Annual Report

1997-1998

Pakistan Science Foundation

PAKISTAN SCIENCE FOUNDATION

ANNUAL REPORT
1997-98

PAKISTAN SCIENCE FOUNDATION
CONSTITUTION AVENUE
ISLAMABAD

LETTER OF TRANSMITTAL

Dear Mr. Secretary,

I have the honour to enclose herewith the Annual Report of the Pakistan Science Foundation for the Fiscal year 1997-98, alongwith its audited accounts as adopted by PSF Board of Trustees for submission to the National Assembly as required by the Pakistan Science Foundation's Act No. III of 1973.

With regards

Yours Sincerely

Dr. Khalid Mahmood Khan
Chairman
Pakistan Science Foundation
Islamabad

Secretary
Ministry of Science and Technology
Government of Pakistan
Islamabad

PAKISTAN SCIENCE FOUNDATION

CHAIRMAN

Dr. Khalid Mahmood Khan

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Dr. Munir Ahmed Bhatti	Member Science
Mr. Faris Rehman Khan	Director/Member Finance

BOARD OF TRUSTEES

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1.	Dr. Khalid Mahmood Khan	Chairman
2.	Dr. Munir Ahmed Bhatti	Member Science
3.	Mr. Faris Rehman Khan	Member Finance

Sixteen part time Members appointed as follows:

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5. Dr. Riazuddin Shaikh, Director, Center of Excellence in Advanced Molecular Biology, University of the Punjab, Lahore.
6. Dr. G.A. Miana, Whole time Member, University Grants Commission, Islamabad.
7. Dr. Abdul Rehman Memon, Vice Chancellor, Mehran University of Engineering and Technology, Jamshoro.
8. Dr. M. Ayaz Malghani, Department of Zoology, University of Balochistan, Quetta.
9. Dr. Naseer A. Shaikh, Ex-Chairman, University Grants Commission, Islamabad.
10. Lt. Gen. (R) Shujaat Hussain, Rector, National University of Science and Technology, Rawalpindi.

11. Mr. Salim Mehmud, Scientific Adviser, Defense Science and Technology Organization, Rawalpindi Cantt.
12. Dr. M. Arslan, Ex-Vice Chancellor, Quaid-i-Azam University, Islamabad.
13. Dr. F.H. Hashmi, Director, Metallurgy Division, Dr. A.Q.Khan Research Laboratories, Rawalpindi.
14. Dr. N.M. Butt, Ex-Director PINSTECH, Nilore, Islamabad.
15. Dr. Atta-ur-Rehman, Director, H.E.J. Research Institute of Chemistry, University of Karachi, Karachi.
16. Dr. G.M. Khattak, Ex-Vice Chancellor, NWFP Agricultural University, Peshawar.
17. Engr. A. Karim Khan, Ex-Vice Chancellor, NWFP University of Engineering and Technology, Peshawar.
18. Dr. Ghulam Sarwar Garani, Principal, Bolan Medical College, Quetta.
19. Mr. Aezaz Hussain, Managing Director, Systems (Pvt.) Limited and Member Pakistan Federation of Chamber of Commerce, Lahore.

A view of the 21st meeting of the PSF Board of Trustees held in the committee room of the Foundation on 22nd November, 1997.

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LIST OF ABBREVIATIONS

Provinces

AJK	Azad Jammu and Kashmir
B	Balochistan
C	Centre
F	Frontier
P	Punjab
S	Sindh

Sponsoring Institutions

AKU	The Aga Khan University
AU	Agricultural University
AEARC	Atomic Energy Agricultural Research Center
BAC	Barani Agricultural College
BU	Balochistan University
BZU	Bahauddin Zakaria University
CEME	College of Electrical and Mechanical Engineering, Rawalpindi
CEWRE	Centre of Excellence in Water Resources Engineering
CSIR	Council of Scientific and Industrial Research
EU	Engineering University
FGC	Federal Government College
GC	Government College, Lahore
GU	Gomal University
KU	Karachi University
IIBC	International Institute of Biological Control
NARC	National Agricultural Research Centre
NIBGE	National Institute for Biotechnology and Genetic Engineering
NIAB	Nuclear Institute for Agriculture and Biology
NSFC	National Science Foundation of China
PARC	Pakistan Agricultural Research Council
PDC	Poultry Development Centre

PINSTECH	Pakistan Institute of Nuclear Science and Technology
PU	Peshawar University/Punjab University
QU	Quaid-i-Azam University
SALU	Shah Abdul Latif University
SU	Sindh University
PCCC	Pakistan Central Cotton Committee
UAA/UAAR	University of Arid Agriculture, Rawalpindi
UCR	University College of Agriculture, Rawalakot

Disciplines

Agr	Agricultural Sciences
Bio	Biological Sciences
Biotech	Biotechnology
Eng	Engineering Sciences
Med	Medical Sciences
Phys	Physical Sciences
Chem	Chemical Sciences
Math	Mathematical Sciences
Earth	Earth Sciences
Envr	Environmental Sciences

EXECUTIVE SUMMARY

PAKISTAN SCIENCE FOUNDATION (PSF)

Pakistan Science Foundation is the apex body for promotion and funding of scientific and technological activities in the country. The activities undertaken by the Foundation for the performance of its statutory functions are divided into three broad categories:

i) To promote basic and fundamental research in universities and research institutes on scientific problems related to socio-economic needs/development of the country.

ii) To increase public awareness about science through science promotion activities by establishing museums, clubs, herbaria and planetaria etc.

iii) To establish centers for comprehensive scientific and technological information systems.

The activities of the Foundation revolve around these objectives, some of which are undertaken through Pakistan Museum of Natural History (PMNH) and Pakistan Scientific and Technological Information Centre (PASTIC), the two subsidiary organizations of PSF, while others are performed by the PSF Science Wing, and are reflected in the following.

RESEARCH SUPPORT:

Research support is the principal program of the Foundation for the promotion of basic and fundamental research relevant to the socio-economic needs of the country. During 1997-98, a total of 149 projects in the fields of Agriculture, Biology, Chemistry, Earth, Engineering, Environment, Medical and Physics remained under consideration for funding. Among these, 36 projects were newly received while 113 had been carried over from the previous year. Among these, 18 projects costing Rs. 7.86 million were sanctioned in various fields. In addition, an amount of Rs. 0.243 million was released to University of Peshawar, Peshawar as institutional support grant for purchase of laboratory equipment, accessories, and books.

Monitoring and evaluation of the on-going research projects sponsored by PSF is an important function of the Research Support Programme. During the year, 91 technical reports of ongoing studies including semi-annual and annual reports were received and assessed by the staff and experts. During the period under report, 23 studies/projects in various fields were completed. The final reports of these projects were reviewed by the PSF experts. The studies completed during the year and their main achievements are outlined as under:

1. Isolation and Typing of Various Strains of *Streptococcus thermophilus* and *Lactobacilus bulgaricus,* from Local Dahi Samples and their Effects on Various Physico-Chemical Properties of Milk during Fermentation. (S-AU/Agr-106).

   A total of 318 isolates of *S. thermophilus* and 275 isolates of *L. Bulgaricus* were isolated and classified in 3 groups i.e., A, B and C on the basis of their sugar fermentation and titrable acidity production in milk at 45°C in 5 hours.

2. Soil Management and Alfalfa Production in Azad Kashmir. (AJK-UCR/Agr-132).

The protein enriched perennial legumes are recommended to be introduced as alternative fodder in Azad Kashmir. Crimson clover produced significantly and consistently higher CFDM at all soil moisture levels than other varieties .

3. The Effect of Echinococosis on Rabbit and Sheep along with its Control by Indigenous Plants of Pakistan. (P-PU/Agr-137).

P. Glandulosa one of the favorite fodders of herbivores in Punjab province of Pakistan and its cultivation in pastures, animal tracts and its field trails can play remarkable role in the natural control of cystic echinococcosis in meat producing animals.

4. Studies on Physiological Adaptations during Pregnancy and Lactation in Dwarf Goat to Improve its Production. (P-PU/Agr-138).

It is suggested that the Dwarf goat may be utilized for extensive breeding due to early cycling post partition, however, with the technological care of the kids instead of depending on the nanny goats

5. Characterization and Improvement of Plant Growth Promoting Rhizobacteria (PGPR) and their Effect on Cereal Production (P-NIBGE/Agr-153).

Among PGPR strains tested, Psedomonas 96-51 and its extract obtaining growth hormones increased root areas, root length and plant biomass of rice and wheat. Inoculation with diazotrophic bacterial strains contributed higher amounts (upto 28%) of nitrogen to rice plants. Inoculation also increased the number of tillers, grain yield and straw weight.

6. Integrated Pest Management of the Pests of Chickpea in Hyderabad District (S-AU/Agr-156).

The results achieved so far indicate that the caterpillars of *H. armigera* are the most important pests of chickpea in the area and they first attack the vegetative parts and tender foliage of the crop. It is concluded that the proper time of sowing chickpea crop in Hyderabad District is in the month of October.

7. Studies on Plasmid Associated Bacteriocin production by Lactobacilli (S-KU/Bio-186).

The lactocin LM-06 preparation inhibited the growth of *L. monocytogenes* an important food-borne pathogen.

8. Isolation and Characterization of Cytokinin Mutants of *Arabidopsis thaliana* (P-BZU/Bio -211).

The cytokinin-resistant mutants are expected to provide useful tools to study cytokinins biosynthesis and their mode of action. They can further be used for isolation of potentially useful genes and their transfer to crop plants.

9. Utilization of Dragonflies as Biological Control Agents Against Some Insect Pests of Rice (AJK-UCR/Bio-218).

The population of dragonflies and insect pests of rice was observed by the multiple linear regression equation. It was revealed that the dragonflies had negative regression coefficient with the population density of all the insect pests.

10. Development of *Aspergillus niger* Strain for Citric Acid Fermentation of Molasses (P-GC/Bio 221).

After a process of screening/rescreening and attempts for further improvement, the *A. niger* strain GCMC-7 was found to be the best producer of citric acid. Thus the strain has been preserved for further exploitation for citric acid production in shake flask and stirred Fermenter at a large scale leading to industrial level production.

11. Plasmids of Indigenous Pseudomonads: Molecular Characterization and Gene Manipulation
(S-KU/Bio 222).

About 3% of the isolates were found to degrade phenantherene, while 100% of the isolates degraded octane (liquid hydrocarbon). Most of the isolates were found to be resistant against cadmium chloride, nickel sulphate and lead acetate. The presence of gene for gentamicin/ampcillin resistance in different Pseudomonads was confirmed by DNA hybridization with gentamicin probe (pGO500) using ECL Kit.

12. Amaranthin Production through Cell Suspension Cultrues of *Celosia cristata* (P-CSIR/Bio -223).

The study was aimed at the development & extraction of natural colours from callus and flowers of *Celosia cristata*. It has been observed that colours of the two are quite identical in chemical as well as physical properties. The study has also proved that the natural colours can be established and isolated without the use of chemicals as done in this study.

13. Biodegradable and Safer Nematicides from Natural Sources (S-KU/Chem 240).

Nematicidal activity of extracts from five local plants and a marine animal was tested in the control of root-knot nematodes on mungbean, egg plant, chili, tomato and okra. Encouraging results were obtained.

14. Impedance Spectroscopic Studies of High Tc. Superconductor Ceramics at Super Conducting State (C-QU/Chem 246).

Impedance spectroscopic studies on Y-based and ER-based ceramic samples were carried out at various temperatures. The log-log conductivity frequency provided some interesting information about slope and related parameters. However, the results were not in accordance with the expectations of the researchers.

15. Production of Edible Rice Bran Oil (P-CSIR/Chem258).

A locally developed continuous type extraction stabilizer was used for the extraction of edible oil from rice bran. The results were found comparable with the imported Korean oil.

16. Synthesis, Structure and Pharmacological Studies on some new 4,1- Benzoxazepine-2,5-Diones (C-QU/Chem 265).

22 compounds were synthesized out of which 10 were new. These compounds were purified by thick layer chromatography or column chromatography and their structures were established .

17. Preparation and Characterization of Reforming Catalysts (F-PU/Chem 286).

Copper-chromic catalysts were prepared and characterized by surface area measurement, scanning electron microscope and X-ray diffraction studies after treatment in various conditions.

18. Weak Interactions in a Medium and Their Applications in Astrophysics (C-QU/Phy 73).

Induced neutrino mass and its implications, based on neutrino oscillations, were studied using the finite temperature and density QFT method. The study led to a general understanding of the nature of neutrino and provided a natural and consistent choice of the oscillations parameters.

19. Hard Processes in Nuclear/Particle Physics (C-QU/Phy 85).

The phenomenon of asymptotic freedom which weakens the strength of the interaction at large momentum scale was studied with specific reference to the following three areas.
Prompt Photon emission in decays.
J/Y photo production in the forward region.
Fragmentation of heavy quarks into quarkonia.

20. Characterization of Radiation Induced Defects in Semiconductors (C-QU/Phy 87).

Deep level transient spectroscopy was used to measure various parameters, characterizing a deep level defects. The samples used were prepared from prefabricated n-pp junctions. It was found that the transition metals used readily form complex with Fei, making it unable for reversible pairing with boron atoms.

21. Studies on Anisotropy and Vortex Motion in Melt Texture Grown Super conductors (C-QU/Phy 90).

The DC and AC magnetization studies of oriented polycrystalline high TC superconductors, with special reference to their anisotropy were conducted. The dynamics of vortex motion in these materials were also studied by the method of magnetic relaxation.

22. An Experimental Study of Plasma Focus Discharge (C-QU/Phy 92).

Experiment were undertaken on high temperature plasma generated by three different Dense Plasma Focus machines. The results were compared and analyzed and the dependence of different mechanical parameters were recorded.

23. Fabrication of Cadmium Telluride Photovoltaic Solar Cells by Closed Space Sublimation (C-QU/Phy 103).

Closed Space Sublimation technique was used to fabricate a low cost solar cell. The cell has three distinct layers of Tin Oxide, Cadmium Sulfide and Cadmium Telluride deposited one over another on a glass plate.

One of the main achievements and usefulness of any research is the publication of results in scientific journals, and through projects, 51 research papers were published in different scientific journals. In addition, 7 Ph.D., 13 M. Phil and a number of M. Sc. degrees were awarded to the Research Associates employed in the PSF-supported projects.

Scientific research was further supported by giving annual grants-in-aid to various societies for publication of technical journals. During the year a total amount of Rs. 0.590 million was released for the purpose. Furthermore, holding of 18 conferences was supported through partial financial assistance costing Rs.0.427 million, and three scientists were given travel grants to participate in international conferences abroad.

SCIENCE POPULARIZATION:

Popularization of Science is one of the statutory functions of Pakistan Science Foundation. Popularization and promotion of science has also been emphasized in the National Science and Technology Policy. The Foundation is engaged in science popularization activities at national level with the aim of increasing awareness about the role played by science in the development of the nations. In order to achieve this objective, the Foundation has taken up a number of programs including science exhibitions, fairs, science film shows, popular science lectures and science quiz competitions etc. as summarized below.

Science Caravan is a Mobile Science Exhibition that has been designed to increase public awareness about science, and to motivate the younger generation of Pakistan toward the study of Science. Through the Mobile Science Exhibition, the people living in rural and backward areas of the country are exposed to some of the most fascinating scientific and technological developments of modern world. All narration are in national language, and are accompanied by simple illustrations. At present, five Science Caravan Units are operating in Balochistan, Sindh, NWFP, Punjab and Federal Areas. During the year, the Caravan units organized 16 mobile exhibitions and planetarium shows, where 280 schools brought their students to see the caravan exhibition and planetarium/film shows.

One of the most powerful means through which science can be popularized is holding of "Science Fairs". Such Fairs are held quite regularly by most countries of the world but most frequently in the developed world. All kinds of new scientific discoveries and achievements are

displayed at such Fairs for the knowledge and understanding of the general public. This kind of interaction not only educates the citizens of the country but also helps in the generation of public support which is highly essential for science to prosper.

The 'National Science and Technology Fair-97", held at Islamabad w.e.f. 4th to 14th October, 1997 was thus an endeavor of Pakistan Science Foundation in this very direction. This Fair was held as a part of the ongoing Golden Jubilee celebrations of our Independence. 37 organizations took part in this Fair. A 2-days Symposium on "Popularization of Science through Mass Media" was also held on October 8 and 9,1997, at Holiday Inn-Islamabad Hotel. Besides the symposium, a number of events such as Inter-Board Science Quiz/Essay Competitions, Inter-Board Science Exhibition Contest, an Art Competition on 'New Frontiers of Science', an Aeromodelling Contest, a "Walk for Science' and a 'Race for Science', Computer Exhibition and Software Competition were some of the other prominent events which took place during the Fair.

The Foundation continued its Science Promotion activities such as, Essay and Poster Competitions, distribution of Science Magazines, books, Posters, Leaflets among the schools and organization of Popular Science Lectures, Science Film/Planetarium Shows. The dubbing of commentaries of Science Education Films in Urdu language also continued.

PLANNING & DEVELOPMENT:

Contract was awarded for the construction of Block II of Pakistan Museum of Natural History, Islamabad. The block has since been completed and the Public Services Division of the Museum, which was working in a rented building, has shifted to the newly constructed block. A piece of land for the construction of PSF Science Centre at Faisalabad was acquired from the Agriculture University Faisalabad. The PC-I for the establishment of Science Centre was prepared and got approved from the PSF D.D.W.C. Consultants were engaged for preparing design of the Centre building. Contract for the construction of the building was awarded by inviting tenders from qualified contractors. The construction work remained in progress during the report period and is expected to be completed soon.

PAKISTAN MUSEUM OF NATURAL HISTORY (PMNH)

During the year under review, both research and public service activities continued in earnest. PMNH was able to add 6340 specimens of plants, animals, minerals and fossils etc. to its reference collection. The three Science Divisions of the Museum made this collection during 18 field trips to various parts of Pakistan. Curation of this collection was carried out and these specimens alongwith other material already collected, was thoroughly researched upon. Based on this material as many as 19 research articles were published in scientific journals and in the book on "Biodiversity of Pakistan" published jointly by PMNH and Florida Museum of Natural History, USA.

Interaction between PMNH scientists and many national and foreign organizations also continued. Various research programs were implemented in collaboration with Southampton and Oxford Universities, UK; Florida State Museum, USA; ETH, Switzerland; Punjab

University, Lahore and Quaid-i-Azam University, Islamabad. A number of field trips were undertaken with the counterpart scientists as part of these programs.

The distinction of PMNH lies not only in research but also in implementing a powerful mass education and public awareness program. In this context, many programs on habitat degradation and other aspects of environment were recorded and televised in collaboration with PTV-2. PMNH also produced its first documentary on "Geckoes: Myths and Realities" for public education. A three-day workshop was also organized on "Natural History Museum: A new concept in Environmental Studies". Fifty (50) Science Teachers belonging to various educational institution of Rawalpindi and Islamabad area participated in this Workshop.

PMNH designers/artists remained actively engaged in the renovation of exhibits at the Marghzar Display Corner and planning the shifting and interior designing of the PMNH Block-II at Shakar Parian, besides designing different fairs and exhibitions. The Science Fair-97 and Science Centre Faisalabad were designed for PSF. Another exhibition was designed at Crisis Prevention Centre, Al-Farabi Institute, Islamabad, organized by UNICEF in connection with the International Women's Day.

The main target set for the year under report was the completion of Block-II of PMNH building. This block has been completed and the Display Centre, previously located in a rented building at F-7 Markaz has been shifted there along with the Public Service Division personnel.

PAKISTAN SCIENTIFIC AND TECHNOLOGICAL INFORMATION CENTRE (PASTIC)

PASTIC is one of the organs of PSF established to undertake the establishment of comprehensive scientific and technological information and dissemination centres. Its main objective is to collect, organize, classify and disseminate information in all disciplines of science and technology to the scientific community of Pakistan.

With its National Centre at Islamabad and four sub-centres at Karachi, Lahore, Quetta and Peshawar, PASTIC develops inter-library cooperation for sharing resources, establishes and maintains links with international/regional information networks/agencies. It trains information specialists in modern information handling and management techniques.

During report period, more than 2,000 requests for supply of articles were received, against which 1,906 were honored. More than 500 bibliographies were supplied to the researchers.

PASTIC publishes "Pakistan Science Abstracts" on regular basis. During the report period, four issues were finalized and composed. Similarly on the basis of information on technology, collected from 27 countries, one issue of the monthly bulletin, "Technology Information" was published. Under Reprographic Services of PASTIC, over 2,153,310 impressions, 2,512 pages and 185,197 copies were produced against 124 jobs received from 15 S&T organizations. PASTIC library added to its collection some 92 books, 55 documents and 891 periodical issues during the report period. Various databases on CD-ROM were purchased/updated.

International liaison is the prominent activity of PASTIC as it is the National Focal Point for International/Regional Information Networks, like SAARC Documentation Center, WHO/CEHANET and UNEP/INFOTERRA. The PASTIC also acts as coordinating/ collaborating body for UNDP/TIPS, UNESCO/ASTINFO etc. During the report period, information/data from these organizations was collected and disseminated to various institutions and professionals. In addition, CDS/ISIS package was provided to six organizations. PASTIC also trains information specialists in modern information handling and management techniques. In this connection, trainings and lectures were arranged at National and International level during the report period.

A seminar on "Patents, A source of Information Introduction to Industrial Property" was attended by Mr. Aqil Khan, Chief Editor, at WIPO, Geneva. A Workshop on Chemical Safety and Environmental Information was attended by Mr. Zaheer Nasir, Assistant Programmer from 3-6 November, 1997 in Jordan.

PASTIC's allied Technological Information Promotion System (TIPS) remains always busy to publish upto date information on technology and trade opportunities. It covers 14 different sectors for carrying over the required information from the developing countries. During the report period, 1,500 technology/trade offers and requests received from 39 countries were disseminated to users. Subsequently, 200 Pakistani entrepreneurs/business organizations were provided information as required. It organized Pharma Expo 97 at Islamabad and also arranged computer exhibitions in Islamabad and Faisalabad. It has published a book on "Trade and Technology Information" in urdu language. It has launched its first and second issue of "White Meat" a bilingual publication regarding Poultry and Fisheries.

INTRODUCTION

Pakistan Science Foundation was established on June 30, 1973 under the Pakistan Science Foundation Act No. III as an autonomous body to promote and finance scientific and technological activities having a bearing on the socio-economic needs of the country. Under the Act, the Foundation has been entrusted to carry out the following functions:-

i) establishment of comprehensive scientific and technological information and dissemination centers,

ii) promotion of basic and fundamental research in universities and other institutions on scientific problems relevant to the socio-economic development of the country,

iii) utilization of the results of scientific and technological research including pilot plant studies to prove the technical and economic feasibility of processes found to be promising on a laboratory scale,

iv) establishment of science centers, clubs, museums, herbaria and planetaria,

v) promotion of scientific societies, associations and academies engaged in spreading the cause of scientific knowledge in general or in the pursuit of a specific scientific discipline or technology in particular,

vi) organization of periodical science conferences, symposia and seminars,

vii) exchange of visits of scientists and technologists with other countries,

viii) grant of awards, prizes and fellowships to individuals engaged in developing processes, products and inventions of consequence to the economy of the country, and

ix) special scientific surveys not undertaken by any other organizations and collection of scientific statistics related to the scientific efforts of the country.

The Foundation shall also:-

i) review the progress of scientific research sponsored by it and evaluate the results of such research,

ii) maintain a National Register of highly qualified and talented scientists/engineers and doctors both in and outside Pakistan, and to assist them in collaboration with concerned agencies to seek appropriate employment, and

iii) establish liaison with similar bodies in other countries.

The activities performed under the above mentioned statutory functions are given in the chapters that follow.

CHAPTER - 1

ACTIVITIES & PROGRAMMES

The Activities and Programs undertaken by the Foundation for the performance of its statutory functions can be broadly divided into the following four categories.

i. Establishment of Comprehensive Scientific and Technological Information and Dissemination Centers.

ii. Promotion and Financing of Scientific Research in the Country and the Utilization of the Research Results.

iii. Promotion and Popularization of Science in Society.

iv. International Liaison.

The first activity is carried out through Pakistan Scientific and Technological Information Centre (PASTIC), a subsidiary organization of PSF. The other functions i.e., research support, science popularization etc. are performed by the Science Wing of the Foundation. Functions of the Science Wing of PSF are further subdivided as under:

(I) Research Support Sections performing the following activities.

1. Research Support
    a) Grants for Research Projects
    b) Institutional Support
2. Research Evaluation
3. Promotion of Scientific Societies/Learned Bodies
4. Travel Grants
5. International Liaison
6. Awards and Fellowships
7. Survey and Statistics
8. Scientists Pool
9. Planning and Development Program

(II) Science Popularization Section, which carries out the following activities;

1. Science Popularization Activities including Science Caravans, Science Clubs, Science Fairs and holding Popular Science Lectures, Workshops, Conferences and Symposia.

