Basic Tenets of Obtaining A Biomedical Research Grant

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"A grant is a mechanism by which an agency awards money to fund a research study or other activity, such as an educational program, service program, demonstration, or research project."¹

Obtaining a grant for a research project provides the principal investigator (PI) an opportunity to work in an area of science which enables him/her to contribute meaningfully to the body of science. It is also a great contribution for the parent institute as it provides funding to develop a new service or research environment.

In order to secure funding for research, the PI develops a research proposal which is a description of the research question or hypothesis and also provides a description of the background of research, aims and objectives and the detailed methodology planned. A tentative budget for the research project and the timeline for conducting the research work including the process of implementation are the key elements of the research protocol. It is imperative that the project should have qualities that would appeal to the scientific review board members and justify its approval for funding.

The grant proposal must be written as per the guidelines of the funding agency. The usual format includes an introduction to the topic with an emphasis on the background and justification for the research envisaged, which is followed by the aim and objectives of the proposal, detailed methodology including the outcome variables, references, a tentative budget proposal and the proposed timeline for the research project.

Identifying the appropriate extramural funding agency which will provide funds for the research is a very crucial step. The PI must carefully read the scope and guidelines for research proposal before submitting a research proposal to obtain funding from a particular funding agency. The thrust areas of the funding agency should match with the proposed research. The timeline for submission of research proposal to the funding agency must be noted carefully. The PI should prepare the concept in advance with plenty of literature search and inputs from seniors or peers. It is also essential to obtain the approvals from the institutional scientific committee and ethics committee to enable timely submission.

NEED FOR EXTRAMURAL FUNDING

The idea of asking for funds from an external agency is to enable the PI to conduct research which is different from the routine work that is being carried out at his/her institution. Often, most institutes have a basic laboratory infrastructure but lack the specific equipment or reagents needed. The instruments and equipment so purchased in a research project, remain in the custody of the researcher till the project is completed and thereafter it should become an asset of the department. Additionally, conducting scientific research systematically and meticulously involves additional manpower which can be hired for the tenure of the research project with the monetary support from the funding agency.

FUNDING AGENCIES

There are two major sources for funding of research, i.e., public funding (governmental agencies or research councils) or private agencies (corporations through research and development departments). For health research or life sciences, some of the important government funding agencies are: Department of Biotechnology (DBT), Department of Science and Technology (DST), Indian Council of Medical Research (ICMR), University Grants Commission (UGC), and Council of Scientific and Industrial Research (CSIR), all of which provide both major and minor projects in different biomedical research areas.

GOVERNMENTAL FUNDING AGENCY

Indian Council of Medical Research (ICMR)

The ICMR provides funding support for health research projects. The research projects can be submitted under the following categories:

Short duration low-cost proposals (minor projects): The ICMR provides grants to support short-term *extramural research projects* that cover the biomedical needs. Scientists/professionals employed at a medical college, research institute, or university, research and development laboratories, government and semi-government organizations, and NGOs can apply for extramural research grants with documentary evidence of their employment and a requisite Department of Scientific and Industrial Research (DSIR) certificate required to allow the researcher to avail exemption from customs duty while purchasing any equipment, reagents, consumables, etc for the research project. These projects have a financial cap of Rs 10 lacs with a duration not exceeding 1 year.

Adhoc projects: ICMR provides financial support in the form of ad-hoc projects to researchers employed in teaching and research institutes or non-governmental organizations along with evidence to support their employment and DSIR certificate. These projects have a financial cap of Rs 1.5 crores for a duration of upto 3 years (may be extended upto 5 years).

Task Force: These are centrally planned and implemented on a multi-centric basis with time-bound defined targets with a focus on research areas of national priority. The collaborating scientists with expertise are encouraged to undertake activities. The financial cap is Rs 5 crore per collaborating centre for the total duration.

Cohort study: Prospective, observational, demographic information is collected over prolonged duration with an aim to assess the cause of disease and analyze the association between risk factors and disease. These studies are without any experimental work. The financial cap is Rs 2 crore per year.

National Registry: An organized system that uses observational studies to collect data regarding topics of national priority like clinical trials intervention with patient involvement.

Centre for Advanced Research (CAR): It is like creating an advanced centre of technology in medical sciences e.g., Biosafety level 3 laboratory, advanced centres for fungal identification and research.

