Annual Report

1998-1999

Pakistan Science Foundation

PAKISTAN SCIENCE FOUNDATION

ANNUAL REPORT
1998-99

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 1998-99, 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

EXECUTIVE COMMITTEE

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

BOARD OF TRUSTEES

Non-Existent

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PAKISTAN MUSEUM OF NATURAL HISTORY (PMNH)

PAKISTAN SCIENTIFIC AND TECHNOLOGICAL INFORMATION CENTRE (PASTIC)

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 museum, 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 1998-99, a total of 179 projects in the fields of Agriculture, Biology, Chemistry, Earth, Engineering, Environment, Medicine and Physics remained under consideration for funding. Among these,128. projects were newly received while 51 had been carried over from the previous year. Out of these, 21 projects costing Rs.8.7 million were sanctioned in various fields. In addition, an amount of Rs. 0.557 million was released to various institutions 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, 76 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, 18 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 are as under:

- Studies on the Nature and Application of Fungi and Bacteria Controlling Insect Pests of Azad Jammu and Kashmir.

- Free Living Nematode Rhabditis as Heliminth Vaccine against *Toxocara vitulorum.*
- Some Physicochemical Studies on Alternate Bearing in Apple in Azad Kashmir
- Identification and control of Plant Parasitic Nematodes associated with Rice using Organic Amendments in Thatta District, Sindh.
- Construction of Genetically Engineered Noval Celluloytic Yeast Strain for Step Conversion of Biomass produced on Saline Land for Ethanol Production.
- Cage Culture of *Lutjanus Johni* (Snapper) and *Pomadasys kaakan* (grunt) Marine commercial Fishes.
- Study of Hereditary Disorders in Pakistani Kindreds-II.
- Biotechnological Potential of Immobilized Enzymes: Application of Immobilized Enzymes in the Synthesis of Valuable Compounds.
- Evaluation of Aqueous Extracts of Sea Weeds as an Elicitor of Plant Defence Mechanism
- Synthesis of Biologically Active Organotin Derivatives: Their Characterization and Application.
- Synthesis of N,N-Dialkylbenzylamine Derivatives and Their Evaluation as Chelating Organic Reagents.
- Flash Pyrolysis of Indigenous Coal Utilizing Effective Radical Transfer.
- Draining and Long Range Interaction in Polymer Solutions.
- Electronic Spectra of Diatomic Molecules.
- Numerical/Theoretical Study of Laser Light Propagation and Energy Deposition and Thermal Transport in Laser-Produced Plasmas and Computational Study of Z-θ Pinch Plasma.
- Elastic and Diffractive Scattering and QCD based Phenomenology
- Atomic Coherence Effect in Laser and Quantum Optics
- Study of Heavy Ion Reactions using Dielectric Track Detector.

One of the main achievements and usefulness of any research is the publication of results in scientific journals, and through projects, 73 research papers were published in different scientific journals. In addition, 4 Ph.D. and 6 M. Phil degrees were awarded to the research Associates employed in the PSF-supported projects.

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. The Foundation provided financial assistance amounting to Rs.0.39 million to various Universities and R&D organizations for organizing 17 National and International Science Conferences, Seminars, Symposia, etc.

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. 0.56 million was released for the purpose.

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, computer exhibitions, fairs, science film shows, popular science lectures, donation of books, strengthening of science laboratories and science quiz competitions etc.

A workshop on "Training of Trainers for Science Popularization in SAARC Member States" was organized by the Pakistan Science Foundation w.e.f. 5th-9th October, 1998, in the PSF Auditorium, Islamabad. The workshop was sponsored by the SAARC-Japan Fund. Four SAARC Member States i.e., Bhutan, Nepal, Sri Lanka and India sent two representatives each to attend the Workshop. Twelve representatives from Pakistan were nominated.

Science Caravan of Pakistan Science Foundation 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 is in national language, and is 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 14 mobile exhibitions and planetarium shows, where 180 schools brought their students to see the caravan exhibition and planetarium/film shows.

The Foundation also continued its other 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:

The Foundation has initiated a development programme for the establishment of 15 Science Centers at district level all over Pakistan. This will be done through Public and Private partnership by making optimum use of the available facilities (in terms of land/building) with the educational/R&D organizations and meeting the development cost by generating funds through PSF Science Promotion activities, financial/material inputs by local private sector. The first Science Centre has been established at Faisalabad. The Center's building was completed during the report period. The exhibition hall and display rooms have been equipped with diorama, working models and exhibits pertaining to Biology, Physics, Engineering, Solar Energy, Computer Science, etc. The Centre shall soon be opened for students and public.

