Account (UBI)	10.00	-	-	-
AISTD Account (UBI)	214,396,671.00	744,908,987.83		513,710,026.45
b) With non-Scheduled Banks				
On Current Accounts	-	-	-	-
On Deposite Accounts	-	-	-	-
On Savings Accounts	-	-	-	-
5. Post Office Savings Accounts	-	-	-	-
<b>Total (A)</b>	-	<b>744,996,708.83</b>	-	<b>513,891,919.45</b>

## Schedules Forming Part of Balance Sheet

as at 31.03.2017

### Schedule 11 - Current Assets, Loans, Advances Etc.

Particulars	Current Year		Previous Year	
B) Loans, Advances & Other Assets				
1. Loans:				
a) Staff Loan	-	-	-	-
b) Other entities engaged in activities/objectives similar to that	-	-	-	-
c) Others	-	-	-	-
2. Advances and other amounts recoverable in cash or in kind or for value to be received:				
a) On Capital Account	-	-	-	-
b) Prepayments				
Membership Fee	51,750.00	-	51,525.00	-
AMC Photocopier	8,950.00	-	-	-
Conference Expenses	2,000.00	-	-	-
License Free-Cyberoam Firewall	130,408.00	-	-	-
NIC Software Maintenance	331,202.00	524,310.00	-	51,525.00
c) Security Deposit				
BNPL Sarojini Nagar PO (Security Deposit)	50,000.00	-	50,000.00	-
Deldsl-Digital NTC (Security Deposit)	20,000.00	-	20,000.00	-
Digital NTC (Security Deposit)	10,000.00	-	10,000.00	-
Furniture & Fixtures Rent (Security Deposit)- Vasant Kunj	-	-	60,000.00	-
Rent (Security Deposit)-Vasant Kunj	-	80,000.00	60,000.00	200,000.00
d) Others-				
Adeptech Solutions PVT. LTD.	-	-	165,000.00	-
Central Cottage Industries Corp. of India Ltd.	-	-	93,000.00	-
MRM End to End Marketing Solutions LTD.	-	-	302,624.00	-
Society for Environment & Development, Delhi	250,000.00	-	-	-
Dr. Praveen Kumar S	20,100.00	-	-	-
Dr. Vinod Kumar	-	-	4,086.00	-
Dr. Premila Mohan	-	-	15,900.00	-
MFPI Expenditure by SERB	4,110,493.00	-	9,652,135.00	-
UBI (Recoverable)	-	4,380,593.00	308,000.00	10,540,745.00
3. Income Accrued:				
a) On Investments from Earmarked/ Endowment Funds	-	-	-	-
b) On Investment – Others	-	-	-	-
c) On Loans and Advances	-	-	-	-
d) Others (includes income due unrealized)				
Interest accrued on Saving A/c Balance-SERB UBI	21,464,512.00	-	6,268,116.00	-
SERB EPFO Account (UBI)	24.00	-	-	-
AISTD Account (UBI)	880,020.00	22,344,556.00	-	6,268,116.00
4. Claim Receivable	-	-	-	-
<b>Total = (B)</b>	-	<b>2,732,945.9</b>	-	<b>17,060,386.00</b>
<b>Total (A) + (B)</b>	-	<b>772,326,167.83</b>	-	<b>530,952,305.45</b>

## Schedules Forming Part of Income & Expenditure

as at 31.03.2017

Amount in Rs.

Schedule 12 - Income From Sales / Services		
Particulars	Current Year	Previous Year
1. Income from Sales		
a) Sale of finished Goods	-	-
b) Sale of Raw Material	-	-
c) Sale of Scraps	-	-
2. Income from Services		
a) Labour and Processing Charges	-	-
b) Professional / Consultancy Services	-	-
c) Agency Commission & Brokerage	-	-
d) Maintenance Services(Equipment / Property)	-	-
e) Others	-	-
<b>Total</b>	<b>-</b>	<b>-</b>

Schedule 13 - Grants / Subsidies				
Particulars	Current Year		Previous Year	
	1. From Central Government			
a) Grant in Aid (General)	4,220,000,000.00		4,101,500,000.00	
Transferred to Corpus/Fixed Assets (Schedule 1)	(12,955,691.00)	4,207,044,309.00	(14,218,240.00)	4,087,281,760.00
b) Grant in Aid (Capital)	-	2,875,000,000.00	-	2,208,500,000.00
c) Grant in Aid (Scheduled Castes - General)	-	295,000,000.00	-	200,000,000.00
D) Grant in Aid (Scheduled Castes - Capital)	-	250,000,000.00	-	50,000,000.00
E) Grant in Aid (Scheduled Tribe - General)	-		-	
F) Grant in Aid (Scheduled Tribe - Capital)	-		-	
G) Grant in Aid (Salaries)	-	30,000,000.00	-	40,000,000.00
2. State Government(s)	-	-	-	-
3. Government Agencies	-	-	-	-
4. Institutions/ Organisations	-	-	-	-
5. International Organisations	-	-	-	-
6. Other	-	-	-	-
<b>Total</b>	<b>-</b>	<b>7,657,044,309.00</b>	<b>-</b>	<b>6,585,781,760.00</b>

## Schedules Forming Part of Income & Expenditure

as at 31.03.2017

Amount in Rs.