Capacity building/support for sustained quality research: Evidence-driven process of strengthening the

abilities of an organisation to perform core functions and continue to improve and develop on time.

Table I provides details of research programs supported by ICMR.^{2,3}

Department of Biotechnology (DBT)

It is one of the major sources of funding for research in various fields of science and technology, including agriculture, plant biotechnology, bioinformatics, medical biotechnology and basic science research. Funding is provided for infrastructure facilities, societal developments, biotechnology product and process development, international cooperation, bioresources, and human resource development. DBT provides funding under individual fellowship programs for young faculty, postdoctoral students, post-graduates and students pursuing Masters in Sciences (M.Sc). The eligible candidates can apply during their career break and gain research experience by submitting their proposal at any university or institute (under a faculty/supervisor) for conducting their research work. Even permanent faculty may apply for such fellowships to pursue higher education overseas or at other higher educational institutes in India providing specialized research support. Under these schemes DBT provides prestigious and popular fellowships like the TATA innovation, Har Gobind Khorana, S Ramachandran Award and Janaki Ammal Women Bio-Scientist Award. Table II provides a list of programs funded by DBT.^{2,4}

Department of Science and Technology (DST) and Science Engineering Research Board (SERB)

Science Engineering Research Board (SERB) is an offshoot of DST which offers various schemes to scientists for pursuing a career advancement course or planning to work in institutes with high throughput technology.

Atmanirbhar Bharat: Indian women scientists and researchers can apply for SERB-Power Research Grants at any higher education institute. The applicant must be a regular academic or research scholar in a recognised institution or lab in India. Indian Institute of Technology (IIT), Indian Institute of Science Education and Research (IISER), Indian Institute of Science (IISc), National Institute of Technology (NIT), Central Universities, and National Labs of Central Government Institutions are Level I Category, while State Universities/Colleges and Private Academic Institutions are Level II Category. Level I applicants can receive Rs. 60 lac for 3 years, while level II applicants can receive Rs. 30 lac for 3 years.

Intensification of Research in High Priority Areas (IRHPA): Projects funded by the IRHPA should take on difficult problems that contribute to the growth of

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Program	Specific areas of research supported	Nature of support	Duration of support	Amount sanctioned
Junior Research Fellowship	All areas of life sciences	Contingency	3 years +HRA	Fellowship: Rs. 31,000/-
				Research grant: Rs. 20,000 per annum
Senior Research Fellowship	All areas of life sciences	Contingency	3 years	Fellowship: Rs. 35,000/- +HRAResearch grant: Rs. 20,000 per 2annum
Research Associateship	All areas of life sciences	Contingency	3 years	Fellowship: Rs. 47,000/- +HRA (with Rs.2000 yearly increment)
Short-Term Low-Cost Proposals	Thrust areas in health research	Contingency	Upto 1 year	Rs. 20,000 per annum (Up to Rs. 10 lac)
Extramural Adhoc	Thrust areas in health research	Staff, contingency, travel, equipment, and overhead charges	3 years	Up to Rs. 1.5 crores
ICMR Emeritus Scientist	Biomedical sciences	One project assistant	Initially for 2 years. Extendable up to 3 years	Honorarium: Rs. 60,000 per month
		Contingency		Contingent grant Rs. 1 lac per annum
Task Force Projects	National priority areas of research; usually multicentric projects		3 Years	Up to Rs. 5 crores for the total duration per center
Support for post-doctoral fellows		HRA, NPA, contingencies, travel	2 years (extendable up to 3 years)	Fellowship of Rs. 65,000 per month plus HRA, NPA, contingency grant of Rs. 3.0 lac per annum, 25% of which can be used for travel.

TABLE I. List of Programs Funded by the ICMR

HRA-House rent allowance, NPA-Non-practicing allowance.

scientific understanding. The IRHPA's projects focus on new areas of study that are not getting enough funding or attention elsewhere. IRHPA fund provided for infrastructure development which provides funding for 5 years for establishing high throughput technology facilities at institutes.

Core Research Grant (CRG) offered by SERB is open to all permanent faculty of universities across the country who wish to initiate research as a part of their promotion and progress in career.