2. Funding for Conferences, Symposia, Seminars, Workshops

In addition to PASTIC, the other subsidiary organization of PSF is the Pakistan Museum of Natural History (PMNH), established in 1979 to serve the national needs in the vitally important areas of research, conservation and education involving Pakistan's heritage of natural resources. The Museum is a national repository for permanent storage of plants, animals, rocks, minerals and fossils of the country.

The progress of the work carried out by the Science Wing of the Foundation, PMNH and PASTIC during the year 1997-98 is summarized in the following pages.

PAKISTAN SCIENCE FOUNDATION (PSF)

I. RESEARCH SUPPORT SECTIONS

1. RESEARCH SUPPORT

During the year under report the Foundation carried out a number of programs for the promotion of basic and fundamental research in universities and other institutions on scientific problems relevant to the socio-economic development of the country. These programs include:

(a) Grants to research projects submitted by individuals or groups of scientists in the universities and research institutions throughout the country.

(b) Institutional support to scientific institutions for provision of equipment, literature, staff training facilities, etc. to build institutional capability for conducting research.

(c) Support for participation in regional and international research programs.

a) Grants for Research Projects

Research Support is the principal program of Foundation for the promotion of basic and fundamental research having relevance to the socio-economic needs of the country. During the period under report, 36 projects requesting for funds totaling more than Rs. 23.500 million were received by the Foundation, whereas 113 project proposals, at various stages of their processing, were brought forward from the previous year. Thus, in all 149 projects in the fields of Agriculture, Biology, Biotechnology, Chemistry, Earth Sciences, Engineering, Environment, Maths, Medical and Physics remained under active consideration of the Foundation. The proposals were examined by the experts in the relevant fields in the light of their scientific merit and relevance to the national needs according to the criteria laid down by the Foundation.

The criteria for research are; competence of the scientific personnel to carry out the research, institutional capability i.e., availability of requisite equipment and library facilities, scientific merit of the proposed research, and likelihood of completion of the project within the stipulated time. Each proposal, after getting a favourable review report by an expert in that particular field, is placed before the Technical Committee for technical evaluation and Executive Committee of the Foundation for final approval.

During the year, only 18 project proposals succeeded in getting the approval of the Foundation at an estimated cost of Rs. 7.860 million. Details of the newly approved projects are given in Annexure-II.

b) Institutional Support

Pakistan Science Foundation assists the Universities and Research Institutions by providing them Institutional Support Grants for the purchase of equipment, chemicals, literature etc. to research workers, who for one reason or another are unable to obtain these from their

own Institutions. This is meant to strengthen the research capabilities of these institutions to enable them to conduct research directed towards the solution of problems of national importance. During the report period Institutional Support Grants, amounting to Rs. 0.243 million was sanctioned to the following Institution(s) for the purpose:

Institution	Purpose	Amount
University of Peshawar, Peshawar	Spare parts for FT-IR 16PC and Spectra Physics Laser DLS Photometer for NCE in Physical Chemistry.	Rs. 1,50,000/-
	Equipment for Geographic Information System (GIS) and Remote Sensing Laboratory of the Geography Department.	Rs. 93,000/-

2. RESEARCH MONITERING AND EVALUATION

The Foundation evaluates the technical progress as well as fiscal position of on-going projects continuously till the completion of the projects. During the year, a total of 113 reports (semi-annual, 1st & 2nd annual and final) were received and evaluated as per procedure laid down for reviewing the progress of scientific research and evaluating the results of such research.

a) On-Going Projects

During the year, 91 semi-annual and first & second-annual reports received after the initiation of each project or after the submission of the annual reports were scrutinized by the Research Support Sections to assess the interim progress of these projects, and to release their next due instalments. The details of reports are given in Annexure-III.

b) Completed Projects

The final technical reports of 23 research projects were received during the year 1997-98. The reports were evaluated by the subject experts and were subsequently submitted along with reviewers' comments to the relevant PSF Technical Committees for consideration and adoption. Titles of the completed projects followed by their summaries are given below.

i) List of Completed Projects

S. No	Project No.	Project Title:
1.	S-AU/Agr(106)	Isolation and Typing of Various Strains of *Streptococcus thermophilus* and *Lactobacilus bulgaricus,* from Local Dahi Samples and their Effects on Various Physico-Chemical Properties of Milk during Fermentation.

2.	AJK-UCR/Agr(132)	Soil Management and Alfalfa Production in Azad Kashmir.
3.	P-PU/Agr (137)	The Effect of Echinococosis on Rabbit and Sheep along with its Control by Indigenous Plants of Pakistan.
4.	P-PU/Agr(138)	Studies on Physiological Adaptations During Pregnancy and Lactation in Dwarf Goat to Improve its Production.
5.	P-NIBGE/Agr(153)	Characterization and Improvement of Plant Growth Promoting Rhizobacteria (PGPR) and their Effect on Cereal Production.
6.	S-AU/Agr(156)	Integrated Pest Management of the Pests of Chickpea in Hyderabad District.
7.	S-KU/Bio (186)	Studies on Plasmid Associated Bacteriocin production by Lactobacilli.
8.	P-BZU/Bio (211)	Isolation and Characterization of Cytokinin Mutants of *Arabidopsis thaliana.*
9.	AJK-UCR/Bio (218)	Utilization of Dragonflies as Biological Control Agents Against Some Insect Pests of Rice.
10.	P-GC/Bio (221)	Development of *Aspergillus niger* Strain for Citric Acid Fermentation of Molasses.
11.	S-KU/Bio(222)	Plasmids of Indigenous Pseudomonads: Molecular Characterization and Gene Manipulation.
12.	P-CSIR/Bio (223)	Amaranthin Production through Cell Suspension Cultrues of *Celosia cristata.*
13	S-KU/Chem(240)	Biodegradable and Safer Nematicides from Natural Sources.
14.	C-QU/Chem(246)	Impedance Spectroscopic Studies of High Tc. Superconductor Ceramics at Super Conducting State
15.	P-CSIR/Chem(258)	Production of Edible Rice Bran Oil.
16.	C-QU/Chem(265)	Synthesis, Structure and Pharmacological Studies on some new 4,1- Benzoxazepine-2,5-Diones.
17.	F-PU/Chem(286)	Preparation and Characterization of Reforming Catalysts.
18.	C-QU/Phy(73)	Weak Interactions in a Medium and Their Applications in Astrophysics.

19.	C-QU/Phy(85)	Hard Processes in Nuclear/Particle Physics.
20.	C-QU/Phy(87)	Characterization of Radiation Induced Defects in Semiconductors.
21	C-QU/Phys (90)	Studies on Anisotropy and Vortex Motion in Melt Texture Grown Super conductors.
22	C-QU/Phy(92)	An Experimental Study of Plasma Focus Discharge
23	C-QU/Phy(103)	Fabrication of Cadmium Telluride Photovoltaic Solar Cells by Closed Space Sublimation.

ii) Brief Summaries of Completed Projects

Project No: **S-AU/Agr(106)**

Project Title. **Isolation and Typing of Various Strains of *Streptococcus thermophilus* and *Lactobacilus bulgaricus*, from Local Dahi Samples and their Effects on Various Physico-Chemical Properties of Milk during Fermentation.**

Duration:	2-years
Date of Initiation:	01.06.1991
Date of Completion:	31.05.1993
Location of Scheme:	Sindh Agriculture University, Tandojam
Principal Investigator:	Dr. Mohammad Akbar Arain Associate Professor
Total Expenditure:	Rs. 68,350/-
Main Objectives:	To utilize and exploit isolated suitable strains of *Lactobacillus bulgaricus* and *Streptococcus thermophilus* from local made dahi samples. To produce fermented milk product (dahi) and to get optimum performance of suitable acid production, required floavour and texture characteristics of the final product.

To establish a starter culture bank having suitable strains of the isolated organisms with known desirable properties. This will help the Dairy Industry of the country to be self sufficient in starter culture organisms.

Summary of work done:

A total of 264 samples of indigenous made dahi were collected and analyzed for the isolation and identification of different strains of *S. thermophilus* and *L. bulgaricus* on the basis of their morphological, growth, on specific media, biochemical characteristics and production of titrable acidity in milk. 318 isolates of *S. thermophilus* and 275 isolates of *L. bulgaricus* were isolated in the present study. All the isolates of both the organisms showed uniform morphological, cultural and growth characteristics but differences were observed in sugar fermentation and percentage of titrable acidity production. The isolates of both the organisms were classified in 3 groups i.e., A, B and C on the basis of their sugar fermentation and titrable acidity production in milk at 45°C in 5 hours.

Project No: **AJK-UCR/Agr(132)**
Project Title: **Soil Management and Alfalfa Production in Azad Kashmir.**

Duration:	3-years
Date of Initiation:	01.07.1993
Date of Completion:	30.06.1996
Location of Scheme:	University College of Agriculture, Rawalakot
Principal Investigator:	Dr. Mohammad Ilyas Associate Professor
Total Expenditure:	Rs. 379,587/-
Main Objectives:	To determine the drought and cold tolerance of alfalfa at different stages of plant growth. To develop alfalfa cultivation technology at various topographical areas. To evaluate the short and long-term effects of alfalfa on soil physio-chemical properties including aggregation, infilteration rate, hydraulic conductivity, bulk density, pentrability, N.P.K. content, pH. and organic matter.

To evaluate residual effect of alfalfa on the yield of following wheat and or maize.

Summary of work done:

This report evaluated the current land use system of the agricultural land of Azad Jammu & Kashmir (AJK) and suggests some alternatives. In most parts of Azad Kashmir continual cultivation of wheat and maize crops in rotation, primarily for fodder production, is causing land degradation and has imposed serious threat to sustainable agriculture and natural environment in the region. The field study was carried out at University College of Agriculture, Rawalakot, which is a relatively cold place, to evaluate alfalfa, clover, ryegrass, wheat and maize crops for their impact on soil characteristics and biomass production. A pot study was also conducted to screen alfalfa, and clover for drought tolerance.

The treatments for field study comprised 44 crops or their varieties acquired from different parts of the world. Cumulative forage dry matter (CFDM) produced in about three years of growth period (October 1993 to June 1996) was measured. The CFDM produced by two varieties of alfalfa, namely the Hunterfield and the Sandoze Sundor, was significantly higher than produced by the local wheat and maize in rotation or any other fodder crop under study. The other notable legume which showed potential to grow in the area of study was the crimson clover which established quickly and closely followed the two alfalfa varieties for CFDM. These protein enriched perennial legumes thus should be introduced as alternative fodder in the region.

Eleven of the corps under study were also compared for their effect on soil properties: nitrogen, potassium and phosphorus content of soil, infiltration rate, field-saturated hydraulic conductivity, penetration resistance and aggregate stability. All these properties can be related to some extent to soil erosion. The alfalfa significantly decreased potassium and penetration resistance but increased nitrogen and phosphorus in soil, infiltration rate, field-saturated hydraulic conductivity, and aggregate stability when compared with the local wheat/maize rotation. The drought tolerance studies using soilmoisture blocks evaluated different varieties of alfalfa and clover for CFDM produced under soil moisture stress. The alfalfa varieties; "Hunterfield" and "Sandoze Sunder" produced higher CFDM compared to the other varieties at the lowest soil moisture level which was 50% of the field capacity water content. Among clover, however, the crimson clover produced significantly and consistently higher CFDM at all soil moisture levels than other varieties.

Project No: **P-PU/Agr (137)**
Project Title: **The Effect of Echinococosis on Rabbit and Sheep along with its Control by Indigenous Plants of Pakistan**

Duration: 3-years

Date of Initiation: 01.09.1994

Date of Completion:	31.08.1997
Location of Scheme:	University of the Punjab, Lahore
Principal Investigator:	Dr. (Mrs.) Tanveer Akhtar Assistant Professor
Total Expenditure:	Rs. 442,076/96
Main Objectives:	Experimental production of hydatidosis in lab. animals. Histopathological examination of infested body organs. Detection of naturally growing vegetation capable of controlling hydatidosis. Biochemical studies on liver function among hydatid infested rabbits and sheep.

Summary of work done:

Five experimental groups of rabbits having five animals each, were inoculated with crude low dose (CLD), filtered low dose (FLD), crude medium dose (CMD), filtered medium dose (FMD) and filtered high dose (HD) of hydatid cyst fluid (HCF) of sheep origin upto 98 days. Their respective controls each having three rabbits, were inoculated with similar doses of distilled water. HCF doses were increased after each 14 days and last three doses were kept constant. Their haematological studies showed that toxic and pathological impact of HCF was parallel to the poisonous properties of some insecticides/pesticides/herbicides and with exo and endotoxins Their serum biochemistry revealed significant changes in their GOT, GPT, bilirubin, glucose and plasma protein contents that altered by the increased HCF dose and were more pronounced in the rabbits given crude hydatid cyst fluid.

As far as the changes in their general appearance and behavior are concerned, the high dose groups were worst affected by the toxicity of HCF. They showed magnificent abnormalities like fear, depression, sluggishness, falling hair and turned ear pinnae. However, the low dosed groups showed little such changes throughout the course of study although they became sluggish after 98 days. These rabbits were maintained upto 1½ year but the HCF dose was stopped after 98 days. Out of total animals, 6 died due to weakness, respiratory whistling and difficult breathing. On autopsy, their lungs were full with hydatid cyst in the crude dose groups only.

Histopathology of sheep liver having three different kinds of cysts was also studied at different distances from the cyst wall. Their damaging effects were found inversely proportional to the distance from the cyst. Present results indicate that HCF produced high

toxic effects in tissues surrounding the cyst both biochemically and histologically. Tissue biochemistry of naturally infected sheep liver was studied for alkaline phosphates, acid phosphates, transaminases bilirubin, cholesterol, protein contents, free amino acids and nucleic acids. These parameters decreased significantly close to the cyst wall and started to normalize with the increase of distance from the cyst wall.

In-vitro studies of protoscoleces were carried out for their mortality after exposing them for one hour to different dilutions of aquous extracts of 20 local plants or their parts. It was found that among the plants tested *Azadirachta inica* was the most effective at 100% concentration which achieved LT 50 after four minutes and 54 seconds. For *in-vivo* studies, three groups (each having three rabbits) were injected intraperitoneally as well as subcutaneously with 65000 protoscoleces at each site. Out of three groups, one group was considered as control (fed on green fodder) and remaining two groups were orally administered with dried powdered leaves of *Prosopis glandulosa* (2 g/day) and dried powdered fruit of *Embilia ribes* (2g/day) upto 90 days. They were also provided with normal green fodder. Their blood samples were monthly pooled. In both treated groups; hematological indices, i.e., RBC counts, PCV, MCH, MCHC increased to some extent as compared to controls. However, WBC and ESR decreased after treatment. Their liver function test i.e., transminases, bilirubin and glucose level increased. While protein contents remained unchanged when compared with the control. Increase in hematological indices and satiability or slight increase in the protein contents showed the improvement of health conditions of treated animals.

It is concluded that *P. glandulosa* one of the favorite fodders of herbivores in Punjab province of Pakistan and its cultivation in pastures, animal tracts and its field trails can play remarkable role in the natural control of cystic echinococcosis in meat producing animals.

Project No: **P-PU/Agr(138)**
Project Title: **Studies on Physiological Adaptations During Pregnancy and Lactation in Dwarf Goat to Improve its Production.**

Duration:	2 years
Date of Initiation:	01.06.1994
Date of Completion:	31.05.1996
Location of Scheme:	University of the Punjab, Lahore
Principal Investigator:	Dr. Abdul Majeed Cheema Associate Professor
Total Expenditure:	Rs. 362,671/-
Main Objectives:	To synchronize a sizable group of dwarf goat for simultaneous studies during pregnancy and lactation.
	To determine the maternal levels of insulin, glucagon, thyroxin, triodothronine, growth hormone prolacti

and cortisol, the hormones recently understood to be instrumental in milk production efficiency in ruminants, during the different phases.

To determine the levels of target metabolites of the hormones (i.e. glucose, free fatty acids, β-hydroxyl-butyrate and free amino acids) which serve as precursors for milk constituents.

To judge the relationship between hormonal levels and target metabolites specifically at the critical phase of ovulation, parturition and early lactation

To suggest physiological manipulations in altering hormones sensitivity to enhance milk production in the breed and improve its kids survival for better productivity

To generate important data on the hormonal involvement and their sensitivity to metabolites in various reproductive phases of the goat for biotechnological innovative work to exploit its prolific breeding characteristic.

Summary of work done:

Physiological characteristics of an animal depend, mainly on the abilities to use nutrients, appropriately through regulation, for growth and reproduction. Their precise control for the need through mobilization, deposition etc. is dependent upon various hormones. An animal passing through varied reproductive phase has different demands for the nutrients accompanying altering hormonal setup for physiological adaptations. Some of these physiological characteristics are the indicator of economic benefits or disadvantageous in a breed. Therefore, adequate, understanding of physiological setup is the prerequisite for the biotechnological procedures to be considered in farming. The present project work is undertaken to fulfill this objective.

The results revealed that in early pregnancy (anabolic phase), the levels of hormones and the associated nutrients in the blood evidently exhibit that nutrients are clearly diverted for storage. This interaction in the hormones and nutrients in the later half of the pregnancy is reversed and because of the demands in fetal growth, energy subtracts are maximally diverted towards uterus. A few fractions of free amino acids exceptionally remained enhanced in the entire gestation compared to pregnancy state. Their increased presence may be considered necessary for the gestation adaptation by the breed to carry multiple features. Decline in the several protein fractions and appearance of a new protein signifies their role in anabolism of early pregnancy. Also the appearance of four new protein fractions in the late pregnancy may be attributed to the catabolic role of these in late pregnancy.

In lactation, the status of the studied hormones with the resultant target nutrients level in the blood shows that partitioning of the nutrients is not favorable for adequate let down of

milk in this breed of the goat. It is realized that metabolic set up of the goat, adapted in pregnancy, fails to shift to an efficient lacational level. The restoration of the levels of certain free amino acids peculiar to pregnancy, soon after a short early lactation, in mid lactation, supports this apprehension. Also the appearance of a protein very specific to the cycling characteristic of the goat in early lactation demonstrates that the physiological set up of the goat is soon onset to the subsequent cycling. This renders the lactation phase poor in performance. It is suggested from the findings that this breed of goat may be utilized for extensive breeding due to early cycling post partition, however, with the technological care of the kids instead of depending on the nanny goats. The enhancing of let down of milk in Dwarf goat may be possible by exogenous administrations of related factors, however, it requires a separate planned study.

Project No: **P-NIBGE/Agr(153)**

Project Title: **Characterization and Improvement of Plant Growth Promoting Rhizobacteria (PGPR) and their Effect on Cereal Production.**

Duration:	3-years
Date of Initiation:	01.07.1994
Date of Completion:	30.06.1997
Location of Scheme:	NIBGE, Faisalabad
Principal Investigator:	Mr. Ghulam Rasul Scientific Officer
Total Expenditure:	Rs. 210,406/-
Main Objectives:	Screening of organisms able to produce plant growth hormone (IAA) by using non radio labeled or radio labeled (DNA auxin) probe (pluc2.).
	Characterization of the bacterial strains using RFP and ERIC-PCP finger printing.
	Production of IAA or leaky mutants by Tns mutagenesis.
	Comparative studies of the effect of inoculating IAA^{-} and IAA + wild type strains on plant growth and grain yield in wheat and rice.

Summary of work done:

Identification of the genes responsible for indoleacetic acid (IAA) production in plant growth promoting bacteria (PGPB) was carried out by using pluc 2 DNA probe. Out of 18

strains tested 12 strains were found to harbor IAA producing genes. Protein profile of total bacterial proteins proved useful for differentiation of bacterial strains up to species level. For differentiation of the bacterial isolates, REP, ERIC and random primers were used in polymerase chain reaction (PCR). Unique pattern of PCR products obtained form each isolate confirmed that the isolates were different strains and were not "re-isolates" obtained from the same environment, Identification and quantification of plant growth hormones IAA and gibberellic acid (GA), produced by PGPR, was carried out on high pressure liquid chromatography (HPLC). Some *Azospirillum* strains produced both IAA and GA while none of the enterobacter species tested produced these growth hormones. Azoarcus strain K-1 produced higher amount of GA and Zaospriullum strain ER-2 produced higher amount of IAA. Indoleacetic acid production increased with the age of bacterial culture while decrease in the production of GA was noted at the later growth stages. Pure IAA and GA in the concentration range of 1-2 ug/ml increased root area and plant biomass of rice and wheat. Among PGPR strains tested, Psedomonas 96-51 and its extract obtaining growth hormones increased root areas, root length and plant biomass of rice and wheat. Inoculation with diazotrophic bacterial strains contributed higher amounts (upto 28%) of nitrogen to rice plants. Inoculation also increased the number of tillers, grain yield and straw weight.

Project No: **S-AU/Agr(156)**
Project Title: **Integrated Pest Management of the Pests of Chickpea in Hyderabad District.**

Duration:	2 years
Date of Initiation:	01.08.1995
Date of Completion:	31.07.1997
Location of Scheme:	Sindh Agriculture University, Tandojam
Principal Investigator:	Dr. Mohammad Khan Lohar Professor
Total Expenditure:	Rs. 239,292/-
Main Objectives:	The susceptibility and resistance of different cultivars of chickpea against the major insect pests will be studied in different ecological zones of Hyderabad district. The biology, ecology and behavior of the pests will be studied under laboratory and field conditions. The control measures such as cultural, biological and chemical will be applied to observe their efficacy. The effect of various control measures on the grain yield of chickpea will also be recorded.

Summary of work done:

The aim of the study was to work on population dynamics and bioecology of the major pests of the crop and determination of predators and parasites of major insect pests. The research was carried out in 4 talukas of Hyderabad District, viz., Hyderabad, Tando Allahyar, Tando Mohammad Khan and Hala. The Chickpea pests including pod borer *(Heliothis armigera)*, Tabacco caterpiller (*Spodoptera litura*), chickpea cutworm *(Agrotis ipsilon)*, chickpea semi looper *(Plusia orichalcea)*, whitefly, *(Bemisia tabaci)* and Thrips *(Thrips tabaci)* were researched upon.

Among all of the above mentioned pests, chickpea pod borer and cutworm were the major insect pests of this crops. Berseen caterpillar was also recorded. The maximum pest population was recorded during 1st week of February. The thrips started attacking chickpea crop from 4th week of December till 3rd/4th week of January. Four parasitoids, viz., *Cumpoletis, Apanteles, Trichogramma* and *Exorista* species were recorded on cutworms during the study. The taxonomic status of the parasites and predators revealed that all the parasitoids were Hymoptera, while two of predators were Coleopterans and two belonged to Hemiptera The results achieved so far indicate that the caterpillars of *H. armigera* are the most important pests of chickpea in the area and they first attack the vegetative parts and tender foliage of the crop. It is concluded that the proper time of sowing chickpea crop in Hyderabad District is in the month of October.

Project No: **S-KU/Bio (186)**
Project Title: **Studies on Plasmid Associated Bacteriocin production by Lactobacilli**

Duration:	3-years
Date of Initiation:	01.7.1993
Date of Completion:	30.6.1996
Location of Scheme:	University of Karachi, Karachi.
Principal Investigator:	Dr. Roquyya Siddiqui Associate Professor
Total Expenditure:	Rs. 250,563/-
Main Objectives:	To isolate and characterize Lactobacilli. To screen the isolates for production of bacteriocin. To determine the location of determinants.

Summary of work done:

One hundred and twenty five (125) lactobacilli isolates were collected from different food and clinical samples including milk, yogurt, fermented fruits, fermented vegetables,

fermented pulses, fermented meat, dental carries and infant feces. All the isolates were identified by their morphological, colonial characters and catalase reaction.

The isolates were screened against each other for bacteriocin production by agar-well diffusion assay and overlay method. Twenty one lactobacilli isolates produced an inhibitory substance effective against some of the other isolates tested. All the bacteriocin producing isolates were immune to the inhibitory effect of their own bacteriocin. Of the 21, five best produces (LM-06, LM-07, LY-05, LY-06 and LC-09) were selected for further studies. The inhibitory substance produced by all five isolates were identified as lipoproteinic in nature as their activity was completely abolished after treatment with proteolytic and lipolytic enzymes while they retained full activity after treatment with catalase and lysozyme. The stability of proteinaceous inhibitors to pH and temperature were studied. LC-09 appeared to be a novel bacteriocin as it resisted 100°C for approximately 3 hours. The bacteriocin produced by LM-06 was the strongest of all as it inhibited a majority of other isolates against which tested and hence LM-06 was retained for detailed investigations The isolate was identified as *L. casei* on the basis of biochemical reactions and its bacteriocin was designated as lactocin LM-06. The lactocin LM-06 preparation inhibited the growth of *L. monocytogenes* an important food-borne pathogen. The bacteriocin bioactivity was lost after one month at room temperature while was stable for more than two years at -20°C. To get the direct evidence of plasmid association of lactocin LM-06 production, acridine orange and ethidium bromide as curing agent were tried. The curing of Nac+ phenotype was achieved by 120 μg/ml of ethidium bromide while acridine orange was not effective in this respect. Beside ethidium bromide, elevated temperature (42°C) mediated curing of Lm-06 production. The restriction analysis of the isolated plasmid pNRJ revealed a plasmid of approximately 60 kb responsible for the production.