### Schedule 14 - Fees / Subscriptions

Particulars	Current Year	Previous Year
1. Entrance Fees	-	-
2. Annual Fees / Subscriptions	-	-
3. Seminar / Programme Fees	-	-
4. Consultancy Fee	-	-
5. Others	-	-
<b>Total</b>	<b>-</b>	<b>-</b>

### Schedule 15 - Income From Investments (Income on Invest. From Earmarked/ Endowment Funds transferred to Funds)

Particulars	Investment from Earmarked Funds		Investment -Others	
	Current Year	Previous Year	Current Year	Previous Year
1. Interest				
a) On Govt. Securities	-	-	-	-
b) Other Bonds/Debentures	-	-	-	-
2. Dividends				
a) On shares	-	-	-	-
b) On Mutual Fund Securities	-	-	-	-
3. Rents	-	-	-	-
4. Others : Interest on MFPI Balance in Saving Account	480,001.00	253,879.00	-	-
Interest on S & T SC Balance in Saving Account	1,162,362.00	1,288,982.00	-	-
Interest on S & T ST Balance in Saving Account	52,517.00	48,596.00	-	-
Interest on AISTD Balance in Saving Account	880,020.00	-	-	-
<b>Total</b>	<b>2,574,900.00</b>	<b>1,591,457.00</b>	<b>-</b>	<b>-</b>
Transferred to Earmarked/Endowment Funds	2,574,900.00	1,591,457.00	--	-

### Schedule 16 - Income from Royalty, Publication Etc.

Particulars	Current Year	Previous Year
1) Income from Royalty	-	-
2) Income from Publications	-	-
3) Other	-	-
<b>Total</b>	<b>-</b>	<b>-</b>



## Schedules Forming Part of Income & Expenditure

as at 31.03.2017

Amount in Rs.

<b>Schedule 17 - Interest Earned</b>		
<b>Particulars</b>	<b>Current Year</b>	<b>Previous Year</b>
1. On Term Deposits		
a) With Scheduled Banks	51,889,397.00	38,518,936.00
b) With Non-Scheduled Banks	-	-
c) With Institutions	-	-
d) Others	-	-
2. On Savings Accounts		
a) With Scheduled Banks	62,074,651.00	31,921,576.00
b) With Non-Scheduled Banks	-	-
c) Post Office Savings Accounts	-	-
d) Others (Project Interest)	-	-
3. On Loans :		
a) Employees / Staff	-	-
b) Others	-	-
4. Interest on Debtors & Other Receivables	-	-
5. Interest on Refund	2,416,634.32	912,990.93
<b>Total</b>	<b>116,380,682.32</b>	<b>71,353,502.93</b>

<b>Schedule 18 - Other Income</b>		
<b>Particulars</b>	<b>Current Year</b>	<b>Previous Year</b>
1. Profit on sale / disposal of Assets		
a) Owned assets	-	-
b) Assets acquired out of grants, or received free of cost	-	1,964.00
2. Export Incentives realized	-	-
3. Fees for Miscellaneous Services	-	-
4. Deferred Revenue Grant (AS-12)	12,756,626.00	12,522,354.00
5. Miscellaneous Income- Other Income RTI Receipts	730.00	210.00
<b>Total</b>	<b>12,757,356.00</b>	<b>12,524,528.00</b>

## Schedules Forming Part of Income & Expenditure

as at 31.03.2017

Amount in Rs.

### Schedule 19 - Increase / (Decrease) in stock of Finished Goods & Work in Progress

Particulars	Current Year	Previous Year
a) Closing Stock		
Finished Goods	-	-
Work-in-Progress	-	-
b) Less : Opening Stock		
Finished Goods	-	-
Work-in-Progress	-	-
<b>Total</b>	<b>-</b>	<b>-</b>

### Schedule 20 - Establishment Expenses

Particulars	Current Year	Previous Year
a) Salaries and Wages	54,325,750.00	36,176,808.00
b) Allowances and Bonus		3,454.00
c) Contribution to Provident Fund- Employer	1,316,042.00	1,139,246.00
d) Contribution to Other Fund (NPS Employer Contribution)	2,474,949.00	1,413,940.00
e) Staff Welfare Expenses	-	-
f) Expenses on Employee's Retirement & Terminal Benefits	-	-
Leave Encashment Provision	2,184,435.00	990,921.00
Pension Contribution	-	4,200.00
g) Others		
Telephone Expenses Reimbursement	213,947.00	110,134.00
School Fee Reimbursement	186,962.00	113,692.00
Newspaper Reimbursement	22,555.00	14,187.00
Medical Reimbursement	524,386.00	210,635.00
Transfer Expenses Reimbursement	-	126,422.00
Secretary Accommodation Expenses	-	485,100.00
Transfer Grant	-	80,000.00
Leave Travel Concession	642,320.00	45,361.00
<b>Total</b>	<b>61,891,346.00</b>	<b>40,914,100.00</b>

## Schedules Forming Part of Income & Expenditure

as at 31.03.2016

Amount in Rs.

<b>Schedule 21 - Other Administrative Expenses</b>		
<b>Particulars</b>	<b>Current Year</b>	<b>Previous Year</b>
a) Bank Charges	11,442.55	28,352.62
b) Car Hire Charges	3,699,638.00	2,567,202.00
c) Professional Fees	972,354.00	811,256.00
d) Electricity Charges	1,346,018.00	1,205,217.00
e) Membership fee	51,525.00	-
f) Meeting Expenses(GRC)	6,289,741.00	-
g) Honorarium Expenses (Non- Official)	638,000.00	856,000.00
h) Hospitality Expenses	1,356,357.00	1,208,881.00
i) Printing & Stationery	4,955,972.00	2,347,555.00
j) Rent- Building	47,522,437.00	47,422,150.00
k) Advertisement/Publication	1,859,428.00	316,696.00
l) Conference Expenses	98,108.00	9,000.00
m) Conveyance Expenses	1,796.00	1,057.00
n) Housekeeping Expenses	1,316,264.00	1,315,109.00
o) International Conference	101,135.00	570,329.00
p) Repair & Maintenance	952,256.00	690,746.00
q) Security Expenses	448,802.00	512,937.00
r) Travelling Expenses (Domestic)	9,240,647.00	6,659,167.00
s) Travelling Expenses (International)	408,870.00	839,485.00
t) Audit Fee	264,250.00	661,000.00
u) Accommodation Expenses	113,511.00	345,896.00
v) Computer hardware & Software	923,829.00	459,738.00
w) Foreign Exchange Difference		6,375.00
x) Internet Charges	1,297,994.00	1,011,491.00
y) Newspaper & Periodicals	14,797.00	10,202.00
z) Postage Expenses	160,748.00	221,417.00
aa) Telephone Expenses	275,900.00	281,826.00
ab) Festival Expenses	132,400.00	74,727.00
ac) NSDL E Governance Charges	5,508.00	3,870.00
ad) Training Expenses	204,835.00	4,000.00
ae) AMC	998,917.00	242,933.00
af) RPF Penalty & Interest	-	204,688.00
ag) Miscellaneous Expenses	614,202.00	407,900.00
<b>Total</b>	<b>86,277,681.55</b>	<b>71,297,202.62</b>

## Schedules Forming Part of Income & Expenditure

as at 31.03.2017

Amount in Rs.