Empowerment and Equity Opportunities for Excellence in Science (EMEQ) scheme of the SERB offers research support and funding preferably to researchers belonging to the Scheduled Caste and Scheduled Tribe.

Scientific Useful Profound Research Advancement (SUPRA) scheme deals with new breakthroughs (out of box ideas) with high-quality proposals consisting of new hypotheses or innovations in technology. Fellowships: Amongst the other scholarly short-term funding opportunities, the prestigious J.C Bose Fellowship for senior faculty or emeritus scientists and the SERB Women Excellence Award are individual fellowships offered to scientists or researchers of high repute, providing them a chance to pursue their research even at a later age. Innovation in Science Pursuit for Inspired Research (INSPIRE) Fellowship, Satyam-Yoga, Swarna Jayanti Fellowship Scheme, Women Scientist Scheme (WOS) for break in career for female researchers are other schemes which are displayed on DST/SERB website.

Table III provides a description of programs funded by SERB.^{2,5}

Department of Health and Research (DHR)

Department of health research is the parent institute of ICMR which undertakes projects like establishment of a network of laboratories for managing epidemics and

Program	Specific areas of research supported	Nature of support	Duration of support	Amount sanctioned
DBT Research Associate- ship Program	Frontier areas of biotechnology and life sciences; coordinated by Indian Institute of Sciences, Bengaluru	Contingency	2 years	Stipend: Rs. 47,000 – Rs. 54000 HRA per month Research grant: Rs. 50,000 per year
TATA Innovation Fellowship	Biological sciences and biotechnology	Consumables, equipment, inter- national and domestic travel, manpower and other contingent expenditure	3 years (extendable up to 2 years)	Rs. 25000 pm Contingency grant: Rs. 6 lac per annum
Har Gobind Khorana - Innovative Young Biotechnologist Award	Frontier areas in bio- technology/ biotechno- logy related fields	Equipment, soft- ware, consumables, contingency and travel grant	3 years	Rs. 75,000 per month+ HRA for candidates not in regular employment Rs. 1 lac per year for regularly employed candidates
S Ramachandran– National Bioscience Award for Career Development	Basic and applied research in biological sciences including medical sciences	Contingency	3 years	Contingency grant: Up to 10 lac, cash prize: Rs. 2 lac Research grant: Rs. 5 lac per year Citation and trophy
Janaki Ammal Women Bioscientist Award (Senior and Young category)	Biology and bio- technology	Contingency	5 years (young category)	Senior category: One-time cash prize: Rs. 5 lac along with citation and gold medal Young category: One-time cash prize of Rs 1 lac along with citation and gold medal Research grant of Rs. 5 lac per annum

TABLE II. List of Programs	Funded by Department	t of Biotechnology (DBT)

HRA House rent allowance.

natural calamities like Virology Research and Diagnostic Laboratory (VRDL), establishment of Multidisciplinary Research Units (MRU) in medical colleges, human resource development scheme of DHR, etc which provide major funding for infrastructure development, creation of instrumentation facility for the institute to pursue research as well as increase the availability of trained personnel for health research. *Table IV* highlights the programs supported by DHR.^{2,6}

International Fellowship

Indian Science and Research Fellowship (ISRF) from DST offers fellowships to faculty/students from Bangladesh, Bhutan, Maldives, Myanmar, Nepal, Sri Lanka, Thailand and Afghanistan to work in India and gain expertise, and exchange knowledge and ideas for future research.

University Grants Commission (UGC)

The UGC provides funding for research pertaining to varied sciences which could be integral to health research including humanities, social sciences, pure sciences, engineering, technology, pharmacy, medical, and agricultural sciences. It offers funding for minor research projects of amounts upto Rs 5 lac for sciences and Rs. 3 lac for social sciences, arts, law, literature, etc. Additionally, monetary support is offered for organising conferences and seminars.Upto Rs. 1.5 lac is provided for organizing international conferences. Under the Faculty Development Programme it provides the following: award of teacher fellowship for pursuing M.Phil/ Ph.D degree, participation of teachers in academic conferences in India