Project No: **P-BZU/Bio (211)**
Project Title: **Isolation and Characterization of Cytokinin Mutants of Arabidopsis Thaliana**

Duration:	2- years
Date of Initiation:	01.08.93
Date of Completion:	31.07.95
Location of Scheme:	Bahauddin Zakariya University, Multan
Principal Investigator:	Dr. Javed Iqbal Mirza
Total Expenditure:	Rs. 2,08,035/-
Main Objectives:	Isolation of Cytokinin of *A. thaliana.* Genetical and physiological characterization of the mutants alongwith the study of developmental abnormalities due to the mutations.

Summary of work done:

Plant hormones are of vital importance to the normal growth and development of plants. An important group of hormones, the cytokinins, is involved in processes such as cell division, senescence, chloroplast maturation, cotyledon expansion and morphogenesis of shoots and roots. During the project, about 24 cytokinin resistant mutants of *Arabidospis thaliana* were isolated. Most of these mutants also have associated developmental abnormalities such as root hair abnormalities, altered gravitropic response. Longer hypocotyles, dwarf or semi-dwarf stature, frequent inflorescence branches, reduced apical dominance, absence of trichomes and abnormalities of reproductive structures. Genetic studies indicated single recessive nuclear mutations controlling the mutants phenotypes.

Present cytokinin resistant mutants have revealed several novel developmental processes that could be regulated by cytokinins. These cytokinin-resistant mutants are expected to provide useful tools to study cytokinins biosynthesis and their mode of action. They can further be used for isolation of potentially useful genes and their transfer to crop plants.

Project No: **AJK-UCR/Bio (218)**
Project Title: **Utilization of Dragonflies as Biological Control Agents Against Some Insect Pests of Rice.**

Duration:	2-years
Date of Initiation:	01.7.1995
Date of Completion:	30.6.1997
Location of Scheme:	University College of Agriculture, Rawalakot.
Principal Investigator:	Dr. Abdul Khaliq
Total Expenditure:	Rs.2,35,702/-
Main Objectives:	To identify the insect pests of rice and their natural enemies in Azad Kashmir.
	To evaluate the voraciousness of different species of natural enemies as feeders of rice pests for utilization in pest management program.
	To study the possible ways of conserving natural enemies of rice pests.

Summary of work done:

A survey was undertaken to collect the insect pests of rice and dragonflies visiting rice fields from various localities of Azad Kashmir. The number of insect pests and dragonfly

species recorded were 28 and 14 respectively. The feeding capacity of 11 dragonfly species on some insect pests of rice in a day (10 hours) was determined by forced feeding. The adults of various dragonfly species consumed different numbers of yellow stem borers, white stem borers, hairy caterpillars, rice skippers, white-backed planthoppers, white leafhoppers, green leafhoppers, rice bugs, cicadellid leafhoppers and grasshoppers *(Oxya spp.)* in 10 hours. The females of all the dragonfly species proved to be the most voracious feeders as compared with their males. *Orthetrum sabina* was found to be the most voracious feeder followed by *O. pruinosum neglectum, O. triangular triangular, O. glaucum,, Crocothemis servilia ,O. erythraes, Pantala flavescens, Palpoplaura sexmaculatea sexmaculata, Sympetrum commixtur, Acisoma panorpoides panaorpoids,* and *Trithemis festiva.*

The population density of dragonflies was maximum from middle of August to the end of September. However, it was at peak from last week of August to 3rd week of September. The population then declined as the crop matured and the pest population became low. The studies on the seasonal abundance of insect pests of rice were conducted at four localities, i.e., Hajeera, Mandhole, Harighale and Banipasari during the crop season 1996-97. The population of rice skipper and grasshoppers was somewhat higher than other insect pests. However, the population of different insect pests was higher from the 2nd week of August to the 4th week of September and then decreased, as the crop matured. The efforts were made to evaluate the feeding potential of dragonflies in the field cages. They did not show any activity and interest in their prey due to their captivity.

In view of this dragonfly attitude, the relationship between the population of dragonflies and insect pests of rice was observed by the multiple linear regression equation. The statistical analysis revealed that the dragonflies had negative regression coefficient with the population density of all the insect pests. It indicated that the pest population was decreased with the corresponding increase in dragonflies population. However, their feeding behavior was not similar at all the localities but differed from locality to locality.

Project No: **P-GC/Bio (221)**

Project Title: **Development of *Aspergillus niger* Strain for Citric Acid Farmentation of Molasses.**

Duration:	2-years
Date of Initiation:	01.6.1995
Date of Completion:	31.5.1997
Location of Scheme:	Government College, Lahore
Principal Investigator:	Dr. Ikram-ul-Haq
Total Expenditure:	Rs.2,73,834/-

Main Objectives: To develop the strain of *Aspergillus niger*, after their isolation and screening from local habitats, and its mutation by UV/chemical treatment for maximum conversion of sugar into citric acid.

Summary of work done:

Two hundred and fifty (250) isolates of *Aspergillus niger* were obtained form soil samples collected from different areas by pour-plate-method by using malt extract agar medium. The agar plates were incubated at 30°C for 2-3 days. The black spores from individual colonies were picked up and transferred to potato dextrose agar slants for culture maintenance. The cultures were incubated at 30°C for 3-4 days for maximum sporulation and were stored in the refrigerator at 10°C for maintenance and screening for citric acid fermentation. The isolates were again propagated in the petriplates on Czapek dox agar medium containing bromocresol green dye as an indicator. The fungal colonies that produced yellowish zone due to citric acid production were further picked up on potato dextrose agar slants for citric acid fermentation in shake flasks.

After a process of screening and rescreening and attempts for further improvement, the *A. niger* strain GCMC-7 was found to be the best producer of citric acid. Thus the strain has been preserved for further exploitation for citric acid production in shake flask and stirred Fermenter at a large scale leading to industrial level production.

Project No: **S-KU/Bio(222)**
Project Title: **Plasmids of Indigeneous Pseudomonads: Molecular Characterization and Gene Manipulation.**

Duration: 3-years

Date of Initiation: 01.09.1994

Date of Completion: 31.8.1997

Location of Scheme: University of Karachi, Karachi

Principal Investigator: Dr. Sheikh Ajaz Rasool

Total Expenditure: Rs. 569,438/-

Main Objectives: To isolate large varieties of pseudomonads from indigenous sources useful for genetic manipulation studies.

Plasmids isolated will be used to study for their broad host range properties.

To test different degradative plasmids for biodegradation of biopesticieds hydrocarbons and toxic metal ion utilization.

To use representative prospective bacterial strains for extraction/isolation and characterization of different types of plasmids.

To study the purified version of plasmid DNA having different markers.

Summary of work done:

The present research findings are concerned with the isolation of pseudomonads from different pathological/diagnostic laboratories/hospitals of Karachi, and from environment (soil and water) . More than 200 isolates were characterized as *Pseudomonas aeruginosa.* All of the isolates were screened for drug resistance against different concentrations of eight antibiotics. The results of the present studies are alarming because of the increasing trend of multiple drug resistance. It appears that *Pseudomonas aeruginosa* has developed very powerful resistance against commonly used antibiotics due to their haphazard use and transmissible nature of resistance plasmid. Indeed, it is one of the most inherent antibiotic resistance organism encountering in the clinical laboratory. Present study shows that resistance to ampicillin and cefalexin is the most common. All the isolates (100%) offered resistance against cefalexin (upto 500 ug/ml) and 99% (upto 500 ug/ml) against ampicillin. However gentamicin (an aminoglycoside), polymyxin B and ceftazidime (3^{rd} generation cephalosporin) resistance has been the least, yet 6% and 9% of the isolates were found to be resistant upto 500 ug/ml of gentamicin and ceftazidime respectively, indicating that the resistance profile against these antibiotics has gradually increased in Pseudomonads. Resistance to the drugs by common bacterial is worldwide both in the developed and the developing countries. It has been argued that there is a direct relation between the antibiotic used and the frequency and kinds of antibiotic resistant strains in human beings.

The isolates were also screened for hydrocarbon degradation using solid and liquid hydrocarbons. About 3% of the isolates were found to degrade phenantherene, while 100% of the isolates degraded octane (liquid hydrocarbon). Most of the novel pollution phenomena are related with the man-made organic chemicals like pesticides, plastics and other synthetics that persist, degrade slowly or, are converted to less desirable residues. All the isolates were also monitored for metal resistance against six metals. Most of the isolates were found to be resistant against cadmium chloride, nickel sulphate and lead acetate.

Plasmid transfer among bacteria, provides a means for dissemination of anitmicrobial resistance among clinically significant pathogens. We observed the transfer of gentamicin resistant plasmid from 2 *Pseudonas* strains to *E.coli* FPL5014 cells. The presence of gene for gentamicin/ampcillin resistance in different Pseudomonads was confirmed by DNA hybridization with gentamicin probe (pGO500) using ECL Kit. In fact, presence of cojugative and mobilizable multiple drug resistance factors have been instrumental in posing problems related to the management of clinico-medical therapy.

Project No: **P-CSIR/Bio (223)**
Project Title: **Amaranthin Production through Cell Suspension Cultrues of *Celosia cristata.***

Duration: 2-years

Date of Initiation:	01.6.1995
Date of Completion:	31.5.1997
Location of Scheme:	Biotechnology & Food Research Centre PCSIR Laboratories Complex, Lahore.
Principal Investigator:	Dr. A.F.M. Ehteshamuddin/Miss Sadia Ehsan
Total Expenditure:	Rs.3,46,636/-
Main Objectives:	Development of a process for production of natural food color, Amaranthin, from cultured cells of *Celosia cristata,* using cell suspension culture technique.

Summary of work done:

Colouring agents, both natural and synthetic, are used in many food products to enhance their appearance and appetizing qualities. Toxic effects of many synthetic colouring materials have been established, such materials consumed even in small quantities over a sufficiently long period of time might produce cancer. Where as these natural pigments are harmless, and are being ingested by human beings in fruits and vegetables in heir every day food.

The present study was aimed at the developmental extraction of natural colours from callus and flowers of *Celosia cristata* . It has been observed that colours of the two are quite identical in chemical as well as physical properties. Cultured cells of *Celosia cristata* can be exploited commercially round the year. Presently, this technique seems quite useful for the production of natural coloring pigments in desired quantities. Moreover, the study has also proved that the natural colours can be established and isolated without the use of chemicals. The authors have suggested that the work may be further established on following lines.

There is an urgent need to continue the efforts to develop techniques for the production of natural colours/pigments by suspension cultures form selected colored callus strains. Optimization of extraction from the cultured callus keeping in view the stability of these products.

Project No:	**S-KU/Chem(240)**
Project Title:	**Biodegradable and Safer Nematicides from Natural Sources.**
Duration:	1-year
Date of Initiation:	17.8.95

Date of Completion:	16.8.96
Location of Scheme:	H.E.J.Institute of Chemistry, Karachi.
Principal Investigator:	Dr. M. Iqbal Chaudhry
Total Expenditure:	Rs.1,12,485/-
Main Objectives:	To carry out bioassay directed isolation of nematicidal compounds from higher plants and marine organisms using general cytotoxicity and in-vitro anti-nematode bioassays.
	To determine the chemical structure of active compounds using modern spectroscopic techniques.
	To carry out field studies of nematicidal compounds and extracts in the experimental agricultural fields by growing different crops with and without their application.

Summary of work done:

Plant diseases cause serious losses to crop plants and adversely affect the agricultural economy of the country. Of the plant disease causing organisms like fungi, bacteria, viruses and nematodes, the plant parasitic nematodes have been recognized as one of the greatest threat to crop production. Of these, the root-knot nematodes are the most important pests of the world. For the control of these nematodes, synthetic nematicidals have been used but due to their phytotoxic effects, bio accumulation and hazards to environment, there is need to develop alternative strategies for the control of nematodes.

The project tested nematicidal activity of extracts from five plants abundantly available in Pakistan, *viz., Atriplex stocksi, Azadirachta indica* (Neem), *Datura fastuosa, Eichornia crassipes,* and *Syzygium cumini,* a brown marine alga *Dictyota hauckiana* and a marine animal *Zaonthid* in the control of *Meliodogyne javanica* root-knot nematode. In *in-vitro* studies an increase in concentration of extract upto 1000ppm, a decline in hatchability of the eggs and mortality of J2 larvae of *M. javanica* root-knot nematodes was observed with decreasing effect @ 100 and 10 PPM concentration. In *in-vivo* studies, more than 50% reduction in root-knot development was observed on mungbean, egg plant, chilli, tomato and okra used as test plants. An increase in the length of root and shoot was also observed especially in treatment where extracts were applied along with infection with root knot nematodes. Soil drenching with water suspension of extracts of *D. fastuosa* significantly inhibited root knot gall formation and growth of mungbean, chilli and okra where as there was no effect on egg plant and tomato. *C. crasips* and *D. hauckiana* showed significant reduction of root-knot development of mungbean followed by *A. indica, A .stocksi, D. fastuosa, S. cumini* and *Zoanthid,* where in chillies *A. indica* showed better results followed by *A. stocksi.* Investigation on *Zoanthid* have resulted in the isolation of a number of nematicidal constituents.

A research paper entitled, "Nematicidal Activity of Marine Organisms" based on this project has been published.

Project No: **C-QU/Chem.(246)**
Project Title: **Impedance Spectroscopic Studies of High Tc. Superconductors Ceramics at Super Conducting state.**

Duration: 3-years

Date of Initiation: 1.7.93

Date of Completion: 30.6.96

Location of Scheme: Quaid-i-Azam University, Islamabad.

Principal Investigator: Dr. Mehboob Mohammad

Total Expenditure: Rs.8,24,421.00/-

Main Objectives: To construct equivalent circuit(s) representing the electro chemical process of ceramic at super conducting state through impedance measurements.

Summary of work done:

Under this project impedance spectroscopic studies on high Tc. Super Conductors were proposed at Super Conducting state to investigate the RC equivalent of circuit(s), thus obtaining the information about various resistances, capacitances and impedances and their origin.

Studies were carried out on electrochemical spectroscopic studies as super conductor-electrolyte system. For this purpose a non freezing solution at 77K was developed. However no useful information could be obtained. Subsequently, impedance measurements on Y-based and ER-based ceramic samples were carried out at various temperatures. The log-log conductivity frequency provided some interesting information about slope and related parameter such as energy barriers binding energy and hopping distance. Attempts were made to prepare thin film of super conductors and some new doped super conductors. Impedance studies on these super conductors led to the interpretation of the Nyquist and Bode plots and *the evaluation of trapping parameters.*

The results obtained during three years report period were not according to expectations of the researchers, since the studies were carried on pre final sintering samples. However, further studies are being carried out on final -sintering samples.

Project No: **P-CSIR/Chem(258)**
Project Title: **Production of Edible Rice Bran Oil.**

Duration: 2-years

Date of Initiation:	21.7.93
Date of Completion:	20.7.95
Location of Scheme:	PCSIR Laboratories Complex, Lahore.
Principal Investigator:	Dr. M. Yaqub Rai.
Total Expenditure:	Rs.2,87.220/-
Main Objectives:	Designing and fabrication of extrusion stabilizer, solvent extraction unit, devaxing bran, removal of vax from the oil and for the refining , bleaching and deoderization of the oil. Extraction, devaxing, refining, bleaching and deoderization of the oil. Hydrogenation of oil for the production of Banaspati Ghee.

Summary of work done.

Under the project, studies were undertaken to extract edible oil from rice bran which is available in abundance as a by-product of rice processing industry. The brown rice obtained after removal of husk, is polished to remove the thin layer on the rice to get rice bran in the form of fine powder. This powder contains oil and other products and can be utilised for the production of edible oil.

The locally developed continuous type "Extrusion Stabilizer" was used for the stabilization of the rice bran. The solvent extraction pilot unit was locally designed and fabricated. It consists of (i) solvent reservoir, (ii) oil extractor, (iii) miscall reservoir, (iv) condenser with tubes, (v) desolventizer, (vi) pumps and other accessories. The function of the Solvent Extraction Pilot unit is not only to extract oil but also to separate solvent from the oil. The entrapped solvent from the oil and the meal is also removed.

The refined and bleached Pakistani rice bran oil was compared with the imported Korean oil. The physio-chemical values , such as free fatty acid contents, colour, saponification number and iodine number of the local oil were comparable with the imported Korean oil.

Project No: **C-QU/Chem(265)**
Project Title: **Synthesis, Structure and Pharmaceutical studies on some new 4,1-oxazepine-2,5-dions.**

Duration:	2-years
Date of Initiation:	20.6.95

Date of Completion: 19.6.97

Location of Scheme: Quaid-i-Azam University, Islamabad

Principal Investigator: Dr. Mrs. Naeema Khan.

Total Expenditure: Rs.2,04,195/-

Main Objectives: To synthesize some new derivatives of 4,1-Benzoxazipine 2,5-Diones with different substituents at N-1 and C-3,

To try for the preparation compounds with Sulphur atom in place of Nitrogen by altering known methods which have not succeed,

To study the anti-tumor activity of the compounds thus synthesized at H.E.J. as well as Cancer Research Centre, Bethesda, Mary Land, USA.

Summary of work done:

The 4,1-Bzoxazepine diones constitute an important class of biologically active heterocyclic compounds. They show biological activity i.e. diuretic, chloretic, CNS depressant, antihistaminic and anti-inflammatory. The aim of this project was to synthesize some of these compounds, establish their structure by IR, NMR, MS etc. and study their chemical and biological activities.

In the project, 22 compounds were synthesized in all, out of which 10 were new compounds. These compounds were purified by thick layer chromatography or column chromatography and their structures were established. The Antibacterial studies of some of these compounds were carried out in collaboration with the Department of Biological Sciences, Quaid i Azam University, Islamabad, against two species of bacteria i.e. *E.coli* and *B.subtilus*. The standard antibiotic used for comparing results was Fortrum.

It is an established fact that the activity of a compound depends on the main ring system as well as the substituents. Previously the substituents were mostly changed on the benzene ring. During this study an attempt was made to change the substituents on the N-atom which produced encouraging results. This led to try different substituents at C-3, another probable position for substitution. On the basis of project results, 3 papers were published where as one student completed her M.Phil. work.

Project No: **F-PU/Chem(286)**
Project Title: **Preparation and Characterization of Reforming Catalysts.**

Duration: 2-years

Date of Initiation: 1.10.95

Date of Completion:	30.9.97
Location of Scheme:	University of. Peshawar, Peshawar
Principal Investigator:	Dr. Mohammad Ilyas
Total Expenditure:	Rs.1,98,720/-
Main Objectives:	To find and select the best method for preparation of $Cu\text{-}Cr_2O_3$ catalyst.
	To find a suitable support for these catalysts which increases the rate of reaction using a small amount of catalytic material.
	To study processes for activation and deactivation of these catalysts.

Summary of work done:

Catalyst industry is vitally dependent upon the formation of new and improved catalyst materials. Reforming catalysts are an essential part of Petroleum and Petrochemical Industries. The present studies were carried for the preparation of supported $Cu\text{-}Cr_2O_3$ Catalysts.

Copper-Chromia catalysts in 3,5 and 10% weight of Cu on Chromia were prepared and characterized by surface area measurement, scanning electron microscope and X-ray diffraction studies after treatment in various conditions. It was found that physical characteristics as well as catalytic activity is affected by conditions of pretreatment. Controlling the rate of rise in temperature to reach the calumniation temperature resulted in the formation of high surface area catalysts with well dispersed copper particles on chromia. Three models, (i) Cyclohexane conversion to benzene, (ii) Isopropanol conversion to acetone and (iii) cyclohexanol conversion to cyclohexanone were tested. It was found that reaction No. (i) could be catalyzed efficiently in oxygenated atmosphere, whereas reaction No. (ii) was efficiently catalyzed in non-oxygenated atmosphere. These catalysts were not very effective to catalyze reaction No (iii) even when 10% $Cu\text{-}Cr_2O_3$ /ZrO_2 was used as catalyst both in oxygenated and non-oxygenated. However conversion in oxygenated atmosphere was better than in non oxygenated atmosphere.

Regeneration of these catalysts was achieved by simple treatment of keeping the catalyst in N_2 flow for 90 minutes at 473 K. Cyclohexane conversion was found to be a kinetically controlled reaction, whereas the Langmuir-Hinshewood/Eley-Rideal type reaction mechanism could be involved.

Project No: C-QU/Phy(73)

Project Title: **Weak Interaction in a Medium and their Implications in Astrophysics/ Cosmology.**

Duration:	3-years
Date of Initiation:	1.9.1991
Date of Completion:	31.8.1994
Location of Scheme:	Quaid-i-Azam. University, Islamabad
Principal Investigator:	Dr.Kamal-ud-Din Ahmad
Total Expenditure:	Rs.2,57,619/-
Main Objectives:	To study the induced neutrino mass and its implications based on neutrino oscillations, using the finite temperature and density QFT method in the following problems: Solar neutrino problem which has become of considerable importance and significance because of the expected laboratory data Nucleosynthesis [10] baryogenesis Neutrino data from supernove 87A Daek Matter The fundamental issue of the nature and origin of the neutrino mass itself.

Summary of the work done:

In the Standard Model of elementary particles, neutrinos are exactly massless. However, this is an assumption, since masslessness of neutrinos is not ensured by any basic principle or by observations. Non-zero neutrino masses arise in many extensions of the Standard Model. Massive neutrino and its associated properties, such as the dispersion through medium, matter induced mixing with other neutrino states and its electromagnetic interaction, have important consequences in astrophysics and cosmology.

Under the project the following three aspects of this problem relating with the neutrino dispersion in medium were investigated:

Matter induced spin flavour neutrino oscillations at finite temperature and density;
Neutrino oscillations and Faraday Effect;
Neutrino dispersion in a minimal SUSY Model with explicitly broken R-parity at finite temperature and density.

With respect to aspect No.(i) the index of refraction of a weakly interacting massive Dirac neutrino was investigated. Calculation in a particular extension of the Standard Model by Fukugita and

Yanagida were carried out. This model is designed to give maximal neutrino magnetic moment required for the above mentioned oscillation scenario. The range of oscillations parameters for the solar neutrino problem has been predicted. Furthermore ,the application of the result to birefringence phenomenon in the early universe have also been discussed. With respect to aspect No (ii) an investigation of an effect analogous to the Faraday effect for a massive neutrino de Broglie wave has been carried out. This study led to a general understanding of the nature of neutrino and provides a natural and consistent choice of the oscillations parameters corresponding to different oscillations scenarios, like matter induced flavour oscillations.(MSW effect) spin rotation induced by magnetic field (OVV effect) and matter induced spin flavour oscillations. A detailed numerical study for the MSW-flavour oscillations case has been reported in the framework of Faraday effect. Aspect No (iii) is a super symmetric generalization of the work carried out under aspect No (i) The field theory super-symmetric standard model with explicitly broken R-parity was extended to finite temperature and density, where fermiones coupled to famines give rise to chirality conserving as well as chirality violating neutrino transitions. The refractive index of the neutrinos undergoing such transitions in a heat bath of finite density was then calculated in this framework. Some of the implications of these results to the MSW resonance and in the early universe have been discussed and compared with earlier works.

Eight research papers based on the work conducted under this project have been published/submitted for publication in national and international journals or presented in symposiums. Two research Scholars completed their Ph.D. degrees where as three students completed their M.Phil. degrees during this project.

Project No: **C-QU/Phy(87)**
Project Title: **Characterization of Radiation Induced Defects in Semiconductors**

Duration:	3-years
Date of Initiation:	1.11.1993
Date of Completion:	31.10.1996
Location of Scheme:	Quaid-i-Azam University, Islamabad
Principal Investigator:	Dr. Mrs. Naseem Zafar
Total Expenditure:	Rs.3,55,683.00
Main Objectives:	To carry out investigations of Alpha (α) and Gamma (δ) radiation induced deep level defects in semi-conductors by studying their optical properties and annealing characteristics.

Summary of work done:

Radiation induced defects in semiconductors is an important field of research. The study of radiation effects on the deep level in semiconductors is important both from

electron device performance point of view as well as from fundamental physics of defects in semiconductors point of view. Degradation of semiconductor devices due to radiation damage is a major problem in their use in radiation rich environment because of the fact that fast particle bombardment introduces lattice defects into crystalline solids. In semiconductors , radiation studies are very important due to the extreme sensitivity of their electronic characteristics to the defects produced by interaction with radiation.