### Schedule 22 - Expenditure on Grants, Subsidies Etc

Particulars	Current Year	Previous Year
Grants given to Institutions/Organisations		
a) Grants in Aid (Capital Assets) (Annexure -16 & 16A)	2,977,741,371.00	2,077,139,790.00
b) Grant in Aid (General) (Annexure -17 & 17A)	4,278,052,334.12	4,027,642,711.00
c) Grant in Aid (Scheduled Castes - Capital) (Annexure -18 & 18A)	155,866,966.00	48,406,000.00
d) Grant in Aid (Scheduled Castes - General) (Annexure -19 & 19A)	139,014,000.00	174,953,542.00
e) Grant in Aid (Scheduled Tribe - Capital) (Annexure -20 & 20A)	72,352,425.00	-
f) Grant in Aid (Scheduled Tribe - General) (Annexure -21 & 21A)	63,136,000.00	23,745,819.00
<b>Total</b>	<b>7,686,163,096.12</b>	<b>6,351,887,862.00</b>

### Schedule 23 - Interest

Particulars	Current Year	Previous Year
a) On Fixed Loans (Including Bank Charges)	-	-
b) On Other Loans (Including Bank Charges)	-	-
c) Others	-	-
<b>Total</b>	<b>-</b>	<b>-</b>

## Schedules Forming Part of Income & Expenditure

as at 31.03.2017

Amount in Rs.

<b>Schedule 24 - Prior Period Income</b>		
<b>Particulars</b>	<b>Current Year</b>	<b>Previous Year</b>
A) Refund received against previous year grants		
a) Refund from Projects (Capital) FY 2011-12 (Annexure-22 & 22A)	533,516.00	1,943,196.00
b) Refund from Projects (General) FY 2011-12 (Annexure -23 & 23A)	881,201.00	3,195,965.00
c) Refund from Projects (SC-General) FY 2011-12 (Annexure -24 & 24A)	-	17,931.00
d) Refund from Projects (Capital) FY 2012-13 (Annexure -25 & 25A)	8,921,405.00	3,064,296.00
e) Refund from Projects (General) FY 2012-13 (Annexure -26 & 26A)	2,982,914.93	6,962,472.36
f) Refund from Projects (Capital) FY 2013-14 (Annexure -27 & 27A)	9,822,105.00	1,845,819.00
g) Refund from Projects (General) FY 2013-14 (Annexure -28 & 28A)	9,863,313.74	15,625,221.62
h) Refund from Projects (SC-Capital) FY 2013-14 (Annexure 29 & 29A)	3,100,000.00	-
i) Refund from Projects (SC-General) FY 2013-14 (Annexure 30 & 30A)	660,000.00	-
j) Refund from Projects (Capital) FY 2014-15 (Annexure -31 & 31A)	2,110,205.00	2,447,652.00
k) Refund from Projects (General) FY 2014-15 (Annexure -32 & 32A)	11,373,564.70	27,775,128.83
l) Refund from Projects (SC-General) FY 2014-15 (Annexure 33 & 33A)	5,813.00	5,351.00
m) Refund from Projects (ST-General) FY 2014-15 (Annexure 34 & 34A)	616,554.00	-
n) Refund from Projects (Capital) FY 2015-16 (Annexure -35 & 35A)	6,714,724.00	-
o) Refund from Projects (General) FY 2015-16 (Annexure -36 & 36A)	42,251,620.36	-
p) Refund from Projects (SC-General) FY 2015-16 (Annexure 37 & 37A)	2,299,355.00	-
q) Refund from Projects (ST-General) FY 2015-16 (Annexure 38 & 38A)	4,169.00	-
r) Refund from Projects (General) SERC (Annexure -39 & 39A)	56,240.00	8,424,908.00
B)Time barred cheque recd. back from grantee (FY 2012-13)		
Indian Institute Of Technology, Kanpur (CI)	-	1,190,000.00
<b>Total A) + B)</b>	<b>102,196,700.73</b>	<b>72,497,940.81</b>

## Schedules Forming Part of Income & Expenditure

as at 31.03.2017

Amount in Rs.

Schedule 25 - Prior Period Expenditure		
Particulars	Current Year	Previous Year
a) Professional Fees	-	1,786,963.00
b) Telephone Expenses	1,408.00	-
c) International Conference	-	190,599.00
d) Travelling Expenses (Domestic)	30,586.00	169,090.00
e) Travelling Expenses (International)	23,300.00	-
f) Leave Encashment	44,275.00	384,405.00
g) Newspaper Reimbursement	6,616.00	1,071.00
h) Medical Expenses Reimbursement	11,112.00	-
i) Telephone Expenses Reimbursement	15,041.00	-
j) School Fee Reimbursement	3,065.00	-
k) Salary Arrear (Regular Employees)	737,296.00	468.00
l) NPS Employer Contribution (Arrear)	70,697.00	-
m) Salary (Regular Employees)	(29,730.00)	-
n) Salary (Contract Employees)	12,000.00	(1,164,500.00)
o) EPF Employer Contribution	(2,003.00)	-
p) NSDL E Governance Charges	-	301.00
q) Pension Contribution	9,054.00	17,850.00
r) Car Hire Charges	-	(207,258.00)
s) Printing & Stationery	-	(153,771.00)
t) Rent Secretary Accommodation	66,000.00	-
u) Internet Charges	3,056.00	-
<b>Total</b>	<b>1,001,773.00</b>	<b>1,025,218.00</b>