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Program	Specific areas of research supported	Nature of support	Duration of support	Amount sanctioned
Intensification of Research in High Priority Areas (IRHPA)	Varies depending of emerging problems	Equipment, man- power, consumables, travel and contin- gency, overheads	5 years	Variable depending on the project
Start-up Research Grant	Frontier areas of science and enginee- ring	Equipment, man- power, consumables, travel and contingency apart from overheads	2 years	Up to Rs. 30 lac
Core Research Grant (CRG)	Frontier areas of science and engineering	Equipment, man- power, consumables, travel and contingency apart from overheads	3 years	Up to Rs. 35 lac
Scientific Useful Pro- found Research Advance- ment (SUPRA) scheme	High quality proposals consisting of new hypothesis or challenge existing ones	Equipment, man- power, consumables, travel and contingency apart from overheads	3 years (extendable up to2 years)	Variable depending on the project Projects more than 1 crore budget will undergo international review
Empowerment and Equity Opportunities for Excellence in Science (EMEQ) scheme	Research in frontier areas of science and engineering.	Equipment, man- power, consumables, travel and contingency apart from overheads	3 years	Up to Rs. 50 lac
National Post-Doctoral Fellowships	Research in frontier areas of science and engineering	Minor equipment, consumables, contin- gencies and domestic travel	2 years	Fellowship: Rs. 55,000/- per month HRA Research Grant: Rs. 2 lac per annum Overhead: Rs. 1 lac per annum
JC Bose Fellowship	All areas of science		5 years Maximum age limit up to 68 years	Fellowship: Rs. 25,000/- per month Research grant: Rs. 15 lac per annum Overhead: Rs. 1 lac per annum
SERB Women Excellence Award	All areas of science		3 years	Research Grant: Rs. 5 lac per annum Overhead: Rs. 1 lac per annum
Indo US Fellowship Program	All areas of science and engineering	Air ticket and contingency grant To carry out a well- defined research project at any institution of repute of their choice in the USA	3-12 months	Fellowship: 3000 US dollars per month

TABLE III. List of Programs Funded by Science Engineering Research Board (SERB)

(PTAC) and short term visit of young faculty members to reputed institutes, travel grants (100%) once in three years (for college teachers/college librarians/vice chancellors/ commission members and UGC officers) to present research papers at international conferences held abroad.

Indian Council of Social Science Research (ICSSR)⁷

It provides opportunities in major and minor projects in the

following subheadings:

- 1. Fund for collaborative research with foreign countries such as Thailand, Japan, China, European Union, UK, etc.
- 2. Research Programs
- 3. Senior and post-doctoral fellowship, doctoral fellowship

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Program	Specific areas of research supported	Nature of support	Duration of support	Amount sanctioned
Fellowship program for young scientist	Biomedical and health research	Contingency	3 years	Stipend: Rs. 60,000 – Rs. 70,000 HRA depend- ing on the qualification of the researcher Research grant: Up to Rs. 10 lac per year
Fellowship program for women scientist				Research grant: Up to Rs. 10 lac per year
Start-up grant for fellows undergoing short-term/long-term fellowship	Public health issues and activities, national priority areas	Contingency	3 years	Rs. 30 lac per project

TABLE IV. List of Programs Funded by Department of Health and Research (DHR)

HRA House rent allowance.

- 4. Organizing national and international conferences, seminars etc.
- 5. Capacity building program

The research projects are categorized as:

- 1. Major Project: Duration from 12 to 24 months with a budget of Rs.5-15 lac
- 2. Minor Project: Duration from 6 to 12 months with a budget up to Rs.5 lac

Council of Scientific and Industrial Research (CSIR)

The CSIR encourages research in medical sciences through the following projects and schemes:

- 1. Funding for promoting research in the field of science and technology including agriculture, engineering and medicine and multidisciplinary collaboration.
- 2. Interactive programs with university faculty
- 3. Emeritus Scientist Scheme

- 4. Research Fellowship/Associateship like Shyama Prasad Mukherjee Fellowship, Senior Research Associateship, Shanti Swarup Bhatnagar Award, CSIR Young Scientist award.
- 5. Fund for organising national and international seminars, conferences, workshops, symposia, etc.
- 6. Travel Grant to research scholars
- 7. Faculty Training Programme and adoption of schools and colleges by CSIR laboratories
- 8. Fulbright Nehru Fellowship provides support for research, teaching and professional development in the United States.