The experiments were undertaken using deep level transient spectroscopy (DTLS).to measure various parameters characterizing a deep level defect. These included the thermal emission rates, activation energies, carrier capture cross sections and its temperature dependence. The samples used were prepared from pre fabricated n pp junctions. These samples were irradiated using different semi conductor materials such as Si, GaP, and InP. A new result which emerged from these experiments reveals that the transition metals used readily form complexes with Fei, making it unable for reversible pairing with boron atoms. Among the transition metals used by the researchers, Au is known to form the complexes with iron in both n and p type Si, while a Pd-Fe complexes has recently been proposed in n-Si. It is also possible that iron forms some additional complexes in the presence of gold or other transition metals used in the experiments to account for the loss of Fei donar signal in silicon doped with these metals. It is speculated that the conventional deep level defects, normally attributed to these impurities may itself be this hidden complex. It is, however, clear that the introduction of transition metals provide a simple method for selectively bleaching the iron donor and hence avoiding the effects of the isolated iron impurity in silicon.

Based on the work done under this project, four papers have been presented in national/international workshops/symposia and two research scholars got their Ph.D. degrees where as one student got his M.Phil. degree.

Project No. **C-QU/Phy (85)**
Project Title: **Hard Processes in Nuclear/Particle Physics.**

Duration:	3-years
Date of Initiation:	1.10.1993
Date of Completion:	30.9.1996
Location of Scheme:	Quaid-i-Azam University, Islamabad
Principal Investigator:	Dr. Pervez Amirali Hoodbhoy
Total Expenditure:	Rs.2,19,143/-
Main Objectives:	To investigate large momentum transfer processes in atomic nuclei and nucleons using QCD to study deep structure of these systems.

Summary of work done:

Heavy quarks make application of Perturbative Quantum Chromodynamics possible and meaningful. This is because of the phenomenon of asymptotic freedom which weakens the strength of the interaction at large momentum scales. Under this project the following three areas of research have been studied in detail:

Prompt photon emission in γ decays
J/ψ photo production in the forward region
Fragmentation of heavy quarks into quarkonia.

The rate for $^3S_1 \rightarrow \gamma + X$ has been computed taking into account the bound state structure of the decaying quarkonium state. Improvement requires introduction of additional hadronic quantities, which are identified within the context of a systematically improvable gauge-invariant theory for quarkonium decays. The method developed by the Particle-Nuclear group at Quaid-i-Azam University has been applied to the more complicated three particle case and obtain the photon spectrum for the process $\gamma \rightarrow \gamma + 2g$. It has been found that inclusion of binding and relativistic effects via the two additional parameters, E_B/M and $< ^2 0(0)/M^2 0(0)$, makes the computed spectrum softer for large z.(z. < 0.9). For still larger z, $0.9 < z < 1$, there are non-parturbative effects due to final-state gluon interactions which cannot be reliably computed.

In the second area of research, it has been shown that the important problem of forward J/ψ photo production can be understood in terms of a simple, parameter-free, model. The incident photon, considered to be nearly real here, fuses with a gluon from the target proton to form a colour octet QQ^- pair in the $^3S_0$, $^3P_0$ and $^3P_2$ states. The size of the octet is of O(m-1) where m, the quark mass, is assumed to be much larger than the QCD scale A. Subsequently, the octet propagates and increases its size. Since the quarks are assumed heavy, the repulsive force between quarks is Coulombic and the non-relativistic propagator can be exactly calculated. The system is still small when it finally absorbs, or emits, a low momentum gluon from the ambient QCD vacuum and converts into the final 1—state. It is assumed that, viewed from the proton rest frame, the produced QQ octet moves rapidly away from the proton debris and its decay is, therefore, uninfluenced by co-movers and thus the hadron from which it was formed.

The third area of research considered in this Project concerns fragmentation. Relativistic and binding energy corrections of O(v2) to the fragmentation functions for charm quark splitting into J/ψ and η_c are calculated. It has been shown how these corrections can be expressed in terms of various bound state matrix elements of gauge-invariant quark and gluon operators. In the absence of the said corrections, these results reduce to the leading order result of Braaten et al., as expected. The modified fragmentation functions are used to estimate the contribution of relativistic and binding energy corrections to the corresponding branching ratios in $Z_0 \rightarrow \psi cc$ decays. Since the average value of v^2 for charmonium is about 1/3, one expects the effect of $O(v_2)$ terms not to be negligible. It is found that in case of J/ψ these corrections contribute about 38% to the lowest order $c \rightarrow c\, J/\psi$ result, though for η_c this effect does not exceed more than a few percent.

Project No: **C-QU/Phys (90)**

Project Title: Studies on Anisotropy and Vortex Motion in Melt Texture Grown Super conductors.

Duration:	3-years
Date of Initiation:	1.7.1994
Date of Completion:	30.6.1997
Location of Scheme:	Quaid-i-Azam University, Islamabad.
Principal Investigator:	Dr.Syed Khurshid Hasnain
Total Expenditure:	Rs.1,92,963/-
Main Objectives:	Development of melt texture grown superconductors with large critical currents and well developed bulk anisotropy and identification of crucial parameters for this process Investigation of the anisotropic magnetic and conduction response. Investigation of the vortex excitation , dynamics and structures.

Summary of work done:

The discovery of high Tc superconductors has spurred efforts in two major directions (a) to understand the mechanism of superconductivity, (b) to comprehend the complex and anisotropic magnetic and transport properties of these material. The focus of this project was to prepare and study the magnetic and transport properties of oriented, polycrystalline high Tc superconductors, with special emphasis on their anisotropy.

The dc and ac magnetization studies of these materials, focusing on the properties of the vortices were conducted and an understanding of the factors limiting the critical currents in various crystallographic directions was obtained. The dynamics of vortex motion in these materials was also studied by the methods of magnetic relaxation, field sweep rate dependence and ac susceptibility in superposed dc fields. The studies revealed that the barriers to vortex motion, and subsequent dissipation, are lowered in dc fields and in particular in crossed ac and dc fields the effects are drastic. It has also been found that the decrease in critical currents with increasing fields can be explained on the basis of the so-called *Critical state model* for fields applied parallel to the c-axis, while the behaviour perpendicular to the same is quite different. The transport measurements were conducted and the role of the (JxB) force as well as an angle independent, phase slip contribution to the dissipation was identified. These studies constitute

part of the major international effort to determine the electrodynamics of layered, anisotropic superconductors, the mechanisms determining the losses, and the anisotropy of their response.

The studies have provided a deeper understanding of the effects of the highly anisotropic, layered structure of the high Tc compounds. The results of the study have enabled the researchers to explain the differences observed in the reversible an irreversible components of magnetization, as a function of the orientation, in terms of the differences of self energy and pinning energies of the vortices respectively. The studies have also enabled them to explain the shapes of the M(H) loops and variations of the critical currents on the basis of the critical state model. It has been found that the behaviour of the dynamics could be studied in the conventional magnetic relaxation and swept field experiments and the pinning potentials for various orientations and fields determined. The studies showed that the effect of a crossed field is to lower the barriers to activation of vortex motion and thereby increase dissipation. This latter behaviour was reported for the first time and was related by researchers to the differences in the vortex coherence between low and high temperatures.

Seven publications have been produced on the bases of the research work done under this project. Moreover two (2) Ph.D. and Nine (9) M. Phil thesis have been completed under this project.

Project No: **C-QU/Phy(92)**
Project Title: **An Experimental Study of Plasma Focus Discharge**

Duration:	3-years
Date of Initiation:	1.10.1994
Date of Completion:	30.9.1997
Location of Scheme:	Quaid-i-Azam University, Islamabad
Principal Investigator:	Dr. M. Zakaullah
Total Expenditure:	Rs.321,659.02
Main Objectives:	This project aimed at investigating experimentally, the following problems; X-ray study and imaging, Focus Plasma Shadowgraphy, Optical Radiation Study.

Summary of work done:

Dense Plasma Focus is a simple machine which generates high temperature Plasma for investigation of D-D and D-T fusion. During operation, intense neutron, charged particles and

X-ray bursts are emitted, which enrich the scope of DPF as radiation source for material research, x-ray microscopy and lithography. The device consists of coaxial electrode system, one in the form of rod at the axis while the other is a set of rods which forms a perforated cylinder surrounding the central electrode.

Under this project the results obtained from experiments on three machines, two developed by the Quaid-i-Azam University and one developed by PINSTECH, were compared and reanalyzed to understand the dependence of different mechanical parameters thereof. It was found that proper tuning of the focus tube inductance with that of the driver enhances the neutron emission from the focus region, increase the neutron pulse width and broadens the deuterium pressure range for high neutron yield. The insulator contamination which occurs due to Cu evaporated from the electrodes drastically changes the device characteristics. The possibility of using the device as a multi-pulse neutron generator is also examined.

The solid state nuclear track detectors (SSNTDs) CR-39 were used to investigate the fluence of anisotropy of charged particles emitted from the focus region. The charged particles flux is the highest in the axial direction and decreases towards the radial direction.

The x-ray and neutron emission was investigated using time-integrated and time resolved detectors. The neutron emission profile is broader compared to the x-ray emission profile and also delayed by 30-40 nsec. Correlation of charged particles with neutron and x-ray emission is investigated.

Anodes of three different types: cone shaped anode, tapered anode and cylindrical flat end anode were used to investigate their effect on PF dynamics. Computational results predict that that the strength of the magnetic flux density at anode surface increases steadily along axial transient of the tapered anode.

The effect of the pressure of magnetic probe placed near the electrode of the device in the current sheath dynamics was also investigated. It was found that the current sheath during the radial collapse phase strongly interacts with the magnetic probe jacket and climbs over it upto several centimeters. X-ray images recorded for Argon clearly indicate that the size as well as the intensity of the x-rays source is significantly enhanced compared to the case when no probe is inserted.

With stainless anode, neutron and x-ray emission is investigated by employing time integrated and time resolved detectors. The neutron yield of 3.5×10^8 is observed which is almost double the yield when copper anode is used. It is speculated that low sputtering yield of the anode material lowers the impurity concentration in the plasma and thus enhances the neutron yield. One may, therefore, conclude that proper choice of the electrode material is essential to achieve enhanced radiation yield from plasma focus discharge.

Eight (8) research papers based on the work done under this project were published in National and International journals.

Project No: **C-CEME/Phy(103)**
Project Title: Fabrication of Cadmium Telluride Solar Cell by Closed Space Sublimation

Duration:	3-years
Date of Initiation:	15.6.1995
Date of Completion:	14.6.1998
Location of Scheme:	College of Electrical and Mechanical Engineering, Rawalpindi.
Principal Investigator:	Col. Dr. Nasim A. Khan
Total Expenditure:	Rs. 4,39,140/-
Main Objectives:	Design and fabricate an experimental set up for deposition of Cadmium Telluride Solar cell, Deposit layer of Cadmium Sulphide film, Deposit layers of CdTe films, Fabricate CdTe solar cell, All the above fabrications and designing were to be done by Closed Space Sublimation (CSS).

Summary of work done:

A decisive factor in large scale utilization of photovoltaic solar cells is its cost. Efforts are directed internationally to reduce the cost of solar cells to make them considerably economical for generation of electric power. Under this project efforts were made to fabricate thin films for manufacture of low cost solar cells by closed space sublimation (CSS).

The solar cell fabricated under this study has three distinct layers of thin films. A Tin Oxide film is deposited under the glass which acts as a transparent top conducting layer. Under this layer another layer of Cadmium Sulphide (CdS) is deposited which acts as n-type layer. Under CdS layer a p-type layer of Cadmium Telluride (CdTe)is deposited through CSS.

The process of CSS is carried out in low grade vacuum created by mechanical pumps where the sublimation of material takes place in closed environment on to the glass super strate.

iii) <u>Scientific Publications Produced through PSF-Supported Projects</u>

An important parameter of scientific achievement and a way of utilization of research results is their publication in research journals of repute. During the year, total of 51 research

papers were published out of the results of above projects completed during the report period. The list is given in Annexure-IV.

iv) Higher Degrees Earned through PSF-Supported Projects

One of the major goals of the Foundation is strengthening and development of scientific manpower in the country. Thus in recent years, PSF has been encouraging scientific manpower development through its projects. Under the Program, Research Associates (RAs) are appointed in the projects instead of Research Officers. The Research Associates are required to register for Ph.D or M. Phil and may complete their degrees during the project period.

During the past year, 7 Ph.D., 13 M. Phil and a number of M. Sc. degrees were awarded through the completed projects as detailed below.

S.No.	Name	Degree	Project No.
1.	Two (Names not available)	M.Sc.	PSF/Res/SAU/Agr (106)
2.	7 Graduates	B.Sc. (hons)	AJK-UCR/Agr (132)
3.	Mr. Zaheer Anwar	Ph.D.	P-PU/Agr (137)
4.	6 Graduates	M.Sc.	P-PU/Agr (138)
5.	Mahnaz Qader	Ph.D.	C-QU/Phy(73)
6.	Farida Parveen	M.Phil.	C-QU/Phy(73)
7.	Athar Hussain	M.Phil.	C-QU/Phy(73)
8.	Muhammad Sadiq	M.Phil.	C-QU/Phy(73)
9.	Mohammad Ali Yusuf	Ph.D.	C-QU/Phy(85)
10.	Umar Saeed Qureshi	Ph.D.	C-QU/Phy(87)
11.	Akbar Ali	Ph.D.	C-QU/Phy(87)
12.	Abdul Muqeet	M.Phil.	C-QU/Phy(87)
13..	Arif Mumtaz	Ph.D.	C-QU/Phy(90)
14.	Mohammad Munib Asim	Ph.D.	C-QU/Phy(90)
15.	A. Kayani	M.Phil.	C-QU/Phy(90)
16.	Majeed Anwar	M.Phil.	C-QU/Phy(90)
17.	Javed Ahmed	M.Phil.	C-QU/Phy(90)
18.	Zehra Abbas	M.Phil.	C-QU/Phy(90)
19.	A. Amirabadizadeh	M.Phil.	C-QU/Phy(90)

20.	Mubarik Ahmad Minhas	M.Phil.	C-QU/Phy(90)
21.	Muhammad Aftab	M.Phil.	C-QU/Phy(90)
22.	Muhammad Asif	M.Phil.	C-QU/Phy(90)
23.	S.A.Satti	M.Phil.	C-QU/Phy(90)

3. SUPPORT TO SCIENTIFIC SOCIETIES/LEARNED BODIES

The promotion of Scientific Societies/Associations, Learned Bodies and Academies engaged in spreading the cause of scientific knowledge in general or in the pursuit of a specific scientific discipline or technology in particular, is an important activity of the Foundation. The Foundation makes annual grants to the established learned bodies and scientific societies, as partial financial assistance for the achievement of their approved objectives and publication of their respective scientific journals. Annual grants amounting to Rs. 0.590 million were released to the following Scientific Societies and Journals during the year 1997-98.

Name of Society/Journal	**Amount of Grant**
1. Pakistan Academy of Sciences	Rs.1,00,000/-
2. Scientific Society of Pakistan	Rs. 50,000/-
3. Pakistan Association of Scientists and Scientific Professionals	Rs. 30,000/-
4. Pakistan Association for the Advancement of Science	Rs. 50,000/-
5. Zoological Society of Pakistan	Rs. 40,000/-
6. Pakistan Botanical Society	Rs. 35,000/-
7. Pakistan Society of Biochemistry & Molecular Biology	Rs. 25,000/-
8. Institute of Engineers, Pakistan	Rs. 20,000/-
9. Pakistan Society of Nematologists	Rs. 15,000/-
10. Society of Economic Geologists and Mineral Technologists (SEGMITE)	Rs. 20,000/-
11. Pakistan Society for Semiconductors	Rs. 15,000/-
12. Biological Society of Pakistan	Rs. 20,000/-
13. Pakistan Medical Association	Rs. 15,000/-
14. Pakistan Thalassaemia Welfare Society	Rs. 25,000/-
15. Punjab Mathematical Society	Rs. 15, 000/-
16. Institute of Elect. & Electronics Engineers	Rs. 25,000/-
Publications/Journals	
1. Pakistan Journal of Pharmaceutical Sciences	Rs. 10,000/-
2. Mehran University Res. J. of Engineering & Tech.	Rs. 10,000/-
3. Pakistan Oral & Dental Journal	Rs. 10,000/-
4. Pakistan Veterinary Journal	Rs. 20,000/-
5. Pakistan Journal of Pharmacology	Rs. 20,000/-
6. Journal of Natural Science & Mathematics	Rs. 10,000/-
7. Pakistan Journal of Mineral Sciences	Rs. 10,000/-
Total:	**Rs.5,90,000/-**

4. FUNDING FOR CONFERENCES/SEMINARS/SYMPOSIA/WORKSHOPS ETC.

To enable scientists to share their knowledge and research experience with each other, the Foundation provides partial financial assistance to Universities and R&D Organizations for organizing Science Conferences, Seminars, Symposia, Workshops etc. This is a continuing activity of the Foundation and during the report year, grants amounting to Rs.0.4274/- million were released to various Universities and/or R&D Organizations/Institutions for organizing National/International Conferences, Seminars, Symposia and/or Workshop etc. (Annexure-V).

5. TRAVEL GRANTS

The Foundation, as per its Charter, has been providing travel grants to Pakistani Scientists, Engineers and Doctors for presentation of their research findings in International/Regional workshops, Conferences, Seminars etc. abroad. The purpose of this program is to enable our research workers to interact with their counter-parts in the advanced countries and exchange views with them. This program also provide our scientists the opportunity to learn about the latest research techniques in the developed word. The activity under this program remained nominal because of the ban imposed by the Government on utilization of GoP funds for travel abroad for participation in Workshops, Conferences, Seminars, etc.

During the year the following travel grants could be released to scientists who succeeded in obtaining N.O.C. for availing the PSF travel grants;

Name and Address of Scientist	Conference Attended	Amount Paid
Dr. Farhat Fatima Jamil, PSO, NIAB, Faisalabad.	53rd Annual Session of the Sri Lanka Association for the Advancement of Science, December 8-12, 1997.	Rs.16,790/-
Dr. S. Sakhawat Shah Department of Chemistry Quaid-i-Azam University, Islamabad.	International Science Conference on Sulfur & Colloid Science, held at Sofia, Bulgaria 6-12, 1997.	Rs. 27,510/-
.Dr. M. Saleem Department of Chemistry Quaid-i-Azam University, Islamabad	International Science Conference held at Kualalumpur, Malaysia, May 7-9, 1998	Rs.30,675/-

6. INTERNATIONAL LIAISON

The Foundation, in order to explore possibilities of undertaking collaborative Research Projects, share knowledge and exchange of expertise between Pakistani scientists and scientists in other countries, especially those in the developed countries, has developed contacts with several agencies in those countries. The PSF had been acting as Focal Point for the US-NSF

sponsored research projects till its discontinuation few years back. The PSF has signed an M.O.U with the Royal Society of London for exchange of scientific visits. Under this M.O.U the visits of Pakistani scientists to laboratories of research institutions in UK are sponsored. Thus they find an opportunity to learn about the latest research techniques. In some cases they also conduct research in those laboratories under the guidance of senior British Professors. In exchange to these visits, scientists from UK are invited for delivering lectures/seminars or conduct field work with Pakistani scientists. Thus our research workers are benefited from the experience of British scientists. The Foundation has also signed an M.O.U. with the National Science Foundation of China for exchange of visits and conduct collaborative research projects. Five collaborative projects have been initiated by scientists from different universities and research institutions with their counter part scientists in China.

Participation of Chinese Scientists in the 3rd National S&T Fair, 1997

During the report period, a seven members team from Chinese Academy of Sciences participated in the 3rd Science and Technology Fair held from October 4 to14, 1997 at Islamabad. They exhibited products of various Chinese R&D organizations.

7. PLANNING AND DEVELOPMENT WORK

a) Establishment of Pakistan Museum of Natural History (Phase II)

Contract was awarded for the construction of Block II of Pakistan Museum of Natural History, Islamabad. It was done through pre-qualification of construction companies and subsequently inviting tenders from those who were pre-qualified for the job. The block has since been completed and the Public Services Division of the Museum, which was working in a rented building, has shifted to the newly constructed block.

b) Establishment of Science Centre at Faisalabad

A piece of land for the construction of PSF Science Centre at Faisalabad was acquired from the Agriculture University Faisalabad. The PC-I for the establishment of Science Centre was prepared and got approved from the PSF D.D.W.C. Consultants were engaged for preparing design of the Centre building. Contract for the construction of the building was awarded by inviting tenders from qualified contractors. The construction work remained in progress during the report period and is expected to be completed soon.

II. SCIENCE POPULARIZATION SECTION

Popularization of Science is one of the statutory functions of Pakistan Science Foundation. The Foundation is engaged in such activities on national level with the aim of increasing awareness about the role played by Science in improving and cultivating scientific minds. In order to achieve this objective, the Foundation has taken up a number of programs to popularize Science in the community, particularly among the students. These activities/programs are detailed as under:

1. SCIENCE CARAVAN (MOBILE SCIENCE EXHIBITION)

Science Caravan is a Mobile Science Exhibition that has been designed to increase public awareness about science, and to motivate the younger generation of Pakistan toward the study of Science.

Through the Mobile Science Exhibition, the people living in rural and backward areas of the country are exposed to some of the most fascinating scientific and technological developments of modern world. All narrations are in national language, and are accompanied by simple illustrations. At present, five Science Caravan Units are operating in the provinces of Balochistan, Sindh, NWFP, Punjab and Federal Areas.

The Foundation has decided to upgrade and add new models in the Science Caravan Units. An order for the preparation of exhibits/models (five each) have been placed with the National Museum of Science & Technology (NMST), Lahore. The total cost of the order amounts to Rs. 901,000/- out of which, Rs. 594,660/- (66%) has been paid in advance to the NMST, Lahore, who would deliver the models within one year. The Foundation is also importing exhibits from M/S Science Kit & Boreal Laboratories, New York. LC amounting to US$ 6869.40 has been opened. The exhibits are expected to be received in October-November, 1998.

The Caravan units continued their activities throughout the report period and organized Science Exhibitions in schools as detailed below.

a) Federal and Punjab Units

S. No.	Place of Exhibition	No. of Schools Attended	Period
1.	Rawalpindi	5	7-8 July, 1997
2.	S&T Fair Islamabad	General Public	4-14 October 1997
3.	Sarina Lodge, Faisalabad	-do-	25th Feb to 1st March 1998.
4.	Chakwal	70	29th April to 31st May 1998
5.	Hunza, Northern Areas	14	11th to 30th June, 1998

b) NWFP Unit

1.	Shangla	15	23rd Sep. to 1st Oct 1997
2.	S&T Fair Islamabad	-do-	4-14 October 1997
3.	Karak	23	17th Nov to 6th Dec 1997
4.	D.I. Khan	General Public	17th Feb to 6th March 98
5.	Kohistan	16	3rd to 13th June 1998

c) Sindh Unit

1.	Khairpur and Kot Diji	65	18th Aug to 20th Sept 97 and 29th Sep to 25th Oct 97
2.	Taluka Nara	7	11th to 17th Feb 98
3.	Nawabshah	General Public	10th to 15th March 98
4.	Taluka Sobho Dero	17	20th April to 5th May 98
5.	Gumbat	24	11th to 27th May 98

d) Balochistan Unit

1.	Quetta City, Mach, Kalpur, Mastung and Kalat	14	24th June to 19th July 1997
2.	Quetta City, Pishin, Killa Abdullah, Chaman and Kucklak	11	8th to 27th June, 1998

2. SCIENCE EXHIBITIONS/FAIRS

The Foundation provides financial assistance to Educational Institutions for organizing Science Exhibitions. The students display Models, Posters, Technical Displays and other Scientific Exhibits prepared by them. Such exhibitions help increase general awareness about science among the masses. The Foundation released an amount of Rs. 32, 400/- to the National Museum of Science & Technology, Lahore for distribution of prize money to the winning students.

a) All Pakistan School/College Science Exhibition Contest

The Intra Board School/College Science Exhibition Contest initiated during the year 1997-98 was successfully completed. Boards of Intermediate and Secondary Education, viz.,

Quetta, Karachi, Sukkur, Hyderabad, Multan, Sargodha, Faisalabad, Lahore Gujranwala, Bannu, Swat and Mirpur (AJK), participated in the contest.

All Pakistan School/College Science Exhibition Contest was organized by the Foundation during the National S&T Fair in October, 1997, at the Pakistan Sports Complex Islamabad. Thirteen Boards of Intermediate and Secondary Education including Karachi, Sukkur, Hyderabad, Quetta, Multan, Lahore, Sargodha, Faisalabad, Gujranwala, Islamabad, Bannu, Swat, Mirpur (AJK) sent their 1st three position holder exhibits & students.

The exhibits displayed by the Foundation were evaluated by a panel of judges who unanimously declared the following results.