## Receipts & Payments

as at 31.03.2017

Receipts		Current Year	Previous Year	Payments		Current Year	Previous Year
1	Opening Balances			1	Expenses		
a)	Cash in hand	45,000.00	45,000.00	a)	Establishment Expenses (corresponding to Schedule 20)	59,904,076.00	39,262,428.00
b)	Bank balances			b)	Administrative Expenses (corresponding to Schedule 21)	87,730,118.55	72,627,685.62
	i) In Current Accounts	-	-	2	Payments made against funds for various projects		
	ii) In Deposit Accounts	-	-		Grants given to Institutions/Organisations		
	iii) Savings Accounts : SERB UBI	513,710,026.45	216,451,690.33	a)	Grants in Aid (Capital Assets)	2,977,741,371.00	2,077,139,790.00
2	Grants Received			b)	Grant in Aid (General)	4,278,052,334.12	4,027,642,711.00
a)	From Government of India	7,670,000,000.00	6,600,000,000.00	c)	Grant in Aid (Scheduled Castes - Capital)	155,866,966.00	48,406,000.00
b)	From State Government	-	-	d)	Grant in Aid (Scheduled Castes - General)	139,014,000.00	174,953,542.00
c)	From Other Sources (details)	-	-	e)	Grant in Aid (Scheduled Tribe - Capital)	72,352,425.00	-
3	Income on Investments from			f)	Grant in Aid (Scheduled Tribe - General)	63,136,000.00	23,745,819.00
a)	Earmarked/Endowment Funds	-	-	3	Investments & Deposits made		
b)	Own Funds	-	-	a)	Out of Earmarked/Endowment Funds	-	-
4	Interest Received			b)	Out of Own Funds (Investments-Others)	-	-
a)	On Bank Deposits	100,462,508.00	69,397,478.00	4	Expenditure on Fixed Assets & Capital Work-in Progress		
b)	Loans Advances	-	-	a)	Purchase of Fixed Assets	12,634,666.00	14,280,991.00
c)	Interest on Refund	2,416,634.32	912,990.93	b)	Expenditure on Capital Work-in Progress	185,000.00	
5	Other Income	730.00	210.00	5	Refund of surplus money/loans		
6	Amount Borrowed	-	-	a)	To the Government of India	-	-
7	Any Other Receipts			b)	To the State Government	-	-
a)	Refunds Received Against Previous Year Grant	102,196,700.73	71,307,940.81	c)	To other providers of Funds	-	-
b)	MFPI Earmarked Receipt	46,914,383.00	62,257,993.00	6	Finance Charges (Interest)	-	-
c)	S & T Earmarked Receipt	365,249.00	101,540,040.00	7	Other Payments (Specify)	-	-

## Receipts & Payments

as at 31.03.2017

d) AISTDF Earmarked Receipt	214,396,671.00	-		MFPI Earmarked Payment	37,382,176.00	57,586,287.00
e) Receipt against MFPI Expenditure by SERB	8,007,707.00	499,131.00		S & T Earmarked Payment	28,876,381.00	70,544,507.00
f) Department of Telecommunication	-	49,500,000.00		MFPI Expenditure by SERB	1,900,000.00	1,950,000.00
g) UBI Recoverable	308,000.00	600.00		Department of Telecommunication	-	49,500,000.00
h) Security Deposit for Rented Accommodation (Safdarjung Enclave)	-	110,000.00		Payment towards revalidation of cheques FY 2014-15		67,663.00
i) Dr Vinod Kumar (Sale of Laptop)	4,086.00	-		Praveen Kumar S	20,100.00	-
j) Research Council, UK (GRC Meeting)	1,146,906.00	-		Society for Environment & Development, Delhi	250,000.00	-
				Adeptech Solutions Private Limited, New Delhi		165,000.00
				Central Cottage Industries Corporation of India Ltd.		93,000.00
				MRM End to End Marketing Solutions Limited		302,624.00
				Closing Balances		
				Cash in hand	20,000.00	45,000.00
				Bank balances		
				i) In Current Accounts		
				ii) In Deposit Accounts		
				iii) Savings Accounts : SERB UBI	530,512,306.83	513,710,026.45
				: AISTDF UBI	214,396,671.00	
				: SERB RTI	10.00	
<b>Total</b>	<b>8,659,974,601.50</b>	<b>7,172,023,074.07</b>		<b>Total</b>	<b>8,659,974,601.50</b>	<b>7,172,023,074.07</b>

For Science and Engineering Research Board

Date : 27.06.2017  
Place : New Delhi

*(Signature)*  
Secretary  
SERB

*(Signature)*  
Director-Finance  
SERB

For ASFG & Associates  
Chartered Accountants  
CA. Anshul Gupta  
Partner



F.R.N. 022888N  
M. No. 085799  
Date : 28.09.2017



## SCHEDULE FORMING PART OF THE ACCOUNTS FOR THE YEAR ENDED 31.03.2017

### SCHEDULE 26

#### SIGNIFICANT ACCOUNTING POLICIES

**1. Basis of Preparation of Financial Statements**

These financial statements have been prepared on the accrual basis of accounting, under historical cost convention, in accordance with the accounting principles generally accepted in India.

**2. Fixed Assets**

Fixed assets are stated at cost of acquisition less accumulated depreciation and impairment losses, if any. Cost of fixed assets comprises purchase price, duties, levies and other directly attributable costs of bringing the assets to its working conditions for the intended use.

**3. Capital Work in Progress**

Expenditure incurred on construction of assets which are not ready for their intended use are carried at cost less impairment (if any), under Capital work-in-progress.

**4. Depreciation**

Depreciation on fixed assets is computed on the written down value (WDV) method at the rates and in the manner prescribed under the Provisions of Income Tax Act.

In respect of additions to/deductions from fixed assets during the year, depreciation is considered on pro-rata basis. Assets costing Rs.5,000/- each or less are fully provided.

**5. Grant/ Subsidies Received**

Grants, subsidies or similar assistance received for the general purposes and objectives of the Entity, on an irrevocable basis, be treated as income on receipt basis.

**6. Expenditure on Grants, Subsidies etc.**

Grants, subsidies or other similar assistance given to the Institutions/Organisations for general purposes and objectives of the Entity, on an irrevocable basis, be treated as expenditure when they are released.

**7. Interest Income of SERB**

Besides the grant-in-aid received from Central Government SERB also generates income from:-

- a. Interest on Short term FD's of the Grant-in Aid
- b. Interest on the Saving A/c Balance
- c. and Interest on Refund

Further the above income generated is applied for meeting the expenses as indicated in para 10(2) of the SERB Act 2008.