Table V provides description of programs funded by CSIR.^{2,8}

OTHER GOVERNMENTAL AGENCIES

Some other governmental agencies also offer support as

Program	Specific areas of research supported	Nature of support	Duration of support	Amount sanctioned
CSIR Sponsored Research Scheme	Medicine (basic and clinical sciences), priority to multi- disciplinary projects	Junior Research Fellowships (JRF), Junior Research Fellowships (SRF) and Research Associate (RA), contingency and equipment	3 years (rarely extendable up to 2 years)	Maximum 20 lac (for the other CSIR research scheme, the maximum is 10 lac)
Emeritus Scientist		Contingency, JRF, SRF and RA	3 years (extendable to 2 years upto 65 years of age)	Scientist allowance of Rs. 20,000 pm during the tenure and variable contingency grant

Table V. List of Programs Funded by Council of Scientific and Industrial Research (CSIR)

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funding agencies. These include: Indira Gandhi National Open University (IGNOU); Higher Education Department, Tamil Nadu; Ministry of Human Resource Development (MHRD), New Delhi; Inter-University Accelerator Centre (IUAC), New Delhi; Forest Research Institute, Dehradun; Department of Education, New Delhi; Science and Engineering Research Council, New Delhi; Ministry of Health and Family Welfare; Indian National Science Academy; National Council for Economic Research and Training; Ministry of Forest and Environment; and Ministry of Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homoeopathy (AYUSH).

Table VI highlights the programs funded by AYUSH.^{1,8}

Defence Research Development Organisation (DRDO)

It provides support to research sponsored to academic institutions under the extramural project proposal with a Memorandum of Collaboration (MoC) between DRDO laboratories and establishments and academia. Their thrust areas are primarily aeronautics research and development with futuristic, scientific-technological areas having potential applications for aeronautical systems.

FUNDING FOR INCUBATOR CENTER

Incubators Nurturing Entrepreneurship for Scaling Technologies

Certain funding agencies encourage engineering or research institutes to apply for opening incubation centre or a national facility (or platform) which can accommodate smaller budgeted or funded projects or support any startup companies which require equipment and expertise of an established institute to launch their work. The Atal-Innovation Mission (AIM), SERB SURE (State University Research Centre of Excellence) or Community Resilience Resource Centre (CRRC) under DST are such incubation schemes. Under DST, the Science for Equity Empowerment & Development (SEED) division provides opportunities for establishment of CRRCs. Their mandate was to strengthen community preparedness, response and approach to health challenges, especially during COVID. Science Technology Innovation (STI) capacity building for communities for improved resilience against pandemic and post-pandemic recovery for livelihood was a relatively

new concept with an attempt to improve resilience and livelihood in the community.

DBT Sahaj

This scheme is aimed at infrastructure development and creating a facility or platform with cutting-edge technology. The scheme also provides access to resources that could not be provided by any single research laboratory or scientific department but required for data acquisition and analysis therefore a national facility infrastructure is created.

Biotechnology Industry Research Assistance Council (BIRAC)

It invites proposals for the development, validation and pre-commercialization of a product/technology as opportunities for translation medicine.

Bio-NEST scheme

The Bio-NEST scheme of the DBT provides incubation space to start-ups and entrepreneurs. It aims to connect the industry and academia and enables interactions for efficient exchange of knowledge as well as facilitates technical and business mentorship. It also provides enabling services and required mentorship for intellectual property and technology management, legal and contract, resource mobilization and networking platform. It establishes an efficient governance model.

FOREIGN FUNDING AGENCIES

Foreign Funding agencies also provide opportunities to Indian researchers to apply in such schemes, though competitive but extremely valuable and prestigious to seek for their funds. These are enlisted in **Box 1**.