School Boys

1.	Mr. Adeel Ashraf, Lamestone Public School, Karachi.	1st
2.	Mr. Gul Sher, Govt. Johar Model High School, Multan.	2nd
3.	Mr. M. Shafiq, Govt. Noor Muhammad High School, Hyderabad.	3rd

School Girls

1.	Miss. Sumaira Hussain, Army Public School, Azam Garh, Lahore.	1st
2.	Miss. Tooba Naseem Quaid-i-Azam Division Public School, Gujranwala.	2nd
3.	Miss. Amna Saeed, Laboratory Girls High School, Faisalabad.	3rd

Colleges

1.	Miss. Asma Mehboob, Govt. Girls College, Gulberg, Lahore.	1st
2.	Miss. Saira Naheed, Federal College for Women, F-7/2, Islamabad.	2nd
3.	Miss. Munazza Riaz, Govt. College for Women, Model Town, Gujranwala.	3rd

An amount of Rs.20,000/- was distributed among the above prize winning students who received their prizes & shields from the Chief Guest at the closing ceremony of the National S&T Fair on 14th October, 1997.

b) National Science & Technology Fair-97

The importance of Science and Technology in the socioeconomic development of a nation is now universally recognized. There have been numerous instances in the world during the recent past which have clearly shown that those nations who have given priority to science education and research, have become economically and militarily most powerful. The examples of Malaysia, Japan, China and South Korea can be cited in this regard. Pakistan, of course, is no exception to this general principle, and thus it has been acknowledged by all concerned that Pakistan must pay special attention to the science and technology sector, if it is to face the challenges of the present day world and enter the 21st century with hope.

Pakistan Science Foundation (PSF), whose primary job is to support and coordinate scientific and technological research in the country, is quite alive to its responsibilities. This organization has also been given an additional mandate of popularization of science, so that, general public, especially the young students become more and more aware of the role science plays in our everyday existence. One of the most powerful means through which science can be popularized is holding of Science Fairs. Such Fairs are held quite regularly by most of the countries of the world but more frequently in the developed world. All kinds of new scientific discoveries and achievements are displayed at such Fairs for the knowledge and understanding of the general public. This kind of interaction not only educates the citizens of the country but also helps in the generation of public support which is highly essential for science to prosper. The "National Science and Technology Fair-97", held in October, 1997 at Islamabad was thus an endeavor of PSF in this direction. This Fair was held as a part of the ongoing Golden Jubilee Celebrations of our Independence. During this Fair, which was held from October 4 to 14, 1997 at the Sports Complex, Islamabad, thousands of visitors including a large number of students had an opportunity to see for themselves the scientific achievements made by our scientists and technologists exhibited at more than 50 stalls. As many as 37 organizations took part in this Fair. The most prominent of these organizations being Dr. A.Q. Khan Research Laboratories, Pakistan Atomic Energy Commission (PAEC), SUPARCO, DESTO, Pakistan Museum of Natural History and Pakistan Science Foundation.

In addition, some NGOs and private organizations such as PANAH and Kundi Eye Hospital also took part in the Fair. Many new inventions such as Badar-II Satellite, Night Vision Cameras, Heat seeking Missiles, Rocket Launchers and Industrial Robots were of special interest. A large number of people including young students were seen thronging such exhibits with utmost interest and excitement. The most encouraging aspect of this interest was the deep and probing questions which the visitors asked regarding various displays. It must be mentioned with a sense of pride that the scientists and technologists responsible for their exhibits responded to these questions with great enthusiasm and insight, thus the students and general public learnt many new scientific facts and principles. According to the organizers of the Fair, more than 10,000 members of the general public and more than15,000 students, belonging to about 150 schools visited the Fair. This number far exceeded the number of persons who visited similar Fairs in 1992 and 1994. This clearly indicated a growing interest of general public and students in the scientific activities of this country's scientists. Their enthusiasm and questioning also

The Chief Secretary, Northern Areas visiting the Science Caravan Exhibition in Gilgit

Science Exhibits being explained to the students by the Caravan Incharge, NWFP Unit.

Chairman, Pakistan Science Foundation, Dr. Khalid Mahmood Khan, presenting welcome address at the Inaugural Ceremony of National Science & Technology Fair.

A view of the guests at the Inauguration of the Fair

The Chief Guest viewing the models displayed by Dr. A.Q. Khan Research Laboratories, Kahuta.

The Chief Guest, Syeda Abida Hussain, Federal Minister for Population Welfare and Science & Technology being introduced to the Chinese Delegation at their stall.

showed that a "Science Culture" is slowly evolving in our society which had not developed so far in our country.

The Fair was inaugurated on October 4, 1997 by Federal Minister for Science and Technology and Population Welfare, Syeda Abida Hussain. During her inaugural address, the Federal Minister lauded the efforts of Pakistani scientists in many sectors of national importance, such as, agriculture, defense and industry. However, she regretted the unchecked population growth in the country and described it as a great impediment in the overall improvement in the socio-economic conditions of the people of Pakistan.

In addition to the main Fair, a large number of collateral activities were also held as part of the Fair. As many as Eight programs were organized during the Fair period. A 2-days Symposium on "Popularization of Science through Mass Media" was held on October 8 and 9 at the Holiday-Inn Islamabad Hotel. The symposium was also inaugurated by the Federal Minister of Science & Technology while its various technical sessions were chaired by eminent scientists and journalists of the country. The Federal Minister, while delivering her address, said that while science and technology are vehicles for development of a country, an informed public is also essential for this development and the media can play an important role in mass awareness and science education of the people. She also proposed that the Government plans to set up an Endowment Fund for Scientific Research and Development. Mr.Mushahid Hussain, Federal Minister for Information and Media Developments presided over the second Technical Session. He invited the Foundation to set up a core committee of scientists and journalists who could devise a comprehensive program for science popularization among masses. He also pointed out a need for formal training for science journalists through the holding of regular workshops and refresher courses, so that, the journalists may keep themselves abreast of the latest scientific achievements of Pakistani scientists and the application of these achievements in the welfare of the people. Senator Jamil-ud-Din Aali, Chairman, Senate Standing Committee on Science and Technology also chaired one of the Technical Sessions and emphasized the importance of close cooperation between scientists and media personnel in the popularization of science and inculcating science culture among the masses.

Dr. Atta-ur-Rahman, Co-ordinator General, COMSTECH, Prof. Dr. M.D.Shami, Ex-Chairman, Pakistan Science Foundation and Secretary General, Pakistan Academy of Sciences, Mr. Abdulla Malik, a renowned senior journalist of the country, were among other Session Chairmen, who also pointed out various aspects of a close scientists-journalists interaction for making science a household word. A total of 15 technical papers were presented during the symposium, following which a series of recommendations were evolved. The symposium, thus proved to be highly successful event and should lead to a new avenue of science popularization.

In addition, Inter-Board Science Quiz, Inter-Board Science Exhibition Contest, an Art Competition on 'New Frontiers of Science', an Aeromodelling Contest, a Walk for Science and a Race for Science were some of the other prominent events which took place during the Fair. All these events were highly successful and a large number of people participated in all these events. Many prizes were distributed among the winners of these events. Ms. Tehmina Daultana, Minister of State for Women Development and Special

Education was the Chief Guest at the Inter-Board Science Quiz and Inter-Board Science Exhibition Contest. Boards of Secondary Education sent their teams to the competition. The trophy was won by Faisalabad Board while Multan Board was the runner up.

In the Art Competition, 75 students of High Schools from Rawalpindi/Islamabad area took part. They were given 2 hours to draw on the theme of "New Frontiers of Science". The students took keen interest in the event and made some excellent drawings and crayon-based paintings. A team of four senior scientists and artists evaluated their paintings for creativity and substance and awards were given to the best three drawings.

Aeromodelling Competition was held on October 12th, 1997, and turned out to be a highly skillful as well as entertaining affair. Four aeromodelling clubs and more than 60 individual enthusiasts took part in this event. The contestants exhibited high quality model aeroplane flying and won applause from a large number of spectators. In addition, a large number of scale models of various aeroplanes were also exhibited. Air commodore Tayyab Naeem was the Chief Guest at the event and he greatly appreciated the expertise of the contestants. As in the other events, prizes were awarded to the most outstanding contestants.

A large scale Computer Exhibition was also held as part of the Fair, 15 Computer Dealers took part in the exhibition held at the Marriott Hotel on October 10-11, 1997. Mr. Ahsan Iqbal, Minister of State and Chief Coordinator of Prime Minister's 2010 Program, was the Chief Guest at this event. In his Inaugural Address, he emphasized the importance of latest computer technology in solving many science related technical problems. He also urged the scientists to learn the skill of proper computer programming so as to improve the quality and analysis of their research. The Exhibition turned out to be quite successful and a large number of people visited it.

A computer software development competition was also held, on October 13, 1997. A contingent of 18 competitors took part in this event and presented their ingenious software programs, which were evaluated and duly awarded.

Two special events in which a large number of people took great interest were the Bicycle Race and a Walk for Science. These events were held on two consecutive Sundays, i.e. September 28 and October 5, 1997, respectively. Both events turned out to be highly successful in terms of public interest and enthusiasm. Dr. Khalid Mahmood Khan, Chairman, PSF, was the Chief Guest at both these events. During his address, he emphasized the importance of physical exercise and play for healthy bodies and minds. He also pointed out that these events were held to make citizens of this country familiar with science and science organizations. He also distributed prizes to the winners of these events. In addition prizes were also awarded through Lucky Draw and literally hundreds of prizes were given away.

A Book Exhibition was also held as part of the Fair, on October 4, 1997. It was inaugurated by Federal Minister of Education, Justice (Retd.) Syed Ghous Ali Shah. Twelve main Book Companies, Publishers and Book sellers including Urdu Science Board, Vanguard, Oxford University Press, Pak Book Corporation and National Book Foundation took part in the Exhibition. The Exhibition continued for four days.

Syeda Abida Hussain, Minister for Population Welfare & Science and Technology with Secretary, Ministry of Science and Technology and Chairman, PSF, inaugurating the Symposium.

Syed Mushahid Hussain, Minister for Information and Broadcasting presiding over a session of the symposium.

Senator Jamil-ud-Din Aali, Chairman Senate Standing Committee on Science & Technology at one of the session, being presented shield by Dr. Khalid Mahmood Khan, Chairman, PSF.

CYCLE RACE

Chairman, PSF, Dr. Khalid Mahmood Khan seen among the participants of the Race.

The participants of Bicycle Race.

AERO MODELING

A participant preparing to fly.

Mr. M. Hamza, Chairman Public Accounts Committee alongwith Dr, Khalid Mahmood Khan, viewing the models/exhibits displayed at one of the Stalls.

Chief guest Dr. A. Q. Khan, receiving National Science & Technology Fair Shield from Dr. Khalid Mahmood Khan, Chairman, PSF.

It is also pertinent to point out that almost all prizes distributed in various events throughout the Fair were sponsored through private sources. In some cases the whole event was paid for by such donor agencies. There is a long list of such sponsors, but some of them, which must be identified in terms of relatively large donations, were M/S Hardy Exploration and Production Ltd., M/S CALTEX Oil (Pakistan) Ltd., M/S Pak Book Corporation, M/S Progressive International Agencies (Pvt) Ltd., and M/S Poineer Learning Limited.

The Fair concluded on October 14, 1997, Dr. A.Q. Khan, Project Director, A.Q. Khan Research Laboratories and President, Pakistan Academy of Sciences was the Chief Guest at the concluding ceremony. During his address, he lamented the despicable state of education in the country with special reference to science education and research. He plainly pointed out that with a sound educational and scientific and technological infrastructure within the country, Pakistan might as well forget about becoming an 'Asian Tiger' which it envisages itself to be. Dr. Khan also distributed various prizes, including those awarded to the best stalls of the Fair.

Overall, the Fair turned out to be highly successful. The main objectives of the Fair i.e. bringing together of scientists, technologists, entrepreneurs and general public, and making citizens of this country aware of the local scientists' endeavors and achievements, were adequately met. It was proposed that such Fairs should not only be held with regularity, but these should also be held in all major cities of the country so that more and more people can take part in such Fairs.

3. INTRA BOARD SCIENCE POSTERS CONTEST

The Foundation has initiated this activity in collaboration with the Boards of Intermediate and Secondary Education in 1987. So far, 10 Science Poster Contests have been organized. The 9th Intra Board Science Posters Contest on the theme "Information Highway" was organized by the Foundation on 9-7-97 in Islamabad.

The judges unanimously agreed as under:

1.	Mirza Danish Baig Jamia Jajia Govt. Boys Secondary School, Bufferzone, Karachi.	1st Position
2.	Miss. Maria Miandad St. Marry Girls High School, Hyderabad.	2nd Position
3.	Mr. Fahad Asad C.C.A. Model School No.2, Airport, Karachi.	3rd Position
4.	Mr. Fayyaz Ahmed Govt. Johar High School, Multan.	4th Position

The result of the above competition was conveyed to all the Boards of Intermediate and Secondary Education and prize money amounting to Rs.2,000/- (1st Prize), Rs.1,200/- (2nd Prize) and Rs.800/- (3rd Prize) was sent to the winning students.

Theme for the 10th Science Poster Contest was "Use of Solar Energy in the 21st Century". Nine (9) Boards of Intermediate & Secondary Education, Swat, Sargodha, Faisalabad, Multan, Lahore, Mirpur (AJK), Islamabad, Karachi and Sukkur participated in this contest and sent their best three posters for inclusion in the Inter Board Poster Contest which shall be held in the Foundation. Cash prizes amounting to Rs.0.018 million has been sent to the prize winning students through their respective Boards.

4. INTER BOARD SCIENCE ESSAY COMPETITION

The Foundation is organizing Inter Board Science Essay Competition for awareness of Science among students in three languages i.e. English, Urdu and Sindhi. The 8th Inter Board Science Essay Competition was organized by the Foundation in September, 1997, and the following students were declared best.

English

1.	Miss. Sarah Atiq, Army Public School, Murree.	1st Position.
2.	Mr. Imran Arif, Army Public School, Murree.	2nd Position.
3.	Miss. Aitifa Abdullah, A-1, Pakistan Urdu School, Bahrain.	3rd Position

Urdu

1.	Mr. Ghulam Yasin Nayyer Govt. High School, Waryyam Wala, Tehsil: Shorkot, Jhang.	1st Position.
2.	Miss. Taliaha Rohain, Govt. Comp. Girls High School, Sargodha..	2nd Position
3.	Miss. Ambreen Gulzar WAPDA Girls High School, Steam Power Station, Faisalabad.	3rd Position.
4.	Miss. Tayyaba Sarwar, Jinnah Public Sec. School, Lahore.	4th Position.

The students were invited to receive cash prizes and shields at the closing ceremony of the National Science & Technology Fair on 14th October, 1997. The prizes were distributed by Dr. A.Q. Khan, Project Director, A.Q. Khan Research Laboratories, Kahuta.

Theme for 9th Science Essay Competition was "Impact of Scientific Development on Modern Life". Students from nine Boards, viz., Karachi, Sukkur, Multan, Lahore, Gujranwala, Faisalabad, Sargodha, Islamabad and Swat, participated in this competition. An amount of Rs.0.0244 million was distributed as cash prizes to the winning students through their respective Boards. These essays have been sent to experts for evaluation, results of Inter Board Competition shall be declared after evaluation of the essays by the experts.

QUIZ COMPETITION

Ms. Tehmina Daultana, Chief Guest alongwith Judges of the Competition
& Guests viewing the Competition.

ART COMPETITION

Participating Students

Judges evaluating the posters prepared by students.

5. SCIENCE POSTER PROJECT

Distribution of 10th Science Poster 1997 comprising of 10 posters on different themes was initiated. The posters are distributed to more than 8000 schools on our mailing list throughout the country.

6. ALL PAKISTAN INTRA BOARD SCIENCE QUIZ COMPETITION

All Pakistan Intra Board Quiz Competition also continued during the report period. The Foundation released a sum of Rs.10,000/- each to the following Boards; Islamabad, Quetta, Karachi, Sukkur, Sargodha, Faisalabad, Multan, Gujranwala, Lahore, Bannu and Swat who had organized the Quiz Competition at Intra Board level and forwarded their results. An amount of Rs.23,000/- was released to these Boards for distribution of prize money to the position holders

1st Prize	:	Rs.1000/-
2nd Prize	:	Rs.800/-
3rd Prize	:	Rs.600/-

The winning team and the runners up of Boards participated in the Inter Board Science Quiz Competition held in Islamabad during the 3rd National Science & Technology Fair-97.

All Pakistan Inter Board Science Quiz Competition was organized in Islamabad on 6th October, 1997. Ms Tahmina Daultana, Federal Minister of State for Special Education and Women Development, was the Chief Guest at the ceremony. Sets of books were distributed by the Chief Guest among the Prize Winning Students. The result was as under:

1.	Mr. Muhammad Irfan Govt. Comp. Model High School, Faisalabad.	1st	Rs.2500/-
2.	Mr. Muhammad Imran Govt. High School, Sahiwal.	2nd	Rs.1500/-
3.	Mr. Kashif Islam Govt. High School, Sahiwal.	3rd	Rs.1000/-
4.	Winner Team		BISE Faisalabad.
5.	Runners up team		BISE, Multan.

The above prize winners received their cash prizes & shields from Dr. A.Q. Khan, Project Director, A.Q. Khan Research Laboratories, Kahuta, the Chief Guest of the closing ceremony of the National Science & Technology Fair, Islamabad.

7. ART COMPETITION

An Art Competition on the theme "New Frontiers of Science" was held among the school students of the Federal and Rawalpindi Boards during the 3rd National Science & Technology Fair, 1997 and 27 students of the FBISE, Islamabad and 45 students of BISE, Rawalpindi participated in the competition. The material for the contest was provided to the students by the Foundation. A panel of judges evaluated the drawings made by the students and awarded prizes to the following students.

1.	Mr. Muhammad Taimur Shahid Sir Syed Academy (Special Education), Rawalpindi.	1st
2.	Mr. Tahir Azam Islamabad Model College for Boys, F-10/3, Islamabad.	2nd
3.	Mr. Ahmed Ali Khan Jadoon S.L.S. School, Lalazar, Rawalpindi.	3rd
4. I	Mr. Muhammad Ahsan Khalid F.G. Model School for Boys, I-9, Islamabad.	Consolation
II	Miss. Fatima Jahl, Beacon House (Girls Branch), Rawalpindi.	Consolation

These students were awarded prizes; shields & books by Dr. A.Q. Khan, Project Director, A.Q. Khan Research Laboratories, Kahuta, who was the Chief Guest at the closing ceremony of the National Science & Technology Fair-97.

8. DISTRIBUTION OF POPULAR SCIENCE MAGAZINES TO HIGH SCHOOLS FOR SCIENCE STUDENTS

The Foundation continued subscription to monthly "Science Digest" and Science Magazine "Science Bachoon Key Liye". An amount of Rs.44,000/- was released for the two magazines. These magazines are being regularly distributed to 1000 High Schools in the country. The Foundation has also added another monthly urdu science magazine "Global Science" and 500 copies are being distributed among the schools. An amount of Rs.39,000/- was released to the publisher for purchase of these magazines.

9. DONATION OF SCIENCE BOOKS

Three hundred (300) sets of seven (7) informative science books have been purchased for Rs.0.099 million for donation to selected High Schools of the country.

10. STRENGTHENING OF SCIENCE LABORATORIES

A project for strengthening of science laboratories in High Schools of rural areas has been initiated. In the first phase, two laboratories of rural schools in the Divisions of Hazara and Multan shall be supplied with equipment/glassware/chemicals required for performing

experiments as per syllabi of IX & X classes. The order has been placed with the National Educational Equipment Centre, Lahore.

11. POPULAR SCIENCE LECTURE SERIES OF EMINENT SCIENTISTS, ENGINEERS AND TECHNOLOGISTS

The Foundation, being the prime agency which funds the R&D activities in the fields of Science Engineering & Technology, and promoting awareness about Science & Technology in the country, chalked out a program for organizing popular lecture series by eminent Pakistani scientists on science, engineering and technology in various academic institutions of the country. The following lectures were organized by the Foundation in its auditorium during the period.

S.NO	Date	Name of Speaker	Topic of Lecture
1.	26-3-1998	Dr. Muhammad Mobin Senior System Analyst, PASTIC National Centre, Islamabad.	Expert System Support for Requirement Analysis.
2.	14-4-1998	Dr. Atta-ur-Rahman Director HEJ Research Institute, Karachi.	To felicitate Prof. Dr. Atta-ur-Rahman, who has been awarded Hilal-e-Imtiaz by the President of Pakistan.
3.	2-5-1998	Dr. A. Qadeer Khan, NI, HI, Director A.Q. Khan Laboratories, Kahuta, Rawalpindi.	To felicitate Dr. A. Qadeer Khan for his outstanding achievements in S&T.

PAKISTAN MUSEUM OF NATURAL HISTORY (PMNH)

During the year under review, both research and public service activities continued in earnest. PMNH was able to add 6340 specimens of plants, animals, minerals and fossils etc. to its reference collection. The three Science Divisions of the Museum made this collection during 18 field trips to various parts of Pakistan. Curation of this collection was carried out and these specimens alongwith other material already collected, was thoroughly researched upon. Based on this material as many as 19 research articles were published in scientific journals and in the book on "Biodiversity of Pakistan" published jointly by PMNH and Florida Museum of Natural History, USA.

Interaction between PMNH scientists and many national and foreign organizations also continued. Various research programs were implemented in collaboration with Southampton and Oxford Universities, UK; Florida State Museum, USA; ETH, Switzerland; Punjab University, Lahore and Quaid-i-Azam University, Islamabad. A number of field trips were undertaken with the counterpart scientists as part of these programs.

The distinction of PMNH lies not only in research but also in implementing a powerful mass education and public awareness program. In this context, many programs on habitat degradation and other aspects of environment were recorded and televised in collaboration with PTV-2. PMNH also produced its first documentary on "Geckoes: Myths and Realities" for public education. A three-day workshop was also organized on "Natural History Museum: A new concept in Environmental Studies". Fifty (50) Science Teachers belonging to various educational institution of Rawalpindi and Islamabad area participated in this Workshop.

PMNH designers/artists remained actively engaged in the renovation of exhibits at the Marghzar Display Corner and planning the shifting and interior designing of the PMNH Block-II at Shakar Parian, besides designing different fairs and exhibitions. The Science Fair-97 and Science Centre Faisalabad were designed for PSF. Another exhibition was designed at Crisis Prevention Centre, Al-Farabi Institute, Islamabad, organized by UNICEF in connection with the International Women's Day.

The main target set for the year under report was the completion of Block-II of PMNH building. This block has been completed and the Display Centre, previously located in a rented building at F-7 Markaz has been shifted there along with the Public Service Division personnel. A brief account of research and educational activities of PMNH during 1997-98 is given below

1. BOTANICAL SCIENCES DIVISION (BSD)

a) Reference Collection

The main objective of BSD is to collect, identify and preserve for reference the plant resources of the country. During the year, five field trips were undertaken to North Waziristan, Balochistan, Kohala, Islamabad and adjoining areas during which 700 higher and 210 algal samples were collected.

b) Laboratory Work

Preservation of the newly collected material and curation and cataloguing of the previous reference collection remained in progress. Poisoning, mounting and labelling of 1450 higher and 1235 lower plant specimens was carried out and 650 higher plants, 300 mycological and 250 algal specimens were identified.

c) Extension Work and Services Rendered to other Organizations

For the students of various educational institutions of Pakistan, 950 plant specimens were identified by the BSD and lectures for PTV-2 educational channel on the use of fertilizers, pesticides and desertification in Pakistan were prepared which were later televised nationwide. Eight lectures were prepared for the students of various educational institutions. Expertise is being provided to NORCONSULT International, on a biodiversity study project in Kohala, regarding phytoplanktons.

Publications

Shah, M., and C.C. Wilcock (1997) Taxonomic evaluation diversity and distribution pattern of the genus potentilla L. (Rosaccae) in Pakistan and Kashmir. In:, Mufti, S. A., C.A. Woods, and S. A. Hasan (eds). *Biodiversity of Pakistan*: P 128-139, PMNH, Islamabad.

Awan, M.R. and S. Ahmad (1997) Ethnobotanical studies of Swat district. In: Mufti, S. A., C.A. Woods, and S. AH. Hasan (eds). *Biodiversity of Pakistan* P 140-153, PMNH, Islamabad.

Leghari, M. K. (1998) Fresh water algae of Sindh: an ecological survey of phytoplantons of Phoosna Lake, Badin District. Sindh University Res. Jour. (Sci. Sr.), 26(172):115-124.

Sultana, K., B. Inam and A. K. Shanwari (1996) A new species of *Phragmidium* Lin. from Pakistan. Pak. J. Pl. Sci. 2(1):97-99

2. EARTH SCIENCES DIVISION (ESD)

a) Reference Collection

ESD, as one of its objectives, collects and preserves for reference various rocks, minerals and fossils present in the country. During the year, five field trips were made to Azad Kashmir and Northern Areas and 15 bags of mudstones and/or sediments for the recovery of fossils and 150 rock/mineral specimens were collected.