**8. Prior period Income/Expenditure**

Income/expenditure relating to previous Financial Years has been booked as Prior Period Income/Expenditure in the Income and Expenditure Account.

**9. Refund from beneficiaries:**

- α) Refund/repayment of grant/assistance received by SERB from the beneficiaries as per the conditions stipulated in the sanction document is accounted for on receipt basis.
- β) Refund/repayment of grant/assistance given and received back in the same financial year has been netted off with Grant-in-Aid (expenditure) in the Income and Expenditure Account.
- χ) Refund/repayment of grant/assistance given in previous years and received back in later years (i.e not in same financial year) has been shown as "Refund received against Previous Year Grant" in the Income and Expenditure Account under "Prior Period Income".

**10. Unspent balances of Grants received from DST:**

The unspent balances of Grants are not to be refunded to DST as grants released by the Government are credited for Science and Engineering Research Board in terms of Section 10(1) of SERB Act, 2008.

**11. Time barred cheques**

- a. Cheques issued towards grants/assistance & become time barred during the year have been reversed on 31.03.2017 and transferred to "**Time Barred Cheques Taken Back**" under Current Liabilities.
- b. Cheques issued towards grants/assistance & not become time barred on 31.03.2017 will be reversed on 30.06.2017 as per the advice of CAG Auditors.

**12. Government Grant for Fixed assets of SERB**

In order to comply with AS-12 Accounting for Government Grants under direction of C&AG, amount equivalent to cost of acquisition of fixed assets out of Grants in Aid (General) has been shown as Corpus Fixed Assets. Depreciation for the year amounting Rs. 1,27,56,626/- is being credited to Income & Expenditure A/c as Deferred Revenue Grant as per para 8 of AS 12.

**13. Retirement Benefits**

SERB makes provision for liability towards encashment of leave lying to the credit of employees as on the last day of current financial year subject to the maximum period of leave allowable as per extant rules and retirement benefits shall be governed by the National Pension System (NPS) as applicable to the officers of equivalent rank of the Central Government as amended from time to time

**14. Surplus/Deficit in Income & Expenditure A/c**

Surplus/Deficit in Income & Expenditure Account at the year-end has been transferred to Corpus/Capital Account.

For Science and Engineering Research Board

  
Secretary  
SERB

  
Director-Finance  
SERB

Date: 20.06.2016  
Place: New Delhi

## SCHEDULE FORMING PART OF THE ACCOUNTS FOR THE YEAR ENDED 31.03.2017

### SCHEDULE- 27 CONTINGENT LIABILITIES AND NOTES TO ACCOUNTS

#### 1. CONTINGENT LIABILITIES

1.1 Claims against the Entity not acknowledge as debts **Rs. NIL** (Previous year **Rs. NIL**)

1.2 In respect of

- Bank Guarantees given by/on behalf of the Entity **Rs. NIL** (Previous year **Rs. NIL**)
- Letters of Credit opened by Bank on behalf of the Entity **Rs. NIL** (Previous year **Rs. NIL**)
- Bills discounted with banks **Rs. NIL** (Previous year **Rs. NIL**)

1.3 Disputed demands in respect of:

- Income tax **Rs. NIL** (Previous year **Rs. NIL**)
- Sales Tax **Rs. NIL** (Previous year **Rs. NIL**)
- Municipal Taxes **Rs. NIL** (Previous year **Rs. NIL**)
- In respect of claims from parties for non-execution of orders, but contested by the Entity **Rs. NIL** (Previous year **Rs. NIL**)

1.4 Income Tax (*Refer Para 6 below*)

- Current Year – Rs 21,11,96,149/-	Previous year – Rs 21,11,96,149/-
FY 2011-12	Rs. 9,43,38,079/-
FY 2012-13	Rs. 2,69,50,783/-
FY 2013-14	Nil
FY 2014-15	Nil
FY 2015-16	Rs. 8,99,07,287/-
FY 2016-17	Nil
<b>Total</b>	<b>Rs. 21,11,96,149/-</b>

#### 2. CAPITAL COMMITMENTS

- Estimated value of contracts remaining to be executed on capital account and not provided for (net of advances) **Rs. NIL** (Previous year **Rs. NIL**)

#### 3. LEASE OBLIGATIONS

- Future obligations for rentals under finance lease arrangements for plant and machinery amount to **Rs. NIL** (Previous year **Rs. NIL**)

#### 4. CURRENT ASSETS, LOANS AND ADVANCES

- In the opinion of the Management, the current assets, loans and advances have a value on realization in the ordinary course of business, at least equal to the amount at which they are stated in the Balance Sheet.

**5. Gross Profit in Current FY 2016-17 and Net Profit after considering Prior Income & Expenditure**

Total Income of Current FY 2016-17 is Rs. 7,786,182,347.32 whereas Total Expenditure of Current FY is Rs. 7,847,088,749.67.

In Income & Expenditure A/c excess of Expenditure over Income shows a difference of Rs. 60,906,402.35 as Gross Loss.

SERB is having Net Profit of Rs. 40,288,525.38/- in FY 2016-17 after considering Prior Period Income of Rs.102,196,700.73 and Prior Period Expenditure of Rs.1,001,773/-

**6. TAXATION**

SERB has got exemption u/s 10(46) of the Income Tax Act, 1961 for 5 financial years from FY 2013-14 to FY2017-18 vide gazette notification no. 24/2017/F.No.196/15/2013-ITA-1 published on 31st March, 2017.

After getting exemption u/s 10(46) of the Income Tax Act, 1961 We have rectified/revised SERB Income Tax returns of previous Financial Years which are presently in processing at CPC Bengaluru, Income Tax.

Since our original application for exemption u/s 10(46) was from inception of SERB, the matter has been taken up again with CBOT to grant us exemption for FY2011-12 and FY2012-13 also.

Further we have applied for exemption u/s 10(46) of the Income Tax Act, 1961 to CBDT and Income Tax Department for FY2018-19 and onwards.