CALL FOR PROPOSAL VERSUS ADHOC OR CORE RESEARCH GRANT

The call for proposals are usually announced frequently around the year but at times it becomes challenging as the time window is limited, thereby researchers get less time to do a thorough literature search for the proposal. However, if you have identified your area of work or expertise then prepare for such calls beforehand. The intent of "Call for proposal" is to gather a basic idea of the work that the researcher plans to propose, hence the word limit is

Table VI. List of Programs Funded by AY USH				
Name of the program	Specific areas of research supported	Nature of support	Duration of support	Amount/Grant
Extramural Research Scheme	Priority areas in alignment with National Health Programmes	Staff, equipment and contingency	1-3 years	Maximum Rs. 30 lac

Table VI. List of Programs Funded by AYUSH

Box 1. List of Foreign Funding Agencies

- Universe Foundation, Japan
- International Water Management Institute, Colombo
- FORD Foundation
- United Nations International Children's Emergency Fund (UNICEF)
- United Nations Educational, Scientific and Cultural Organization (UNESCO)
- National Institutes of Health (NIH)
- Brazil, Russia, India, China, and South Africa (BRICS)
- German Academic Exchange Service (DAAD)
- International Foundation for Science, Sweden
- The World Academy of Sciences (TWAS), Italy
- The Third World Network of Scientific Organisations (TWNSO), Italy
- Animal Production & Health Division, Vienna, Austria
- British Council, New Delhi
- International Federation for Women in Agriculture, New Delhi

around 2000 words with emphasis on the justifications that the PI provides specifying clear aims and objectives and well-defined outcomes. The calls are then reviewed by the expert committees of the respective funding agencies and those proposals that are shortlisted as innovative, appropriate and worth funding are invited for submission of the extended proposal with details of methodology and budget.

PRIVATE FUNDING AGENCIES

In addition to government funding agencies, there are private funding options, such as associations, foundations, and societies and sponsors with well-established funding schemes and a wide spectrum of interests, goals and purposes. Companies having a turnover of over Rs 100 crores are required to offer Corporate Social Responsibility (CSR) hence, providing opportunities to give funding. For instance, Bill and Melinda Gates Foundation calls for proposal in areas of challenge in science for which one can visit the Grand Challenges website, Pathogen Genomic Surveillance and Immunology in Asia challenge. Another agency like the Sun Pharma Science Foundation Research Awards and Sun Pharma Science Foundation Scholar Awards offer funds and awards for upcoming brilliant and young Indian researchers under the age of 30 years, for their research projects (Bio-Medical Sciences and Pharmaceutical Sciences) and offer support for excellence in original research work in Medical and Pharmaceutical Sciences by Indian Scientists working in India and Non-Resident Indian Scientists. The DBT-Welcome Trust India Alliance provides early career fellowships to clinicians and Public Health researchers in India. Another agency, Simons offers Global Brain Post-doctoral Fellowships to PhD students. Table VII provides the names of a few companies and organizations offering collaborations.

CONCLUSION

There are ample sources of funds and plenty of opportunities for researchers to pursue their work and avail

Funding Agency	Link to Website		
Amgen Technology Private Limited	https://www.amgen.com/		
Biocon	https://www.biocon.com/		
Bill & Melinda Gates Foundation	https://www.gatesfoundation.org/		
Boehringer Ingelheim India Private Limited	https://www.boehringer-ingelheim.in/		
Bristol Myers Squibb India Private Limited	https://www.bms.com/in		
ELCIA	http://www.elcia.in/		
Eli Lilly and Company (I) Private Limited	https://www.lilly.com/		
Frensius Kabi India Private Limited	https://www.fresenius-kabi.com/in/		
KlinEra Corporation Private Limited	https://www.klinera.com/		
George Institute for Global Health	https://www.georgeinstitute.org.in/		
Glenmark Pharmaceuticals Private Limited	https://www.glenmarkpharma.com/		
GSK/PPD Pharmaceutical Private Limited	https://www.ppd.com/		
Hamilton Health Sciences	https://www.hamiltonhealthsciences.ca/		
Himalaya Drug Company	https://himalayawellness.in/		

TABLE VII. List of Programs Funded by Private Funding Agencies

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FIG. 1 Roadmap for a researcher aspiring for research grant.

the schemes, but the road to achieve them is tough. Hence, the saying that "It's not knowledge but the act of learning, not possession but the act of getting, which grants the greatest empowerment" holds true. The greatest challenge in grant writing is to focus on the research hypothesis, finding neglected areas of science, and establishing new paradigms to bridge gaps in the present knowledge and future development. The road map for an aspiring grant writer is summarized in *Fig.* 1. The field is extremely competitive, challenging, time consuming and one must develop the correct grant writing skills. Accepting or rejecting a research proposal for funding support is based upon the thrust areas, delivery of the proposal, development of the hypothesis, and methodology description.

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