Laboratory Work

Cataloguing of 150 rock/mineral samples was done and 100 fossil gastropods, 80 ostracods and 3 molars of carnivores were identified. Thin sections of 220 rock/mineral samples were prepared while, 200 specimens were subjected to chemical analyses. Also 110 thin sections of rocks were subjected to petrographic studies and 20 rock/mineral samples were studied by XRD. A regional geological map showing different types of ultramatics related to subduction was finalized. Tables of major and base elements of 50 samples of gemstones along

the Indus Suture Zone were prepared. Geological road section map of Kohistan area was prepared. Interpretation of the data obtained by chemical analyses utilizing modern computer/exhibits, Dioramas, Showcases etc. from PMNH Display Centre located at F-7/2 to new building were also carried out. The exhibits in ESD for visitors were displayed.

c) Extension Work and Services Rendered to other Organizations

Research facilities and guidance is being provided to three M. Sc. students of AJK University and a Ph.D. student of Quaid-i-Azam University, Islamabad. Rock/mineral (45) specimens for individuals and students were also identified.

d) Publications

Baqri, S. R. H. (1997) The distribution of sulphur in the Paleocene coal of the Sindh Province, Pakistan. European Coal Geology and Technology, Geological Society Special Publication No. 125, pp. 239-243. Eds. Gayer, R.S. and Pesek J.

Hussain, S. and H. Dawood (1997) Characterization of emerald from Gujar Kili, Swat, Pakistan. Nucleus, 34 (1-2) PINSTECH Research Bulletin, Islamabad.

Hussain , S. (1996). Report on International Symposium on Himalayan Suture Zone of Pakistan. Himalya Notes, No. 7&8, pp. 24.

Javaid, M. , S. R. H. Baqri, A. U. Haq and A.Q. Khan (1996) Pakistan Gypsum by X-ray diffraction. Pak. J. Sci. Ind. Res. Vol.39, Nos. 5-8.

Baqri, S. R. H, S. A. Hasan, S. Khatoon and N. Iqbal (1997) Biodiversity of Gastropods of the Eocene time during the closure of Tethys Sea on the Central Salt Range, Pakistan. In: Mufti, S. A., C.A. Woods, and S. A. Hasan (eds), *Biodiversity of Pakistan*, PMNH, Islamabad, pp 282-291.

Cheema, I. U., A. R. Rajpar and S. M. Raza (1997). Biodiversity in muroids (Rodentia, Mammalia) during Miocene, Potwar Plateau, Pakistan. In: Mufti, S. A., C.A. Woods, and S. A. Hasan (eds), *Biodiversity of Pakistan*, PMNH, Islamabad, pp 482-501.

3. ZOOLOGICAL SCIENCES DIVISION (ZSD)

a) Reference Collection

Like other technical divisions of PMNH, ZSD collects zoological specimens as part of its reference collection. During 1997-98, eight field trips were undertaken to Balochistan, North Waziristan, Kurram and Orakzai Agencies, Khunjerab, Chitral, Gilgit, Hunza, Nagar etc. In all, 3500 fish, 800 butterfly, 380 small mammal, 350 insect, and 50 herpetile specimens were collected.

b) Laboratory Work

Identified 650 specimens including fish, reptile, amphibian and butterfly specimens. Mounting of 1500 butterflies and insects was carried out and 600 morphological drawings for millipedes/centipedes were prepared. Also, stuffed 18 birds, 2 snakes and a markhor and prepared study skins of 15 birds and one pangolin. Repair of 52 stuffed birds was also completed.

c) Extension Work and Services Rendered to other Organizations

Advised IUCN in the preparation of Biodiversity Action Plan. Delivered lecture and provided expertise to LEAD Pakistan on the "diversity, distribution and importance of insects and small mammals".

Expertise regarding fish fauna and zooplankton distribution in Kohala, Azad Kashmir, was provided to NORCONSUTL International.

d) Publications

Mufti, S. A. (1997) Biodiversity : awareness and education through natural history museum. In: Mufti, S. A., C.A. Woods, and S. A. Hasan (eds). *Biodiversity of Pakistan*, PMNH, Islamabad, pp 11-18.

Mufti, S. A. and S. A. Hasan (1997) The state of major ecosystems of Pakistan.In: Mufti, S. A., C.A. Woods, and S. A. Hasan (eds). Biodiversity of Pakistan, PMNH, Islamabad, pp 78-97.

Woods, C.A., C.W. Kilpatrick, M. Rafique, M. Shah and W. Khan (1997). Biodiversity and conservation of the Desosai plateau, Northern Areas, Pakistan. In: Mufti, S. A., C.A. Woods, and S. A. Hasan (eds), *Biodiversity of Pakistan*, PMNH, Islamabad, pp 24-31

Hasan. S. A. (1997). Biogeography and diversity of butterflies of northwest Himalayas. In: Mufti, S. A. , C. A. Woods and S. A. Hasan (eds.) *Biodiversity of Pakistan*, PMNH, Islamabad, pp 164:173.

Smith, D.S. and S.A. Hasan (1997) A preliminary survey of diversity and distribution of butterflies of northern Pakistan. Gilgit to Khunjerab. In: Mufti, S.A., C.A. Woods and S.A. Hasan (eds) *Biodiversity of Pakistan*, PMNH, Islamabad, pp 174: 195.

Ahmed, I. and S.A. Hasan (1997) Diversity distribution and cladistics of intestines (heteroptera: Pentatomidae) from Indo-Malayan region. In: Mufti, S. A., C.A. Woods, and S. A. Hasan (eds). Biodiversity of Pakistan, PMNH, Islamabad, pp 212-219.

Rafique, M. and M.Y. Qureshei (1997) A contribution to the fish and fisheries of Azad Kashmir. In: Mufti. S. A., C.A. Woods, and S. A. Hasan (eds), *Biodiversity of Pakistan*, PMNH, Islamabad, pp 312-321

Baig, K.J. (1997) Distribution of Laudakia (Sauria Agamidae) and its origin. In: Mufti, S. A., C.A. Woods, and S. A. Hasan (eds). *Biodiversity of Pakistan*, PMNH, Islamabad, pp 338-354.

Baig. K. J. (1997) Partition of the Stellio group of Agama into two distinct genera: Acanthocerus fitzinger, 1843 and Laudakia Gray, 1995. (Sauria: Agamiddae), *Herpetologia Bonnensis*, Vol. :21-25.

4. PUBLIC SERVICES DIVISION (PSD)

One of the main objectives of PMNH is to promote education and public awareness about our natural wealth involving Pakistan's heritage of natural resources, and PSD is mainly responsible for achieving this objective. In addition, the Division takes care of the display part of the Museum, and provides assistance/expertise to various S&T organizations in designing and arranging science exhibitions.

Dr. Atta-ur-Rehman, Director, HEJ Research Institute of Chemistry being falicitated on receiving Hilal-e-Imtiaz.

A team of PMNH and Oxford University Scientists at work in Northern Areas.

Participants of the Workshop being trained in the field techniques.

a) Museum Display and Maintenance

Renovation of Marghazar Display Corner was carried out.

Designed the cover of the book on " Biodiversity of Pakistan:. prepared draft of PMNH Newsletter No. 2. Vol. 10 (1997).

Designed and prepared PMNH Pavilion at the S&T Fair 97. Prepared drawings of the layout of PMNH Block -II , according to the final construction of the building, also prepared layout of the proposed display in the new building.

Prepared plan for shifting of exhibits from F-7 Markaz Display Centre to PMNH Block.-II at Shakarparian.

Dismantled the exhibits and shifted them to the new building.

Prepared the first PMNH documentary on lizards.

Exposed 460 colour and 265 black and white photographs for various activities of PMNH.

Designed logo, letterhead, leaflet, banners and certificates for the Workshop on National History Museum: A new concept in environmental studies.

b) Educational Activities

As mentioned above, education of students and public at large about the natural history resources of the country, is the main objective of PSD, thus guided tours of the Museum Display Center are regularly provided to visitors. During the year, tours were provided to 2098 students and 105 teachers of various educational institutions. Film shows on Natural History and other scientific fields were also organized for students.

c) Services Rendered to other Organizations/Professionals

Dubbing of 62 scientific films from English to Urdu was carried out. Also converted these films from 16mm to VHS. Carried out designing of the cover of PSF Annual Report, 1996-97. Designed the cover of agenda and working paper for the meeting of PSF Board of Trustees. Also designed the new PSF brochures. Prepared different designs of the building of Science Centre at Faisalabad. Also prepared drawing showing layout of the Display in the Science Centre Faisalabad. Designed an exhibition at Crisis Prevention Centre (Al-Farabi Institute, Islamabad for UNICEF) on International women's Day.

During the report period 13,465 and 32,536 people visited the main Display Centre and Display Corner respectively.

PAKISTAN SCIENTIFIC AND TECHNOLOGICAL INFORMATION CENTRE (PASTIC)

Pakistan Scientific and Technological Information Centre (PASTIC) is the premier organization in the field of information dissemination, serving thousands of researchers. It is a subsidiary of the Pakistan Science Foundation.

PASTIC has evolved from the erstwhile "Pakistan National Scientific and Technological Documentation Centre (PANSDOC)", which was established in 1957 at Karachi with the assistance of UNESCO, under the Pakistan Council of Scientific and Industrial Research (PCSIR). In 1974, however, PANSDOC was transferred to the Pakistan Science Foundation (PSF), and was renamed as the Pakistan Scientific and Technological Information Centre (PASTIC). After transfer to PSF, the scope and facilities of PASTIC were expanded.

AIMS & OBJECTIVES:

- To procure, process and disseminate scientific and technological information to the researchers.
- To interact with regional and international information agencies/networks.
- To develop inter-library cooperation and resource sharing at national level.
- To train information personnel in contemporary techniques and methods of information handling.
- To develop and strengthen the National Science Reference Library.
- To provide bibliographic and translation services.
- To compile Directory of S&T Periodicals of Pakistan, Union Catalogue of S&T Serials and Bulletin of Technology Information.
- To publish an abstracting and indexing journal entitled "Pakistan Science Abstracts".

PASTIC National Centre, Islamabad is housed in its own building located at the Quaid-i-Azam University Campus, and four Sub-Centers at Karachi, Lahore, Quetta and Peshawar. The Centre offers numerous specialized services to the scientific community of Pakistan. During the year 1997-98, the activities undertaken and services provided by PASTIC are as described below.

1. DOCUMENT PROCUREMENT AND SUPPLY SERVICE

Under the Document Procurement and Supply Service, queries are received from various R&D organizations for supply of reprints of research articles/conference papers and reports, which are procured locally or from abroad. A total of 1906 S&T documents were procured and supplied against 2183 requests received.

2. BIBLIOGRAPHY SERVICE

References from International databases on CD ROM are supplied to users according to their research topics on request. Against 541 orders, 18473 references were collected and supplied on various S&T topics to the researchers.

3. CURRENT CONTENT SERVICE

Under the Current Contents Service, table of Contents of 89 S&T journals of Chemistry, Biology, Physics, Computation, Earth Sciences, Mathematics and Medicine were provided to 484 scientists. During the period under review, copies of 58 articles were also supplied to users.

4. ABSTRACTING AND INDEXING SERVICES

PASTIC publishes a quarterly journal viz., Pakistan Science Abstracts (PSA), which contains abstracts of research articles published in recent S&T Journals of Pakistan. During the report period the following volumes were finalized and composed.

PSA 1995 Vol 35 (1-2) published
PSA 1995 Vol 35 (3-4)
PSA 1996 Vol 36 (1-2)
PSA 1996 Vol 36 (3-4)

5. UNION CATALOGUE

During the report period the updating of the Catalogue has been continued and about 150 organizations/institutions were contacted for acquiring serial holding record of the libraries. Data from 19 organizations have been received and forwarded to computer section for updation.

6. PASTIC NATIONAL SCIENCE REFERENCE LIBRARY

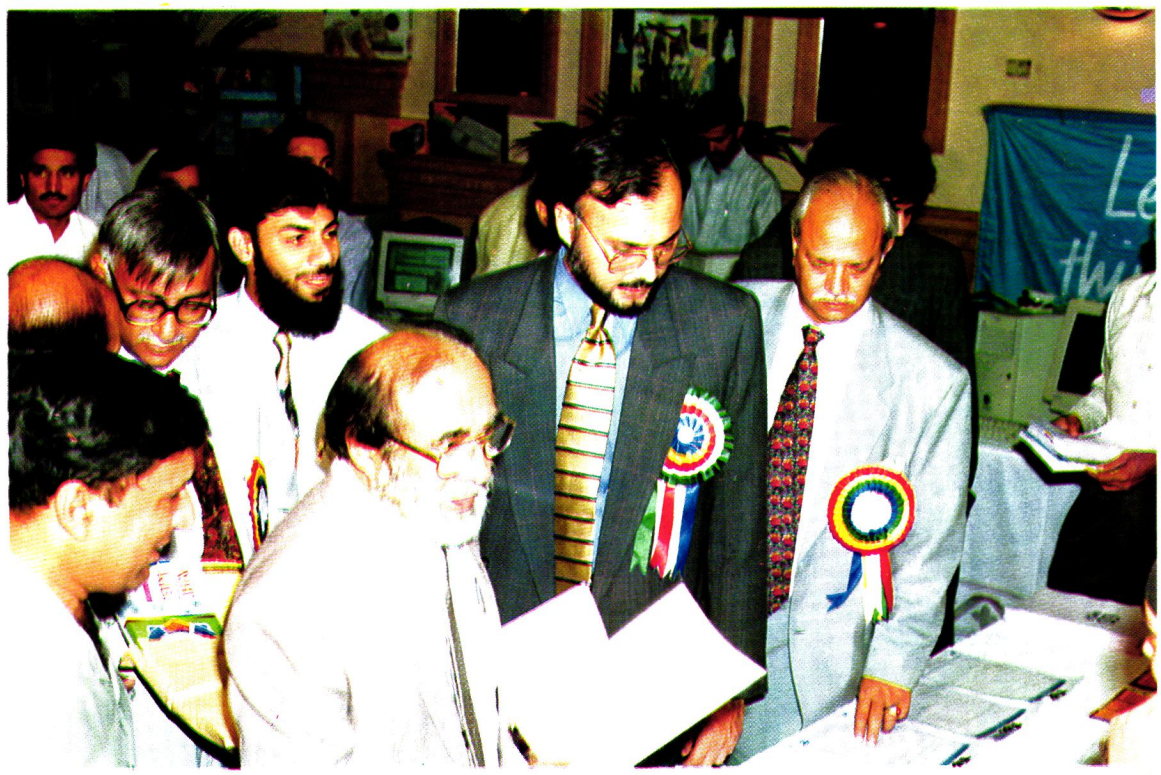
About 891 issues of various S&T periodicals, 55 documents and 92 books were received in the libraries of PASTIC National Center, and the number of references supplied were 1279. The subscription of following databases on CD-ROM were renewed.

i) Life Sciences, ii) POLTOX, iii) PROQUEST, iv) Medline v) Physical Chemical & Earth Science (Abstract) and vi) Sociofile.

7. TECHNOLOGY INFORMATION

PASTIC publishes a monthly Bulletin, namely "Technology Information" based on the information on technologies collected from 27 countries.

The July-August 1997 combined issue of Technology Information was prepared, composed, proof read and finally produced on tracing paper and sent for printing.



Chief Guest at one of the stalls.

8. REPROGRAPHIC SERVICES

The Reprographic Section of PASTIC has facilities ranging from photocopying to offset printing. During 1997-98, about 2,153,310 impressions, 2,512 pages and 185,197 copies were produced by the Unit against 124 jobs received from 15 organizations.

9. COMPUTERIZATION ACTIVITIES

The following computer and accessories were purchased under the report period.

Modem Card for accessing Internet.
Internal Fax/Modem Card.
Two 386SX Computer upgraded to Pentium 133 Mhz, Heat sink, 256KB Cache Memory, 8MB RAM, 1MB 64 bit PCI VGA Card.
Four 386SX computer upgraded to 486DX, Processor 5x86, 133Mhz, 256KB Cache Memory and 8MB RAM.
1.2 MB Hard Disk.
HP 4M Laser Jet Tonner (2).

The following database were strengthened.

Database on Research Published in Pakistan
Database on Serial holdings in S&T Libraries of Pakistan
Database on Pakistani Environmental Health Documents.

2528 laser, 1252 D.M. pages composed, 115 color printout & slides and 32 picture scanned. Pakistan Science Foundation's (Service rules 7, medical rules) were composed. Work related to 3rd National S&T Fair' 97 composed. Work related to computer Exhibition , Lahore and Faisalabad was composed. Computer Software and Desk Top Publishing Services/facilities were provided to other S&T organizations.

10. INTERNATIONAL LIASION

PASTIC is the National Focal point for International/Regional Information Networks like, UNISIST, SAARC Documentation Centre, WHO/CEHANET and UNEP/INFOTERRA. PASTIC is also the Coordinating/Collaborating Agency for UNDP/TIPS, UNESCO/ASTINFO and AIT/ENSICNET. The following collaborating activities were undertaken.

INFOTERRA:

Information was supplied in response to queries pertaining to Ni estimation, vegetable ghee & margarines, noise pollution, bacteriological agents of diarrhea & dysentery, heavy metals, molecular biology, wildlife, microbiology, electroplating wastes, pharmaceutical wastes, reduction of nitrate, nitrite in drinking water, municipal & solid waste management, deforestation, environmental legislation, environmental policies, national conservation strategies, industrial wastes, effect of tanneries, textiles, fertilizers & marble, industrial waste management in textile industry, medicinal plant anti-diabetic activity & diabetic treatment,

toxic effect of hexavelent chromium on kidney of albino mouse, organophosphates, hepatotoxicity & teratogenecity, correlation between systemic hypertension & trace metals level in human scalp hair, nickel removal from industrial effluent, allergy & asthma, water pollution, serum calcium level, acid rain, industries in Pakistan, trace metals in hair, barriers in ecosystem, industrial wastes, phenol in water, drinking water quality, immunity against coccidiosis in poultry, determination of phenolic compounds in water by chromatography, industrial waste management, chromatographic techniques & water nitrate, biotechnology in agriculture, environmental aspects of PAP, skin diseases caused by environmental pollution, extent of contamination of water, soil & plants by seepage through waste water, drinking water chemical analysis cations, anions & metals, air pollution, pesticides in soil determination, radiation pollution & its control, endocrine toxicology in mammals, environmental pollution agencies, environmental toxicology, effect of pollution on germination and aquatic life. The total number of clients served was 50.

CEHANET

CEHANET publications were distributed.
Databases were developed on environmental institutions and professionals.

ASTINFO

ASTINFO publications were distributed.
CDS/ISIS Package was provided to 6 organizations.

SAARC DOCUMENTATION SYSTEM

Information was procured for users under the SAARC Program.
SDC Newsletters and brochures were distributed.
New SDC NFP Cell Coordinator was nominated by PASTIC/PSF and approved by the MoST.

BILATERAL COOPERATION

Project proposals were prepared for bilateral cooperation with Brazil, Malaysia and Tunisia in the field of Information Handling.

MISCELLANEOUS

Information was searched and supplied mostly on Environmental and S&T topics.
Reference and referral services were provided to researchers.
Budget Speech, Annual and Quarterly Reports were compiled.
Computerization of data regarding the Directory of R&D Institutions in Pakistan.
Training provided on MS, EXEL and CDS/ISIS Packages.
Miscellaneous work was undertaken for S&T Fair 97.
Speeches were prepared for Computer Exhibition, COMSTECH and Chairman PSF for various occasions.
Correspondence and composing work was undertaken for the book "50 years of Natural History of Pakistan" to be published by PSF.
PASTIC Brochure was updated and composed.

11. MEETINGS/VISITS/FUNCTIONS

Secretary MoST visited PASTIC to see the facilities available at PASTIC and learn about its services.

12. TRAININGS

a) Training received:

A seminar on "Patents, A source of Information & Introduction to Industrial Property" was attended by Mr. Aqil Khan, Chief Editor, for about four weeks in Switzerland, Austria and Netherlands.

A workshop on Chemical Safety and Environmental Information was attended by Mr. Zaheer Nasir, Asst. Programmer from 3-6 November, 1997 in Jordan.

b) Training/Lectures Imparted

Training on CDS/ISIS package to two Documentalists from Human Rights Commission for Pakistan from 1-2 June 1998.
Two computer training courses were organized with emphasis on DOS, MS Word & Excel.

TECHNOLOGICAL INFORMATION PROMOTION SYSTEM (TIPS)

Technological Information Promotion System based at PASTIC has been regularly publishing daily and weekly bulletins in Pakistan which provides up-to-the-minute and detailed information on technology and trade opportunities. It covers 14 different sectors and has the largest data base in the world on trade/technology information from the developing countries. The sectors are; i) Agro-Industries, ii) Energy, iii) Electronics, iv) Pharmaceuticals, v) Business Opportunities, vi) Food Processing, vii) Machinery, viii) Biotechnology, ix) Textiles, x) Fisheries, xi) Building Materials, xii) Chemicals, xiii) Mining, and xiv) Packaging.

In 1997-98, 1500 technology/trade offers and requests came from 39 countries and were sent to users in Pakistan. Pakistani entrepreneurs/business organizations provided information on 200 products/processes/technologies which were advertised abroad through TIPS network.

- TIPS launched its first and second issue of "White Meat" a bilingual publication regarding Poultry and Fisheries Sector and it has been distributed to nearly 2000 users.

- TIPS third book on Trade and Technology Information in Urdu language published and is out in the market for sale.

- Organized Pharma Expo '97 at Islamabad in collaboration with Pakistan Academy of Sciences.

- Editor TIPS attended a three day workshop on "New Trends in Environmental Education", organized by Pakistan Museum of Natural History, Islamabad.

- Organized Computer Exhibitions in Islamabad and Faisalabad during October, 1997 and February, 1998 respectively.