In such a situation we have shown Contingent Liability for Income Tax at point 1.4.

**7. FOREIGN CURRENCY TRANSACTIONS**

(Amount Rs.)

<b>7.1 Value of Imports Calculated on C.I.F. Basis:</b>	<b>Current Year</b>	<b>Previous Year</b>
Purchase of finished Goods	Nil	Nil
Raw Materials & Components (Including in transit)	Nil	Nil
Capital Goods	Nil	Nil
Stores, Spares & Consumables		

**7.2 Expenditure in foreign currency:**

<b>a) Travel</b>	Rs. 1,01,135/-	Rs.7,60,928/-
<b>b) Remittances and Interest Payment to Financial Institutions/ Banks in Foreign Currency</b>	Nil	Nil
<b>c) Other expenditure:</b>		
- Commission on Sale	Nil	Nil
- Legal and Professional Expenses	Nil	Nil
- Miscellaneous Expenses	Nil	Nil

**7.3 Earning:**

Value of Exports on FOB basis	Nil	Nil
-------------------------------	-----	-----

**7.4 Remuneration to Auditors:**

- Auditors Fee (CAG)	Rs. 40,000/-	Rs. 40,000/-
- Auditors Fee (CA)	Rs.2,24,250/-	Rs.1,94,350/-
- Taxation matters	.....	.....
- For management services	.....	.....
- For certificate	.....	.....
- Others	.....	.....

8. Previous Year figures have been regrouped /recast wherever found necessary.
9. Schedules 1 to 27 are annexed to and form an integral part of the Balance Sheet as at 31.03.2017 and the Income and Expenditure Account for the year ended on that date.

**For Science and Engineering Research Board**



Secretary  
SERB



Director-Finance  
SERB

Date: 27.06.2017  
Place: New Delhi

**For ASPG & ASSOCIATES**  
Chartered Accountants  
F.R.N. 022888N



CA Avinash Gupta  
Partner  
M. No. 085799  
Date: 28.09.2017





कार्यालय प्रधान निदेशक लेखापरीक्षा,  
वैज्ञानिक विभाग  
ए०जी०सी०आर० भवन, आई०पी० एस्टेट,  
नई दिल्ली 110 002

OFFICE OF THE PRINCIPAL DIRECTOR OF AUDIT,  
SCIENTIFIC DEPARTMENTS,  
A.G.C.R. BUILDING, I.P. ESTATE  
NEW DELHI-110002

सं. प्र.नि.वै.वि./निरीक्षण 1(16)/एस ए आर/SERB/2016-17/723-724 दिनांक: 15.11.2017

सेवा में,

**निदेशक**

विज्ञान और इंजीनियरी अनुसंधान बोर्ड  
विज्ञान तथा प्रौद्योगिकी विभाग  
5&5A भू-तल, वसंत स्क्वायर मॉल,  
वसंत कुंज, सेक्टर-बी, पाकेट-5,  
नई दिल्ली- 110070

**विषय: विज्ञान और इंजीनियरी अनुसंधान बोर्ड के वर्ष 2016-17 के लेखों पर आडिट रिपोर्ट।**

महोदय,

मुझे विज्ञान और इंजीनियरी अनुसंधान बोर्ड के वर्ष 2016-17 के लेखों पर आडिट रिपोर्ट अग्रेषित करने का निर्देश हुआ है।

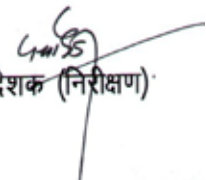
संसद में दोनों सदनों में प्रस्तुत करने से पहले वर्ष 2016-17 के वार्षिक लेखों को विज्ञान और इंजीनियरी अनुसंधान बोर्ड द्वारा अपनाया जाए। प्रत्येक दस्तावेज जो संसद में प्रस्तुत किया जाए उसकी तीन प्रतियां इस कार्यालय तथा दो प्रतियां भारत के नियंत्रक महालेखा परीक्षक को अग्रेषित की जाए। संसद के दोनों सदनों में प्रस्तुत करने की तिथि (या) भी इस कार्यालय को सूचित की जाए।

आपसे अनुरोध है कि ऑडिट रिपोर्ट का हिन्दी अनुवाद अपने कार्यालय में कराने के पश्चात सॉफ्ट कॉपी तथा हार्ड कॉपी दोनों में हमें भेज दें ताकि हिन्दी प्रति को शीघ्र अग्रेषित किया जा सके।

यह प्रधान निदेशक महोदय द्वारा अनुमोदित है।

भवदीय,

संलग्नक : यथोपरि।

  
उप निदेशक (निरीक्षण)

## SEPARATE AUDIT REPORT ON ACCOUNTS OF SCIENCE AND ENGINEERING RESEARCH BOARD, NEW DELHI FOR THE YEAR 2016-17

We have audited the attached Balance Sheet of the Science & Engineering Research Board, (SERB), New Delhi as at 31<sup>st</sup> March, 2017 and the Income & Expenditure Account / Receipts & Payment Account for the year ended on that date under Section 19(2) of the Comptroller and Auditor General's (Duties, Power and Condition of Service) Act, 1971 read with Section 13(3) of SERB Act, 2008. These financial statements are the responsibility of the Board's management. Our responsibility is to express opinion on these financial statements based on our audit.

2. This Separate Audit Report contains the comments of the Comptroller and Auditor General of India on the accounting treatment only with regard to classification, conformity with the best accounting practices, accounting standards and disclosure norms, etc. Audit observations on financial transactions with regard to compliance with the Law, Rules & Regulations (Propriety and Regularity) and efficiency – cum-performance aspects, etc. , if any, are reported through Inspection Reports/Comptroller and Auditor General's Audit Report separately.

3. We have conducted our audit in accordance with auditing standards generally accepted in India. These standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatements. An audit includes examining, on a test basis, evidences supporting the amounting and disclosure in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of financial statements. We believe that our audit provides a reasonable basis for our opinion.

4. Based on our audit, we report that:

i) We have obtained all the information and explanation, which to the best of our knowledge and belief were necessary for the purpose of our audit:

ii) The Balance Sheet, Income & Expenditure Account and Receipts & Payment Account dealt with by this report have been drawn up in the Common format of Accounts approved by the Government of India, Ministry of Finance.

iii) In our opinion, proper books of Accounts and other relevant records have been maintained by SERB, New Delhi except those stated in this audit report, in so far as it appears from the examination of such books.

iv) We further report that: -

(A) **Balance Sheet**

1 **Assets**

### 1.1 Fixed Assets (Schedule-8)

The above includes ₹ 3.50 lakh incurred on development of software towards Management of Budget Expenditure alongwith payment module of Grants-in-aid and its UCs in April 2014/July 2015 at a total cost of ₹ 4.50 lakh. Since the software is deployed and being used for the desired purpose, the non-capitalization of the same had resulted in understatement of 'Fixed Assets-Computer Softwares' by ₹ 4.50 lakh besides overstatement of 'Capital Work-in-progress' by ₹ 3.50 lakh and understatement of current liabilities on account of non-recognition of the balance amount payable to the company by ₹ 1.00 lakh despite raising final bill by the vendor in April 2016.

Further, the non-imposition of the depreciation of ₹ 2.70 lakh (60% of ₹ 4.50 lakh) on the said software had also resulted in understatement of expenditure besides overstatement of assets by the same amount.

### 1.2 Current Assets

An amount of ₹ 7.20 lakh receivable on account of under-recovery of rent from 1-8-2013 to 31-12-2015 needs to be depicted as Current Assets. **Non-depiction of the same in the accounts till date had resulted in understatement of current assets besides overstatement of prior period expenditure by the same amount.**

## 2 Liabilities

### 2.1 Current liabilities and Provisions (Schedule -7)

The above includes an amount of ₹ 5.70 lakh for two persons who were re-employed/absorbed after retirement from the Govt. service. As per DoPT OM dated 27.6.2017 clarifying the CCS (Leave) Rules 1972 towards the eligibility for leave encashment to Govt. servants, the maximum leave encashment could be allowed upto 300 days including the period for which encashment was allowed at the time of retirement. The SERB, however, did not take into account the encashment of leaves by these employees while making provisions for further leave encashment by them. **Therefore, the excess provisions made on this account led to overstatement of liabilities towards provisions for leave encashment besides overstatement of expenditure of ₹ 3.49 lakh during 2016-17 and remaining amount of ₹ 2.21 lakh during prior periods.**

### 2.2 Current liabilities & Provisions

The above does not include ₹ 4.02 crore unspent grant. This resulted understatement of current liabilities and provisions and overstatement of Corpus Fund by ₹ 4.02 crore.



**(B) General****1. Static current liabilities**

An amount of ₹ 287.52 lakh relating to grants-in-aid to 44 institutions was shown as time barred cheques taken back for the period ranging from 2011-12 to 2014-15 under Schedule-7 'Current Liabilities and Provisions'. These static balances were long standing in the accounts. As these amounts were required to be released for the project activities to these institutions which might have been completed now and the amount may no longer be required by them. However, no efforts were made by the Board to ascertain the reasons for non-requisition of the funds by these institutions even after 3 to 5 years of cheques issued to them becoming time-barrred. **Further keeping these liabilities in the accounts without justification is, therefore, not warranted.**

**(B) Grants-in-aid**

SERB received a grant of ₹ 767.00 crore from the DST during 2016-17, besides interest of ₹ 11.64 crore on savings as well as short term deposits and ₹ 10.22 crore as 'Refund from Projects' (Current and Previous Years'). All of the receipts form an integral part of the "Fund for Science and Engineering Research". After disbursement from the fund and other expenditure, the board was left with the balance of ₹ 4.02 crore.

**(E) Management letter: -NIL-**

(i) Subject to our observations in the preceding paragraph, we report that the Balance Sheet, Income & Expenditure Account and Receipts & Payments Accounts dealt with by this report are in agreement with the books of accounts.

(ii) In our opinion and to the best of our information and according to the explanations given to us, the said financial statements read together with the Accounting Policies and Notes on Accounts, and subject to the significant matters stated above and other matters mentioned in Annexure to this Audit Report give a true and fair view in conformity with accounting principles generally accepted in India.

a. In so far as it relates to the Balance Sheet, of the state of Affairs of the SERB as at 31 March, 2017; and

b. In so far as it relates to Income & Expenditure Account of the surplus for the year ended on that date.

For and on behalf of the C&AG of India

Place : New Delhi  
Date : November , 2017

  
Principal Director of Audit  
(Scientific Departments)

**Internal Audit/Control System****Internal Control Mechanism**

Scrutiny of the vouchers for the year 2016-17 alongwith allied record revealed the following deficiencies in the internal control mechanism in implementation of various rules and regulations as per the SERB Act: -

**1. Adequacy of Internal Audit System**

Internal Audit of the Board was required to be conducted by the internal audit wing of Principal Pay & Accounts Office of the Department of Science & Technology, New Delhi which was completed upto March 2016. A total number of 26 paras (one pertains to 2011-13 and 25 for 2013-16) were outstanding till date (July 2017).

**2. Adequacy of Internal Control System**

Following deficiencies in relation to internal control system were observed in audit: -

***(i) Non-maintenance of record of assets created out of Grants for creation of Capital Assets***

Assets created out of Grants-in-aid for creation of capital assets are required to be returned to the Board after completion of the project, unless approval of the Board was obtained by the grantee institution for keeping the same. Even the disposal of such assets by the grantee institutes requires prior approval of the Board when they become obsolete or unserviceable. *However, the board did not maintain any record of these assets created out of grants provided for creation of capital assets to various grantee institutions.*

***(ii) Non-maintenance of the register of grants released by the board***

As per rule 234 of the GFRs 2017, a Register of Grants needs to be prepared by the sanctioning authority as per Form GFR-21, however the same was not being maintained despite release of grants-in-aid amounting to ₹ 2951.93 crore during the period from 2011-12 to 2016-17 by the Board.

***(iii)*** The provisional Utilisation Certificate(s) for the financial year 2016-17 in respect of the grants-in-aid received by the Board from DST were not sent to DST as per Form 12-A (under Rule 238) of GFRs 2017.