CHAPTER 2

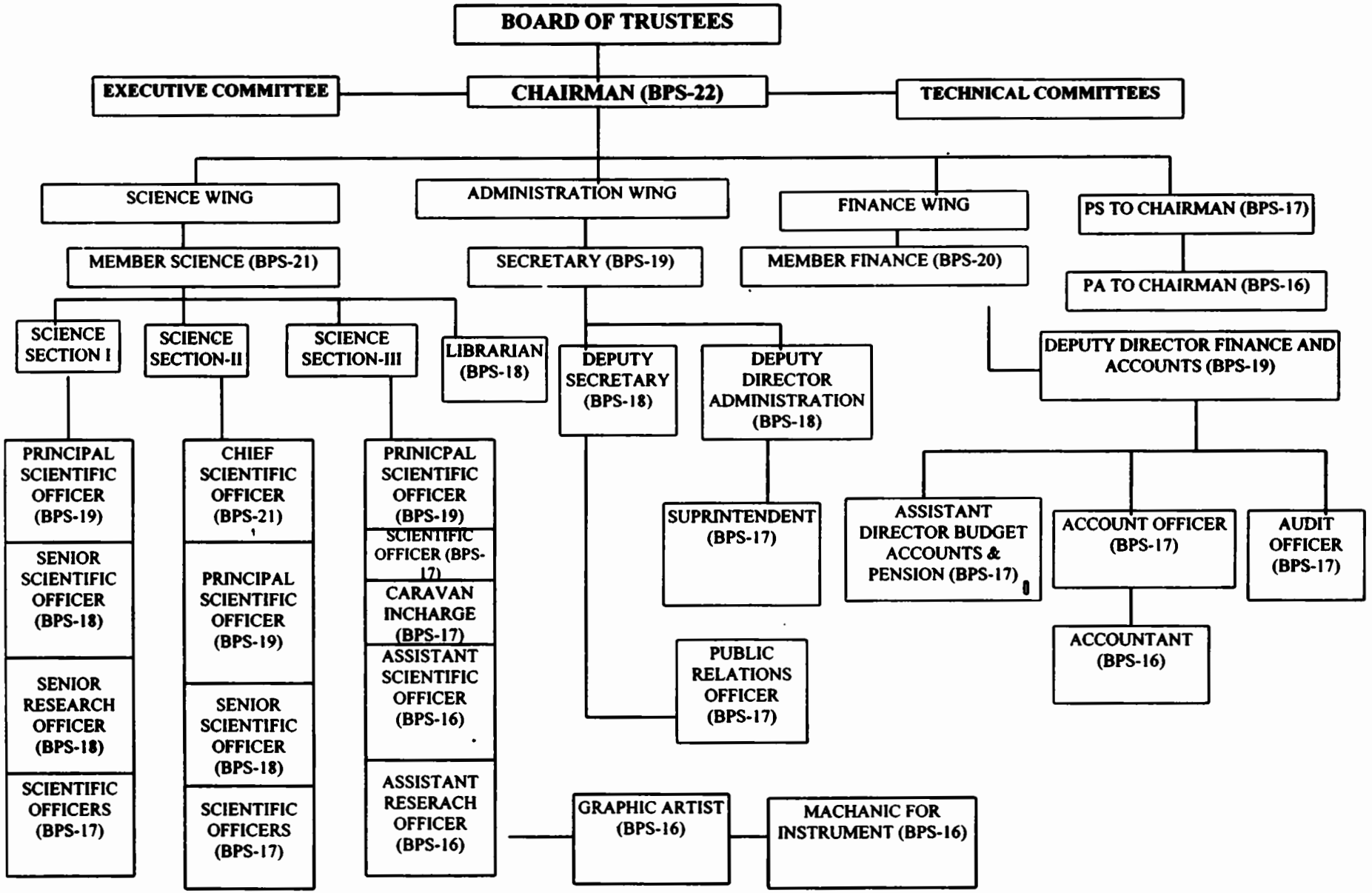
ORGANIZATION AND ADMINISTRATION

The organizational structures of the Pakistan Science Foundation, Pakistan Museum of Natural History and Pakistan Scientific and Technological Information Centre are given on the forth coming pages. The sanctioned strength of staff in the Foundation, PMNH & PASTIC during the period was as under:

PAKISTAN SCIENCE FOUNDATION (PSF)

Sr. No.	Designation	Number
1.	Chairman	1
2.	Member (Science)	1
3.	Member (Finance)	1
4.	Chief Scientific Officer	1
5.	Secretary	1
6.	Principal Scientific Officer	4
7.	Senior Scientific Officer	2
8.	Senior Research Officer	1
9.	Deputy Director (F&A)	1
10.	Deputy Secretary	1
11	Deputy Director (Admn)	1
12.	Public Relations Officer	1
13.	Accounts Officer	1
14.	Assistant Director (Budget, CP Fund & Pension)	1
15.	Research Officer	1
16.	PS to Chairman	1
17.	Librarian	1
18.	Scientific Officer	5
19.	Internal Audit Officer	1
20.	Caravan Incharge	5
21	Graphic Artist	2
22.	Superintendent	1
23.	Assistant Research Officer	1
24.	PA to Chairman	1
25.	Mechanic for Instrument	1
26.	Assistant Scientific Officer	1
27.	Accountant	1
28.	Supporting Staff	125
	Total :	**165**

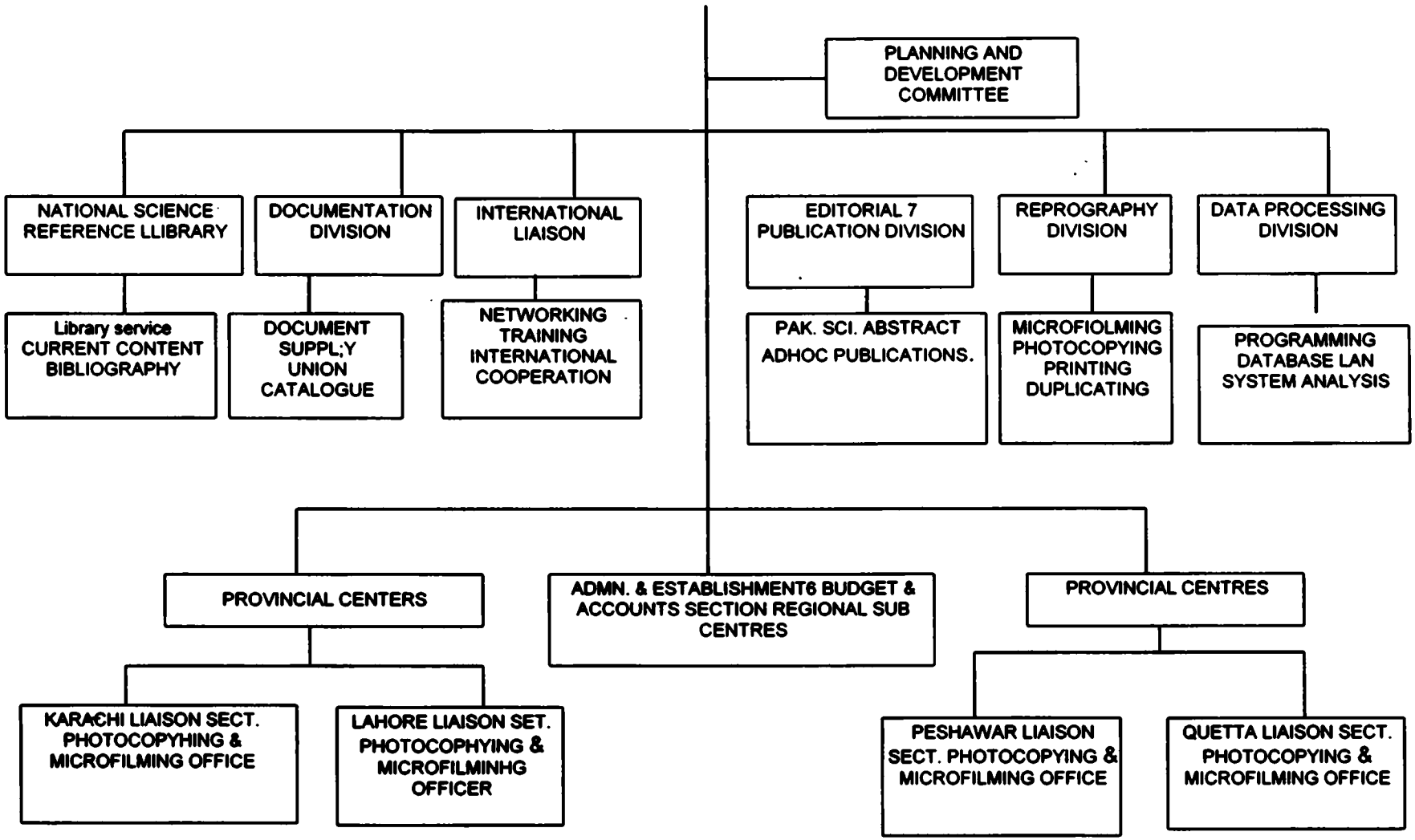
PAKISTAN SCIENCE FOUNDATION
ORGANIZATIONAL CHART



PAKISTAN MUSEUM OF NATURAL HISTORY (PMNH)

S. No.	Designation	Number
1.	Director General	1
2.	Director	3
3.	Curator	6
4.	Associate Curator	10
5.	Manager Operations	1
6.	Research Associate	19
7.	Exhibit Designer	1
8.	Senior Administrative Officer	1
9.	Senior Accounts Officer	1
10.	Librarian	1
11.	Taxidermist	1
12.	Associate Artist	2
13.	Teacher Guide	1
14.	Superintendent	1
15.	Accountant	1
16.	Supporting Staff	85
	Total	**136**

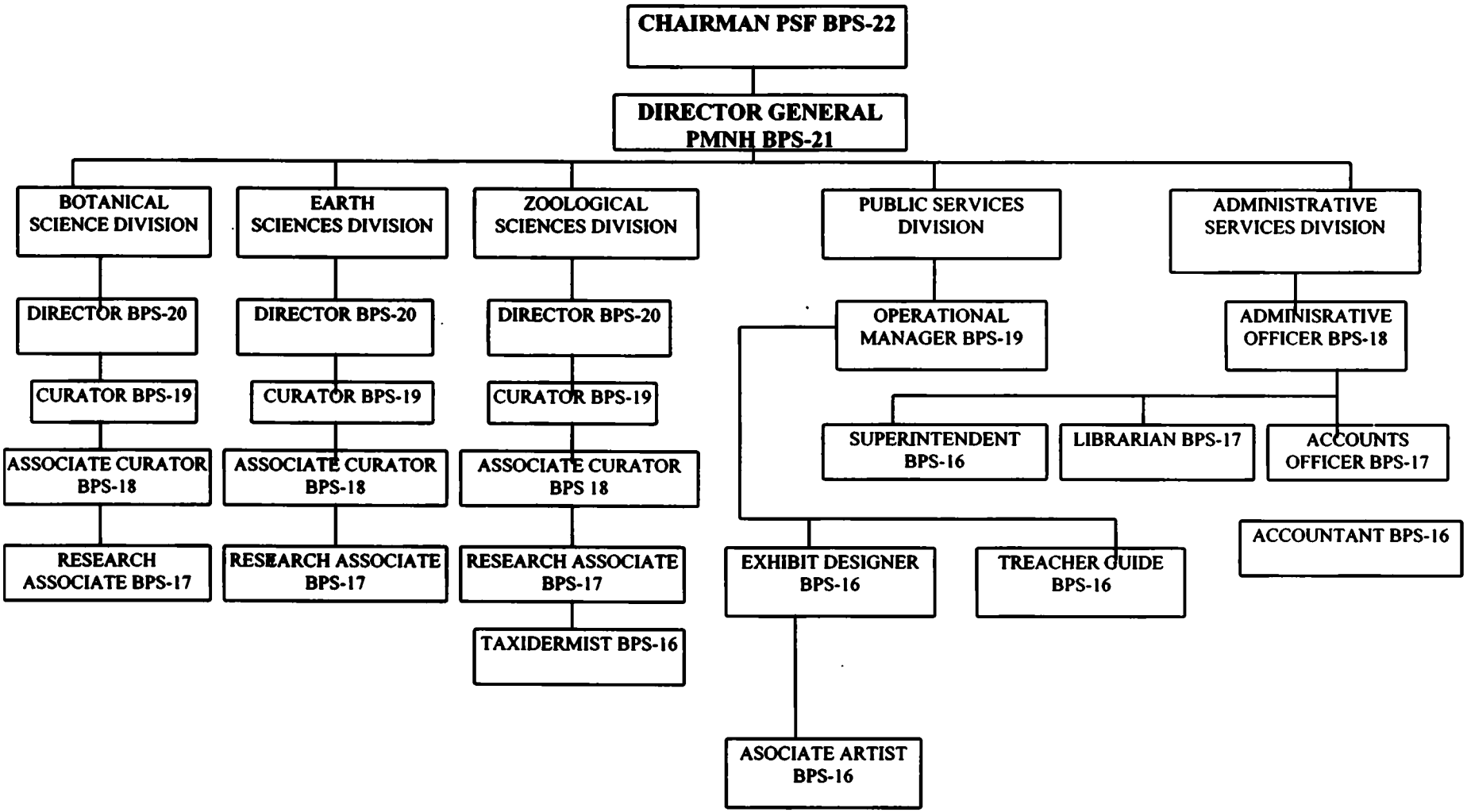
ORGANIZATIONAL STRUCTURE OF PAKISTAN SCIENTIFIC & TECHNOLOGICAL INFORMATION CENTRE



PAKISTAN SCIENTIFIC AND TECHNOLOGICAL INFORMATION CENTRE (PASTIC)

S.No.	Designation	Number
1.	Director General	1
2.	Deputy Director (Doc.)	1
3.	Deputy Director (Admn & Estt)	1
4.	Senior Bibliographic Officer	1
5.	Chief Editor	1
6.	Senior Documentation Officer	1
7.	Senior Translating Officer	1
8.	Senior Information Officer	1
9.	Senior Librarian	1
10.	Manager Reprographic Unit	1
11.	Senior System Analyst	1
12.	Chief Liaison Officer (Karachi & Lahore)	2
13.	Senior Accounts Officer	1
14.	System Analyst	2
15.	Translating Officer	1
16.	Photographic Officer	1
17.	Printing Officer	1
18.	Graphic Artist	1
19.	Bibliographic Officer	1
20.	Patent Officer	1
21.	Scientific Information Officer	3
22.	Manager Technology Information	1
23.	Admn-cum Accounts Officer (Karachi)	1
24.	Liaison Officer PSC, Quetta/Peshawar	2
25.	P.A. To Director General	1
26.	Assistant Information Officer	1
27.	Assistant Programmer	4
28.	Superintendent	2
29	Assistant Scientific Information Officer	4
30.	Assistant Manager Reprographic Unit	1
31.	Accountant	1
32.	Assistant Documentation Officer Karachi/Lahore/Quetta	3
33.	Supporting Staff	108
	Total:	**154**

PAKISTAN MUSEUM OF NATURAL HISTORY
ADMINISTRATIVE CHART



CHAPTER-3

PAKISTAN SCIENCE FOUNDATION
FINANCIAL STATEMENTS
JUNE 30, 1998

AUDITORS' REPORT TO THE BOARD OF TRUSTEES

We have audited the annexed Balance Sheet of PAKISTAN SCIENCE FOUNDATION as on June 30, 1998 and the related Receipts and Expenditure Account together with the notes forming part thereof for the year then ended and state that in our opinion the Balance Sheet, Receipts and Expenditure Account together with the notes forming part thereof respectively give a true and fair view of the state of the Foundation's affairs as on June 30, 1998 and of the surplus for the year then ended.

We further certify that these accounts include receipts of Rs.31,795,000/- which comprise the grants, received from Federal Government and we are satisfied with the propriety of disbursement thereof.

ISLAMABAD_____1998 CHARTERED ACCCOUNTANTS

PAKISTAN SCIENCE FOUNDATION
BALANCE SHEET AS ON JUNE 30, 1998

GRANT AND LIABILITIES	NOTE	1998 Rupees	1997 Rupees
GENERAL FUND	2	27,460,676	28,091,453
RESEARCH SUPPORT GRANT	3	38,675,783	35,259,087
		66,136,459	63,350,540
CURRENT LIABILITIES	4	1,499,666	1,710,175
		67,636,125	65,060,715

The report of the auditors is set out on page 1.

The notes set out on pages 5 to 9 from an integral part of these accounts.

TRUSTEE

CHAIRMAN

PAKISTAN SCIENCE FOUNDATION
BALANCE SHEET AS ON JUNE 30, 1998

FIXED CAPITAL EXPENDITURE	NOTE	1998 Rupees	1997 Rupees
Operating fixed assets	5	25,298,233	26,153,597
RESEARCH PROJECT IN PROGRESS		38,657,783	35,259,087
LONG TERM SECURITIES	6	1,617,195	1,617,195
CURRENT ASSETS			
Advances, deposits & Prepayments	7	638,409	401,849
Cash and bank balances	8	1,406505	1,628,987
		2,044,914	2,030,836
		67,636,125	65,060,715

The report of the auditors is set out on page 1.

The notes set out on pages 5 to 9 form an integral part of these accounts.

TRUSTEE CHAIRMAN

PAKISTAN SCIENCE FOUNDATION
RECEIPT AND EXPENDITURE ACCOUNT
FOR THE YEAR ENDED JUNE 30, 1998

RECEIPTS	Note	1998 Rupees	1997 Rupees
Non-Development		31,795,000	27,395,250
		31,795,000	**27,395,250**
EXPENDITURE			
Non-Development Grants			
Scientific Functions	9	15,034,425	11,893,755
Administrative Expenses	10	17,391,352	16,807,281
		32,425,777	**28,701,036**
		32,425,777	**28,701,036**
SURPLUS(DEFICIT) CARRIED OVER		**630,777**	**1,305,786**
Surplus(Deficit) Carried Over to balance sheet		**630,777**	**1,305,786**

The report of the auditors is set out on page 1.

The notes set out on pages 5 to 9 form an integral part of these accounts.

TRUSTEE CHAIRMAN

PAKISTAN SCIENCE FOUNDATION, ISLAMABAD
NOTES TO THE ACCOUNTS FOR THE YEAR ENDED JUNE 30, 1998

STATUS AND OBJECTS

PAKISTAN SCIENCE FOUNDATION (the Foundation) is a statutory organization established under Pakistan Science Foundation Act, 1973 on the second day of February, 1973. The main object of its establishment is to promote and finance scientific activities having a bearing on the socio-economic needs of the country.

1. ACCOUNTING POLICIES

The principal accounting policies which have been adopted in the preparation of the Foundation's accounts are as follows:

(i) GRANTS RECEIVED

Grants from the Government of Pakistan have been accounted for on actual receipt basis.

ii) RESEARCH SUPPORT GRANT

Research support grant has been accounted for on actual payment basis.

iii) FIXED ASSETS

Fixed assets have been valued at cost less accumulated depreciation except lease hold land which is stated at cost. Depreciation on fixed assets is charged on reducing balance method, at the rates specified in note 5

	1998 Rupees	1997 Rupees
2. GENERAL FUND		
Balance as on July 01	28,091,453	29,397,239
(Deficit)/Surplus Balance transferred from Receipt and Expenditure Account	(630,777)	(1,305,786)
	27,460,676	**28,091,453**
3. RESEARCH SUPPORT GRANT		
Balance as on July 01	35,259,087	32,519,642
Add: Disbursement during the year (3.1)	9,700,145	7,154,751
	44,959,232	**39,674,393**
Less: Project completed during the year (3.2)	6,283,449	4,415,306
	38,675,783	**35,259,087**

	1998 Rupees	1997 Rupees
3.1 Distribusem during the year		
Mathematics and Computer Sciences	57,981	--
Physical Sciences	502,186	1,159,931
Chemical Sciences	1,538,027	1,150,579
Biological Sciences	1,663,722	1,961,763
Earth Sciences	456,346	45,590
Environmental Sciences	733,787	184,991
Engineering Sciences	756,793	518,542
Agricultural Sciences	2,433,636	1,638,887
Medical Sciences	1,121,180	24,325
Institutional Support	293,000	338,000
Board and Committee Meetings	143,487	132,143
	9,700,145	**7,154,7513**
3.2 Project completed during the year		
Physical Sciences	1,304,258	1,893,676
Chemical Sciences	1,843,117	628,476
Biological Sciences	1,775,200	379,786
Agricultural Sciences	1,360,874	1,513,368
	6,283,449	**4,415,306**

	1998 Rupees	1997 Rupees
4. CURRENT LIABILITIES		
Security Deposits (4.1)	1,373,140	1,576,518
Accrued Expenses	97,845	133,657
Sundry Creditor	28,681	
	1,499,666	**1,710,175**
4.1. **SECURITIES DEPOSITS**		
Moderate Builders	577,688	767,773
Faisal associates	99,014	158,745
PCSIR Share for boundary wall	486,898	650,000
Science Caravan, Faisalabad	209,540	
	1,373,140	**1,576,518**

5. OPERATING FIXED ASSETS

Particulars	C O S T				D E P R E C I A T I O N			
	As at July 01, 1997	Additions	As at June 30, 1998	RATE %	As at July 01, 1997	For the year	As at June 30, 1998	Writing Down Value As at June 30,1998
Lease hold land	3,713,418	-	3,713,418	-	-	-	-	3,713,418
Building	19,484,540	--	19,484,540	5	1,899,743	879,240	2,778,983	16,705,557
Motor vehicles	3,496,059	--	3,496,059	20	2,568,587	185,494	2,754,081	741,978
Office equipment	2,360,046	511,490	2,871,536	15	1,360,096	226,716	1,586,812	1,284,724
Science equipment	1,504,548	--	1,504,548	15	964,739	80,971	1,045,710	458,838
Furniture & fixture	1,809,260	147,956	1,957,216	6	585,965	82,275	668,240	1,288,976
Air conditioners	194,974	--	194,974	15	176,294	2,802	179,096	15,878
Library books & films	1,385,087	--	1,385,087	5	238,925	57,308	296,233	1,088,854
Bicycle	680	--	680	20	668	2	670	10
1998 Rupees	**33,948,612**	**659,446**	**34,608,058**		**7,795,016**	**1,514,809**	**9,309,825**	**25,298,233**
1997 Rupees	**33,593,045**	**355,567**	**33,948,612**		**6,224,203**	**1,570,812**	**7,795,015**	**26,153,597**

	1998 Rupees	1997 Rupees
6. DETAIL OF LONG TERM SECURITIES		
WAPDA Islamabad	1,472,195	1,472,195
SNGPL	145,000	145,000
	1,617,195	**1,617,195**
7. ADVANCES, DEPOSITS AND PREPAYMENTS		
Advances to Staff	159,341	112,649
Prepaid rent	479,068	289,200
	638,409	**401,849**
8. CASH AND BANK BALANCES		
Cash at Bank	1,373,140	1,590,268
Cash In hand	25,530	30,884
UNESCO Coupons	7,835	7,835
	1,406,505	**1,628,987**
9. SCIENTIFIC FUNCTIONS		
	9,700,145	7,154,752,
Research and Support Grant		
Scientific Societies and Professional Bodies.	605,024	650,024
Scientific Conferences, Meetings and Seminars.	427,400	562,772
Operation of Science Caravan.	1,693,072	2,565,622
Science centres & herbaria	--	--
Information and documentation	50,000	--
International Liaison	69,104	38,822
Science Promotion Activities.	1,414,705	817,103
Science Fair	1,000,000	--
Exchange of Visits of Scientists and Technologists	74,975	74,660
Scientists Pool	--	30,000
	15,034,425	**11,893,755**

	1998 Rupees	1997 Rupees
10. ADMINISTRATIVE EXPENSES		
Salaries and other benefits	10,503,841	9,895,861
Travelling	122,190	199,586
Rent	1,865,424	2,413,079
Electricity, gas and water.	399,032	271,039
Postage, telephone and telegram	952,148	901,266
Printing & stationery	268,336	122,624
Vehicle running and maintenance	1,063,967	663,548
Newspapers and periodicals	129,992	277,043
Liveries and uniforms	2,400	13,740
Entertainment	67,118	77,406
Repair and Maintenance	185,971	74,845
Audit fee	32,500	12,500
Law charges	35,000	25,000
Depreciation	1,514,809	1,570,812
Maintenance of office building	186,496	106,605
Staff welfare fund	25,000	--
Miscellaneous	37,127	182,327
	17,391,352	**16,807,281**

11 GENERAL

a) Figures have been rounded off to the nearest rupee.
b) Figures of the previous year have been regrouped and rearranged wherever deemed necessary for purpose of comparison.

PAKISTAN SCIENCE FOUNDATION ACT 1973

National Assembly of Pakistan
Islamabad, the 2nd February, 1974

The following Acts of the National Assembly received the assent of the President on the 31st January, 1973 and hereby published for general information.

Act No. III of 1973

An Act to provide for the establishment of the Pakistan Science Foundation.

Whereas it is expedient to provide for the establishment of the Pakistan Science Foundation and for matters ancillary there to,

It is hereby enacted as follows:-

1. **Short title, extent and commencement.** (1) This Act may be called the Pakistan Science Foundation Act, 1973.

   2) It extends to the whole of Pakistan
   3) It shall come into force at once.

2. Definitions. In this Act, unless there is anything repugnant in the subject or context.

   a) "Board" means the Board of Trustees of the Foundation;
   b) "Chairman": means the Chairman of the Foundation; and
   c) "Foundation" means the Pakistan Science Foundation established under this Act.

3. Establishment of the Foundation. (1) As soon as may be after the commencement of this Act, the Federal Government may, by notification in the official Gazette, establish a Pakistan Science Foundation to promote and finance scientific activities having a bearing on the socio-economic needs of the country. (2) The Foundation shall be a body corporate by the name of the Pakistan Science Foundation, having perpetual succession and a common seal, with power, subject to the provision of this Act, to acquire, hold and dispose of property, both movable and immovable, and shall be the said name sue and be sued. (3) The Head Office of the Foundation shall be at Islamabad.

4. Functions of the Foundation: (1) The Foundation shall function as a financing agency for
   i) the establishment of comprehensive scientific and technological information and dissemination centers;
   ii) the promotion of basic and fundamental research in the universities and other institutions on scientific problems relevant to the socio-economic development of the country;
   iii) the utilization of the results of scientific and technological research including pilot plant studies to prove the technical and economic feasibility of processes found to be promising on a laboratory scale;
   iv) the establishment of science centers, clubs, museums, herbaria and planetaria;
   v) the promotion of scientific societies, associations and academies engaged in spreading the cause of scientific knowledge in general or in the pursuit of a specific scientific discipline or technology in particular;

vi) the organization of periodical science conferences, symposia and seminars;

vii) the exchange of visits of scientists and technologists with other countries;

viii) the grant of awards, prizes and fellowships to individuals engaged in developing processes, products and inventions of consequence to the economy of the country; and

ix) special scientific surveys not undertaken by any other organization and collection of scientific statistics related to the scientific effort of the country.

(2) The Foundation shall also;

x) review the progress of scientific research sponsored by it and evaluate the results of such research;

xi) maintain a National Register of highly qualified and talented scientists of Pakistan including engineers and doctors, in or outside the country and to assist them, in collaboration with the concerned agencies in finding appropriate employment; and

xii) establish liaison with similar bodies in other countries.

(3) In the performance of its functions, the Foundation shall be guided on questions of policy by the instructions, if any, given to it by the Federal Government which shall be the sole judge as to whether a question is a question of policy.