***(iv)*** Scrutiny of payment vouchers revealed a payment of ₹ 36.13 lakh to The Taj Mahal Hotel, New Delhi which included an amount of ₹ 0.19 lakh paid for two days stay of Shri Brakaspathy Ramasamy, Consultant (Scientific Adviser), towards Global

Research Council (GRC) meeting held during 25-27 May 2016, despite being posted in SERB New Delhi which is not allowable. The payment of ₹ 0.32 lakh was also made for Shri T. Ramasamy, Ex. Secretary (invited Guest) for three days stay at the hotel despite being residing at the same station at Moti Bagh, New Delhi. Thus, the extravagant expenditure of ₹ 0.51 lakh incurred by SERB could have been avoided.

(v) It was also noticed that the vendor for development of software did not furnish any tax-invoice for release of payment(s) indicating TIN number and service tax (*now GST*) to be charged on the software so developed.

**(vi) Monitoring of Utilisation Certificates**

Rule 238 of GFRs 2017 provided that a certificate of actual utilization of the grant received for the purpose for which it was sanctioned in form GFR 12-A should be insisted upon which should be submitted within twelve months of the closure of the financial year by the institution/organisation concerned. However due to weak monitoring of the UCs, 7557 number of UCs related to grants-in-aid of ₹ 654.57 crore pertaining from 2011-12 to 2015-16 were outstanding till March 2017. Out of the institutions receiving grants, 21.38 to 50.31 percent did not provide any utilisation of in respect of 17.94 to 53.56 percent of the grants-in-aid released to them.

**3. System of Physical Verification of Assets**

The Physical verification of Assets has been carried out for the period upto 2016-17 and no discrepancy was reported.

**4. System of Physical Verification of inventory:** Physical verification of consumable items and materials has been carried out for the period upto 2016-17 and no discrepancy was reported.

**5. Regularity in payment of statutory dues:** Though the Board had no undisputed statutory dues outstanding for more than six months from the date of becoming due during 2016-17, an amount of ₹ 21.12 crore was disclosed as contingent liability towards income tax department for the period 2011-12 to 2012-13 & 2015-16 against which the board had applied for exemption u/s 10(46) of the Income Tax Act 1961.

*Manish Kumar*

Pr. Director of Audit (SD)

5



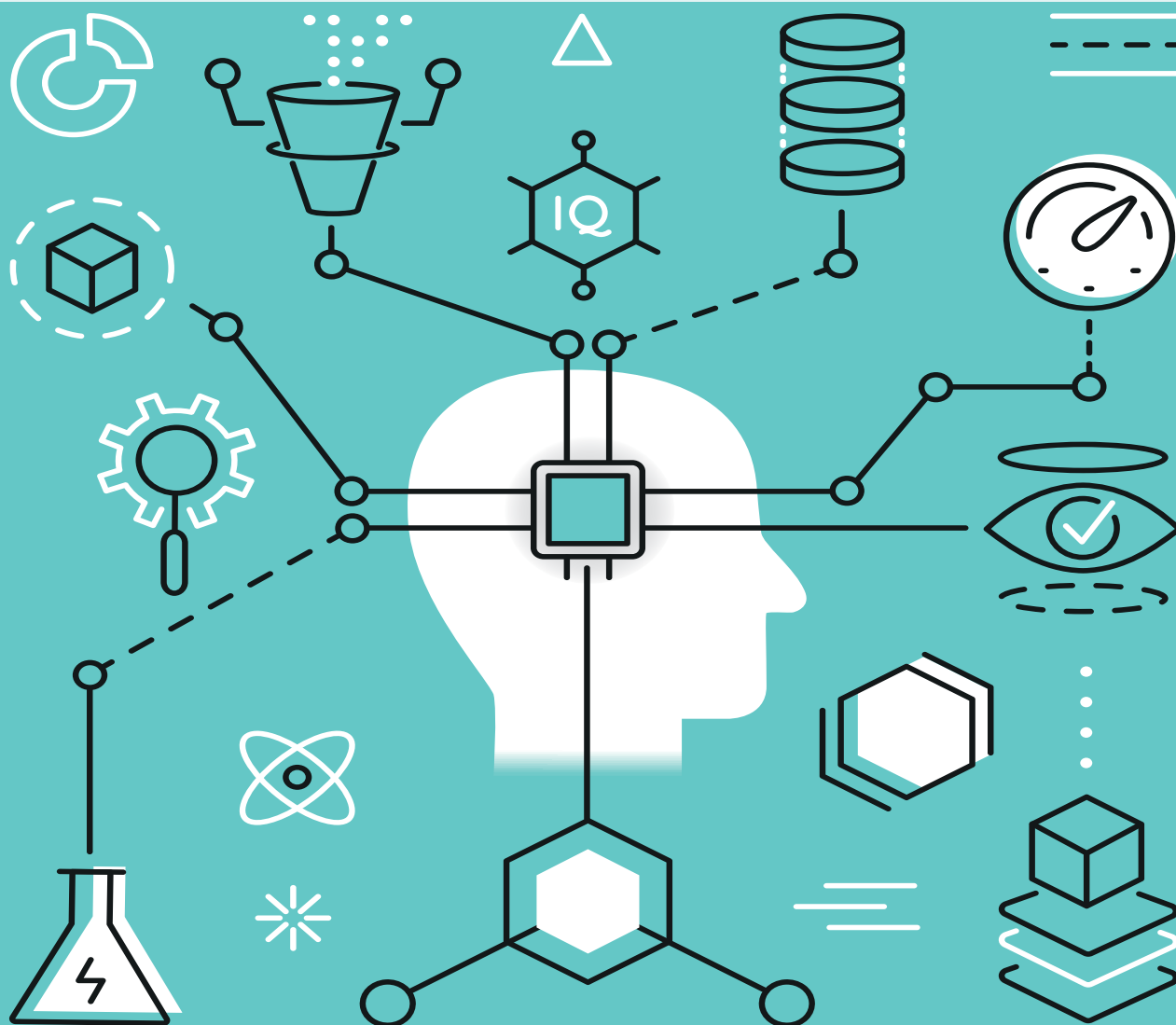






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