5. Board of Trustees. (1) The general direction, conduct and management of the affairs of the Foundation, including administration of its funds, shall vest in a Board of Trustees consisting of the following members namely;-

Whole-time members

i) the Chairman;

ii) one eminent scientist;

iii) the Director of Finance; to be appointed by the President;

Part-time members

iv) the Chairman of the National Science Council;

v) four scientists to be nominated by the National Science Council; and

vi) eleven eminent scientists to be nominated by the President

(2) The remuneration and other terms and conditions of service of the Chairman and the two other whole-time members of the Board shall be such as may be determined by the President.

6. Chairman of the Board. The Chairman of the Board shall be the Chairman of the Foundation and shall be appointed for a term of three years from amongst the eminent scientists of the country having experience of research and scientific administration.

7. Term of Members of the Board. The members of the Board, other than the ex-officio member, shall hold office for a term of three years and shall be eligible for re-appointment or re-nomination, as the case may be.

8. Meetings of the Board. (1) The meeting of the Board shall be held at least twice a year and shall be presided over by the Chairman or, in his absence, by its whole-time scientist member. (2) All decisions at a meeting of the Board shall be taken by a majority of the votes of the members present and voting.

9. Quorum at the Meeting of the Board. To constitute a quorum at a meeting of the Board not less than nine members shall be present.

10. Executive Committee. There shall be an Executive Committee consisting of the Chairman and the two whole-time members of the Board.

11. Delegation of Powers. The Board may, from time to time, delegate the Chairman or the Executive Committee such of its power and functions as it may consider necessary.

12. Adhoc Committees. The Foundation may set up adhoc committees consisting of university professors and other leading scientists and experts to scrutinize applications for financial assistance for carrying out scientific research submitted to the Foundation by the universities or other institutions or by individual scientific workers or groups of scientific workers and to review and evaluate the results of research sponsored by the Foundation.

13. Funds. The funds of the Foundation shall consist of:

a) grants made by the Federal Government and the Provincial Governments;

b) donation and endowments; and

c) income from other sources;

14. Budget. The Foundation shall cause to be prepared and approve a statement of its receipt and expenditure for each financial year.

15. Accounts and Audit. (1) The funds of the Foundation shall be kept in a personal ledger account of the Foundation with the State Bank of Pakistan or with any Branch of the National Bank of Pakistan acting as an agent of the State Bank. (2) The accounts of the Foundation shall be maintained in such form and manner as the Auditor-General of Pakistan may determine in consultation with the Federal Government. (3) The accounts of the Foundation shall be audited by one or more auditors who are chartered accountants with in the meaning of the Chartered Accountants Ordinance., 1961 (X of 1961) and are appointed by the Foundation in consultation with the Auditor-General of Pakistan.

16. Appointment of Officers and Servants. (1) The Foundation may appoint such officers and servants and engage such consultants or experts, as it may consider necessary for the efficient performance of its functions, on such terms and conditions as it may deem fit. (2) In fixing the terms and conditions of service of its officers and servants, the Foundation shall, as nearly as may be, conform to the scales of pay, allowances and conditions of service applicable to the corresponding class of employees of the Federal Government.

17. Annual Reports. (1) The annual report of the Foundation, which shall among other things, clearly bring out the benefits accruing to the nation as a result of the activities sponsored by the Foundation, shall be prepared by the Chairman and submitted through the Board to the Federal Government alongwith the audited accounts of the Foundation. (2) The annual report alongwith the audited accounts of the Foundation shall be laid before the National Assembly.

18. Regulations. The Foundation may make regulations for the efficient conduct of its affairs.

19. Repeal. The Pakistan Science Foundation Ordinance, 1972 (LII of 1972), is hereby repealed.

Annexure-II

LIST OF NEW PROJECTS APPROVED BY THE FOUNDATION DURING 1997-98

No.	Title and Number of Project	Name of PI and the Organization Supported:	Project Cost
	a) *Biological Sciences*		
1.	Development of Subunit Recombinant Vaccine(s) and Sensitive Diagnostic Tests for Controlling Infectious Bursal (Gumboro) Disease of Poultry P-AU/Bio (246)	Dr. Iftikhar Hussain Assistant Professor Dept. of Veterinary Microbiology University of Agriculture, Faisalabad	788735/-
2.	Assessment of Biological Activity in the Marine Cyanobacterial Species from Coastal and Near-Shore Environments S-KU/Bio (277)	Dr. Pirzada J. A. Siddiqui Assistant Professor Center of Excellence in Marine Biology, University of Karachi, Karachi.	385940/-
3.	Citric Acid Fermentation by Mutant Strain of *Aspergillus niger* GCM-7 in Stirred Fermenter. P-GC/Bio (283)	Dr. Ikram-ul-Haq Dept. of Botany Government College, Lahore	504094/-
	b) *Engineering Sciences*		
4.	Determination of Lateral and Vertical Penetration of Canal Water in Rechna Doab, Using Environmental Isotopes. C-PINSTECH/Engg(41)	Dr. M. Ishaque Sajjad, Chief Scientific Officer, PINSTECH, Islamabad.	303241/-
5.	Stress Analysis of Piping System Subjected to Dynamic Loading. C-PINSTECH/Engg(70)	Mr. S.K. Ayazuddin, Principal Scientific Officer, PINSTECH, Islamabad.	5,03,676/-
.6.	Design and Fabrication of a Rock Bed Storage System for a Solar Air Heated Hospital at Goma, Skardu. P-CEME/Engg(73)	Dr. Nasim A. Khan, Officer Incharge R & D, College of Electrical and Mechanical Engineering, Rawalpindi.	3,86,784/-
	c) *Chemical Sciences*		
7.	Characterization of Plasma Membrane Glycoproteins of Rabbit Corneal Epithelium. S-KU/Chem(321)	Dr. Nikhat Siddiqui, Professor, Department of Biochemistry, University of Karachi, Karachi.	6,43,997/-

8.	Synthesis of Neurotensin Mimics. C-FGC/Chem(232)	Dr. Javed Hussain Zaidi, Associate Professor, Department of Chemistry, F.G.College for Men, H-8, Islamabad.	2,22,156/-
	d) Medical Sciences		
9.	Analysis of Morphological, Immuno-histochemical and Genetic Prognostic Determinants in predicting Disease-free Survival of Breast Carcinoma Patients. S-AKU/Med (160)	Dr. Shahid Pervez Assistant Professor Dept. of Pathology The Aga Khan University Hospital, Karachi	229500/-
10.	Low Urinary Citrate, a Major Risk Factor for Calcium Stone in Pakistan- Is it due to low Alkali Intake? S-AKU/Med (161)	Prof. Dr. Jamsheer Talati Dept. of Surgery The Aga Khan University Hospital, Karachi	262732/-
11.	Clinical Application of ^{13}C Urea Breath Test for Diagnosis of *Helicobacter Pylori* Infection and Confirmation of Eradication Following Therapy. C-PINSTECH/Med (172)	Dr. Rakhshanda Bilal Principal Scientific Officer PINSTECH, Islamabad	289,680/-
	e) Environmental Sciences		
12.	Economically Important Plants of Cholistan Desert P-PARC/Envr (37)	Dr Ghulam Akbar Director Rangeland Research Institute NARC, PARC, Islamabad	373,799/-
13.	To Evaluate Suitability of Sewage Sludge as Organic Manure for Crop Production in Potwar Region. P-UAA/Envr (42)	Dr. Mushtaq Ahmed Khan Associate Professor/Chairman Dept. of Soil Science University of Arid Agriculture Rawalpindi	210,528/-
14.	Studies on Metals Eco-toxicity of the River Ravi. P-AU/Envr (44)	Dr. Mohammad Javed Assistant Professor Dept. of Zoology & Fisheries University of Agriculture Faisalabad	551035/-
15.	Floristic Study of Arid Zone (Desert - Nara Region) Sindh. S-SALU/Envr (45)	Dr. Ghulam Raza Bhatti Assistant Professor Dept. of Botany Shah Abdul Latif University, Khairpur	501,243/-
	f) Biotechnology		
16.	Development of Prime Based RT-PCR Diagnostic Test And Study of Hepatitis C Virus Genotypes Prevalent in Pakistan. Biotech/P-NIBGe/Med(4)	Dr. Waris Ali Shah, Senior Scientific Officer, NIBGe, Faisalabad.	5,31,903/-

17.	Biotechnological Solution of Liquid Effluents from Leather Industry. Biotech/P-NIBGE/Env(5)	Mr. Zafar M. Khalid, Principal Scientific Officer, NIBGE, Faisalabad.	5,77,728/-
18.	Determination of Leishmania Species Using PSR Techniques Biotech/S-AKU/Med(12)	Dr. M. Khalid Ashfaque, Associate Professor, Deptt. Of Biochemistry, Agha University, Karachi.	5,93,568/-

Annexure-III

DETAILS OF MONITORING AND EVALUATION OF ON-GOING PSF PROJECTS DURING 1997-98

a) ***Semi-Annual Reports***

No.	Project No.	Project Title	Reports
1.	P-PU/Agr(137)	Effect of Echinococcosis in Rabbits and Sheep alongwith its Control by Indigenous Plants of Pakistan	3rd semi annual
2.	AJK-UCR/Agr(142)	Studies on the Nature and Application of Fungi & Bacteria Controlling Insect Pests of AJK.	3rd semi annual
3.	S-AEARC/Agr (148)	Improving productivity of Salt Affected Lands through Continuous Cropping	3rd Semi annul
4.	P-AU/Agr(155)	Breeding for Seedless Kinnow-A Biotechnology Approach	3rd semi annual
5.	AJK-UCR/Agr (159)	Some Physiochemical Studies on Alternate Bearing in Apple in Azad Kashmir.	2nd semi annual
6.	S-AU/Agr(169)	Population Ecology of Whitefly and Fruit fly on Cucurbits in Sindh	1st semi annual
7.	P-AU/Agr(175)	Factors Affecting Successful In Vitro Maturation, Fertilization and Culture of Buffalo Follicular Oocytes.	2nd semi annual
8.	F-AU/Agr(182)	Management of Onion Downy Mildew under IPM in the NWFP, Pakistan	1st semi annual
9.	S-PCCC/Agr(183)	Breeding for Glandless Cotton.	2nd semi annual
10.	S-KU/Agr(184)	Investigation on the Diseases of Betal Vine and their Cotrol.	2nd semi annual
11.	P-AU/Agr(191)	Evaluation of Cotton Germplasm for the Development of Multipurpose Variety.	1st semi annual
12.	P-PU/Agr(192)	Development of Maize Population for Fodder Purposes.	1st semi annual
13.	P-AU/Agr(195)	Electrophoretic Identification of Pakistani Wheats for Gliadin and HMW Glutenin Subunit Composition and their Relationship with End Use Quality.	1st semi annual
14.	F-GU/Agr(198)	Enhancement of Post Harvest Quality and Stability of Dhakki Date Using Advanced Technology.	1st semi annual
15.	S-KU/Agr(200)	Breeding of Some Important Commercial Marine Shrimps of Pakistan in Captivity	1st semi annual
16.	S-KU/Agr(207)	Identification and Control of Plant Parasitic Nematodes Associated with Rice using Organic Amendments in Thatta District, Sindh.	1st semi annual
17.	P-BAC/Agr(209)	Biology and Management of Black Scurf of Potato.	1st semi annual

18.	C-NARC/Agr(216)	Mating Types, Races and Genetic Variability in *Phytophthora infestans*, the Cause of Late Blight of Potato.	1st semi annual
19.	S-KU/Agr(217)	Studies on the Entomopathogenic Nematodes in Sindh	1st semi annual
20.	S-KU/Bio(193)	Use of Rhizobia in the Integrated Control of Root Rot Diseases of Crop Plants.	2nd semi annual
21	S-AU/Bio (210)	Virus Free Clonal Propagation of Banana *In-Vitro*.	3rd semi annual
22.	P-NIBGE/Bio (219)	Construction of Genetically Engineered Noval Cellulolytic Yeast Strain for Step Conversion of Mass Produced on Saline Land for Ethanol Production	3rd semi annual
23.	P-PU/Bio(228)	Evaluation of the role of salt tolerant bacteria in developing resistance of plants to salt stress conditions	2nd semi annual
24.	S-KU/Bio(233)	Cage Culture of *Lutjanmus jhoni* (Suapers) and *Pomadasys kaakan* (Grunts), Mairine Commercial Fishes.	2nd semi annual
25.	P-AU/Bio(238)	Potentials of Owls as Controlling Agents of Rats and Mice.	2nd semi annual
26.	S-AKU/Bio(239)	Elucidation of the Sturcture and Function of a New Form of Dihydropolate Reductase.	2nd semi annual
27.	P-NIAB/Bio(243)	Production and Evaluation of Immunopotentiators adjuvanted Haemorrhagic Septicaemia Vaccine in Continuous Culture.	2nd semi annual
28.	F-GU/Bio (247)	Development of Salt Tolarant Sugarcane Cultivars through Genetic Engineering	2nd semi annual
29.	C-QU/Bio(264)	Study of hereditary disorders in Pakistani kindreds-II.	1st semi annual
30.	C-NARC/Bio(271)	Biology and host pathogen interaction in powdery scab of potato in Pakistan	1st semi annual
31.	C-QU-Bio(273)	Studies on the Role of Excitatory Amino Acid Neurotransmitters in Regulating Secretion of Growth Hormone in Non-Human Primates	1st semi annual
32.	B-BU/Chem(211)	Biotechnological Potential of Immobilized Enzymes: Application of Immobilized Enzymes in the Synthesis of Valuable Biological Compounds.	2nd Semi Annual
33.	B-BU/Chem(257)	Kinetic Study of the Reactions of Dimeric Molybdeneum (v) with Chloroamines in Aqueous Medium.	3rd Semi Annual
34.	C-QU/Chem(265)	Synthesis, Structure and Pharmacological Studies on Some New 4, 1-Benzoxazepine, 2, 4-Diones.	2nd Semi-Annual
35.	F-PU/Chem(284)	A Study on the Lubricity of of Lubricating oils Produced in Pakistan.	1st Semi Annual.
36.	F-PU/Chem(285)	Flash Pyrolisis of Indigenous Coal Utilizing Effective Radical Transfer.	1stSemi-nnual, 2nd Semi-Annual,

37.	P-BZU/Chem(304)	Flow Injection Enzymes Immunoassays of Proteins and Drugs, Using Biotin-Avidin System and Solid State Reactors.	1st Semi-Annual
38.	S-KU/Chem(311)	Isolation and Characterization of Antibiotics from Soil Fungi for the Development of Drugs.	1st Semi-Annual,
39.	F-PU/Chem(315)	Ion Exchange Properties of Metal-III Phosphates.	1st Semi-Annual.
40.	C-QU/Phy(82)	A Study of the Electrical Behaviour of Organometallic Polymers.	3rd Semi-Annual.
41.	C-QU/Phy(89)	Numerical/Theoretical Study of LASER Light Propagation, & Energy Deposition, Thermal Transport in LASER Produced Plasmas and Computational Study of Z-θPinch Plasma.	3rd Semi-Annual.
42.	C-QU/Phy(93)	Atomic Coherence Effects in LASERs and Quantum Optics.	2nd Semi Annual
43.	P-BZU/Phy(95)	Optical and Electrical Properties of Germinate Glasses.	1st Semi-Annual
44.	C-PINSTEC/Phy(97)	Study of Heavy Ion Reactions Using Dielectric Trac Detectors.	2nd Semi-Annual.
45.	P-PU/Phy(99)	Analytical Investigation of Non-Linear Waves in Semiconductor Superlative Plasmas.	2nd Semi-Annual.
46.	C-QU/Phy(101)	Design and Development of Gas-Puff Z-Pinch.	2nd Semi-Annual.
47.	C-QU/Maths(21)	Ricci Collineation of Space-Time	2nd Semi-Annual.
48.	F-PU/Earth(52)	Measurement of Runoff and Sediment Load from Glaciers of the Raka Poshi and Harmosh Range, North Pakistan.	1st Semi Annual.
49.	P-CEWRE/Earth(52)	Impact of Irrigation Management on Nitrate Leaching on Farmers Fields.	1st Semi-Annual

b) ***First Annual Reports***

1.	P-AU/Agr(119)	Improving Maize Yield through Substrate Dependent Microbially Derived Plant Hormones.
2.	P-PDC/Agr (152)	Isolation of Locally prevailing Strains and Preparation of Vaccine of IBD Virus.
3.	S-KU/Agr(184)	Investigation on the Diseases of Betal Vine and their Cotrol.
4.	P-AU/Agr(191)	Evaluation of Cotton Germplasm for the Development of Multipurpose Variety.
5.	P-PU/Agr(192)	Development of Maize Population for Fodder Purposes.
6.	C-IIBC/Agr (201)	Management of *Pentalonia nigronervosa*, a Vector of Banana Bunchy Top Disease in Sindh Province.
7.	S-KU/Agr(207)	Identification and Control of Plant Parasitic Nematodes Associated with Rice using Organic Amendments in Thatta District, Sindh.
8.	S-KU/Agr(217)	Studies on the Entomopathogenic Nematodes in Sindh
9.	S-KU/Bio(193)	Use of Rhizobia in the Integrated Control of Root Rot Diseases of Crop Plants.

10.	S-KU/Bio(233)	Cage Culture of *Lutjannus jhoni* (Suapers) and *Pomadasys kaakan* (Grunts), Mairine Commercial Fishes.
11.	P-AU/Bio(238)	Potentials of Owls as Controlling Agents of Rats and Mice.
12.	S-AKU/Bio(239)	Elucidation of the Sturcture and Function of a New Form of Dihydropolate Reductase.
13.	F-GU/Bio (247)	Development of Salt Tolarant Sugarcane Cultivars through Genetic Engineering
14.	S-SU/Bio(198)	Acrididae of Punjab
15.	S-KU/Bio(209)	Lipasis: The Multifunctional Enzyme of Microbial Origin
16.	AJK-UCR/Bio(218)	Survey of Rice Pests in Azad Kashmir and Potential of Dragon Flies as Biocontrol Agents.
17.	P-GU/Bio(221)	Development of *Asperigillus niger* Strain for Citric Acid Fermentation of Molasses
18.	S-CSIR/Bio (223)	Amaranthine Production through Cell Suspension Culture Of *Celasia cristata*
19.	P-NIAB/Bio(243)	Production and Evaluation of Immunopotentiators adjuvanted Haemorrhagic Septicaemia Vaccine in Continuous Culture
20.	B-BU/Chem(279)	Physio-Chemical Studies on the Biologically Active Constituents of Ferns in Pakistan.
21.	F-PU/Chem(285)	Flash Pyrolisis of Indigenous Coal Utilizing Effective Radical Transfer.
22.	S-KU/Chem(311)	Isolation and Characterization of Antibiotics from Soil Fungi for the Development of Drugs.
23.	C-QU/Phy(93)	Atomic Coherence Effects in LASERs and Quantum Optics.
24.	P-PU/Phy(94)	Theoretical/ Computational Studies of Fractals in Materials.
25.	C-PINSTECH/Phy(97)	Study of Heavy Ion Reactions Using Dielectric Trac Detectors.
26.	C-QU/Phy(101)	Design and Development of Gas-Puff Z-Pinch.
27.	C-QU/Maths(21)	Ricci Collineation of Space-Time

c) Second Annual Reports

17.	S-AEARC/Agr (141)	Host Plant Resistance of Bioregulator Treated Cotton to Bollworms & Sucking Complex and its Impact on Yield and yield components
18.	AJK-UCR/Agr(142)	Studies on the Nature and Application of Fungi & Bacteria Controlling Insect Pests of AJK.
19.	S-AEARC/Agr (148)	Improving productivity of Salt Affected Lands through Continuous Cropping
4.	P-AU/Agr(155)	Breeding for Seedless Kinnow-A Biotechnology Approach

5.	P-AU/Agr (157)	Free Living Nematode *Rhabditis* as Helminth Vaccine against *Toxocara vituloram.*
6.	F-GU/Agr (158)	Evaluation of the Economics of Various Rice Based Cropping Systems under Dera Ismail Khan Conditions.
7.	S-AEARC/Agr(171)	Exploitation of Mutagenesis & Selection for the Genetic & Agronomic Improvement of Oleiferus Brassicae.
8.	P-AU/Agr(175)	Factors Affecting Successful In Vitro Maturation, Fertilization and Culture of Buffalo Follicular Oocytes.
9.	S-PCCC/Agr(183)	Breeding for Glandless Cotton
10.	S-SU/Bio(198)	Acrididae of Punjab
11.	S-AU/Bio (210)	Virus Free Clonal Propagation of Banana *In-Vitro.*
12.	P-NIAB/Bio(243)	Production and Evaluation of Immunopotentiators Adjuvanted Haemorrhagic Septicaemia Vaccine in Continuous Culture
13.	B-BU/Chem(257)	Kinetic Study of the Reactions of Dimeric Molybdeneum (v) with Chloroamines in Aqueous Medium.
14.	C-QU/Phy(82)	A Study of the Electrical Behaviour of Organometallic Polymers.
15.	C-QU/Phy(89)	Numerical/Theoretical Study of LASER Light Propagation, & Energy Deposition, Thermal Transport in LASER Produced Plasmas and Computational Study of Z-θPinch Plasma.

Annexure-IV

LIST OF PUBLICATIONS PRODUCED THROUGH PSF SUPPORTED PROJECTS COMPLETED DURING 1997-98

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Naeema Khan, Samina Aslam and Farhana Bashir Synthesis, Structure and Antibacterial Studies on Some 3-Substituted-4, 1-Benzoxazepine-2,5-Diones., (under preparation) Ring Opening Reaction in Some 3-methyl -4.

Annexure-V

GRANTS SANCTIONED FOR CONFERENCES, SEMINARS, SYMPOSIA ETC. DURING YEAR 1997-98

S.NO	NAME OF DEPARTMENT	NAME OF EVENT	AMOUNT SANCTIONED
20.	Chemical Society Of Pakistan, University of Karachi, Karachi.	8th National Chemistry Conference, PCSIR Laboratories Complex, Ferozepur Road, Lahore, from 2-4 September, 1997.	Rs.35,000/-
21.	Dr. A.Q.Khan Research Labs., Rawalpindi.	8th International Symposium on 'Advanced Materials" from 18-20, September, 1997, at Islamabad.	Rs.35,000/-
22.	Department of Botany, Government College, Lahore.	Symposium on "Bio-technology for Sustainable Development" from 24-25, May, 1997 at Lahore.	Rs.20,000/-
23.	Department of Microbiology, College of Veterinary Sciences, Lahore.	International Seminar on "Microbiol Diseases of Livestock and Poultry" from 1-2, October, 1997 at Lahore.	Rs.20,000/-
24.	Department of Geography, Government College, Asghar Mall, under the Patronage of Allama Iqbal Open University, Islamabd.	9th All Pakistan Geographical Conference from 26-30 December, 1997 at Islamabad.	Rs.15,000/-
25.	National Museum of Science and Technology, Lahore.	Science Day, 1997, holding of Science Models Competition, Science Quiz and Essay Competition from 30th Oct.97 to 1st Nov.,1997, at Lahore.	Rs.32,400/-
26.	Department of Soil Science, University of Agriculture, Faisalabad.	Seminar on "Degraded Soils: Processes, Management and Economic Analysis, from 18-20 March, 1998 at Faisalabad.	Rs.15,000/-
27.	National Centre of Excellence in Geology, University of Peshawar, Peshawar.	13th Himalaya-Karakoram Tibet International Workshop, from 20-30 April, 1997 at Peshawar.	Rs.25,000/-
28.	Bolan Medical College, Quetta.	6th Biennial Conference of Pakistan Physiological Society, Quetta, from 8-9 October, 1997.	Rs.15,000/-
29.	HEJ Research Institute of Chemistry, University of Karachi, Karachi.	9th International Symposium on Natural Product Chemistry, from 28-12-97 to 1.1.1998, at Karachi.	Rs.30,000/-
30.	Institute of Geology, University of the Punjab, Lahore.	UNESCO Regional Postgraduate Training Course in "Plate Tectonics" from 5-22 December, 1997.	Rs.20,000/-

31.	6th All Pakistan Science Conference.	Society of Pure & Applied Sciences, 11-D Sabzazar, Wahdat Road, Lahore.	Rs.15,000/-
32.	Ist National Symposium on Current Trends in Development & Reproductive Biology.	Pakistan Academy of Sciences, Islamabad.	Rs.25,000/-
33.	6th National Symposium on Frontiers in Physics.	The Pakistan Physical Society, Islamabad.	Rs.20,000/-
34.	US-Pakistan Symposium - Workshop on Silicon Technology.	National Institute of Silicon Technology, Islamabad.	Rs.30,000/-
35.	18th Pakistan Congress of Zoology.	Zoological Society of Pakistan, Islamabad.	Rs.30,000/-
36.	National Seminar on occupational Safety in Minning and Industries.	NWFP University of Engineering and Technology, Peshawar.	Rs.20,000/-
37.	International Seminar on "Agro-Environmental Issues and future Strategies towards 21st Century".	Faculty of Agriculture, Engineering and Technology, UAF, Faisalabad.	Rs.25,000/-