PAKISTAN MUSEUM OF NATURAL HISTORY (PMNH)

Pakistan Museum of Natural History (PMNH) is an important scientific organization carrying out environmental and biodiversity research in the country as well as promoting informal education and public awareness about our natural wealth. It is a subsidiary organization of Pakistan Science Foundation and was established in 1979 to serve 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 main task of PMNH is the collection, storage, curation and research on plants, animals, rocks, minerals and fossils of the country. The three Scientific Divisions viz.; Botanical Sciences, Earth Sciences and Zoological Sciences Division undertook 33 field trips to various localities of Pakistan and added a large number of floral, faunal and geological samples to the PMNH reference collection. Laboratory studies of the collected material and analyses of data were carried out by the scientists of the three Divisions. Their endeavors resulted in the publication of 11 articles in the national and international research journals. Three new international and national collaborative research projects were initiated during the period under review.

The Public Services Division personnel remained engaged in designing the interior of the new display block of the PMNH. Layout plans of the preparation of various exhibits were completed. Most of the work of paleontology gallery has been completed. Similarly Children Discovery Room, Ocean Diorama and Salt Range Diorama have been partially completed. Work is in progress for the Biodiversity of Pakistan exhibit. The Science Center, Faisalabad has been designed and completed. A revised PC-I, Phase II has been prepared for the construction of the remaining portion of Blocks II, IV, V and VII.

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 centers. 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-centers 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 the report period, 2,300 requests for supply of articles were received, against which 1993 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, about 17,31,505 impressions, 5133 pages and 135,864 copies were produced against 111 jobs received from 15 S&T organizations. PASTIC library added to its collection some 57 books, 245 documents and 444 periodical issues during the report period. Various databases on CD-ROM were purchased.

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. 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 one organization. PASTIC also trains information specialists in modern information handling and management techniques. In this connection, certain trainings and lectures were arranged at National level during the report period.

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, 1500 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 also arranged computer exhibition in March 1999 at Islamabad. It has launched its third 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 organization 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 1998-99 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, 128 projects requesting for funds amounting to more than Rs. 64.28 million were received by the Foundation, whereas 51 project proposals at various stages of their processing, were brought forward from the previous year. Thus, in all 179 projects in the fields of Agriculture, Biology, Biotechnology, Chemistry, Earth Sciences, Engineering, Environment, Mathematics, Medicine 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 21 project proposals succeeded in getting the approval of the Foundation at an estimated cost of Rs. 8.7 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.0.557 million were sanctioned to the following institutions for the purpose.

S. No.	Institution	Purpose	Amount
1.	Pakistan Museum of Natural History (PMNH), Islamabad.	Herbarium Containers and one Computer	Rs.100,000/-
2.	Gomal University, D.I. Khan.	Two Computers and one printer	Rs. 80,0000/-
3.	University of Peshawar.	Accessories for Gas Chromatograph	Rs.226,995/-
4.	Sindh University, Jamshoro.	Data Processing Software for Liquid Chromatograph.	Rs.150,000/-

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 95 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, 76 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 18 research projects were received during the year 1998-99. 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.	AJK-UCR/Agr (142)	Studies on the Nature and Application of Fungi and Bacteria Controlling Insect Pests of Azad Jammu and Kashmir.
2.	P-AU/Agr(157)	Free Living Nematode Rhabditis as Heliminth Vaccine against *Toxocara vitulorum.*
3.	AJK-UCR/Agr(159)	Some Physicochemical Studies on Alternate Bearing in Apple in Azad Kashmir.
4.	S-PARC/Agr(207)	Identification and Control of Plant Parasitic Nematodes associated with Rice using Organic Amendments in Thatta District, Sindh.
5.	P-NIBGE/Bio(219)	Construction of Genetically Engineered Noval Cellulolytic Yeast Strain for Step Conversion of Biomass Produced on Saline Land for Ethanol Production.
6.	S-KU/Bio (233)	Cage Culture of *Lutjanus Johni* (Snapper) and *Pomadasys kaakan* (grunt) Marine commercial Fishes.
7.	C-QU/Bio(264)	Study of Hereditary Disorders in Pakistani Kindreds-II.
8.	B-BU/Chem(211)	Biotechnological Potential of Immobilized Enzymes: Application of Immobilized Enzymes in the Synthesis of Valuable Compounds.
9.	S-CSIR/Chem(248)	Evaluation of Aqueous Extracts of Sea Weeds as an Elicitor of Plant Defence Mechanism
10.	C-QU/Chem(256)	Synthesis of Biologically Active Organotin Derivatives: Their Characterization and Application.
11.	P-PU/Chem(278)	Synthesis of N,N-Dialkylbenzylamine Derivatives and their Evaluation as Chelating Organic Reagents.
12.	F-PU/Chem(285)	Flash Pyrolysis of Indigenous Coal Utilizing Effective Radical Transfer.
13.	F-PU/Chem(287)	Draining and Long Range Interaction in Polymer Solutions.
14.	S-KU/Phys(72)	Electronic Spectra of Diatomic Molecules.
15	C-QU/Phys(89)	Numerical/Theoretical Study of Laser Light Propagation and Energy Deposition and Thermal Transport in Laser-Produced Plasmas and Computational Study of Z-θ Pinch Plasma.
16.	P-PU/Phys(91)	Elastic and Differactive Scattering and QCD Based Phenomenology
17.	C-QU/Phys(93)	Atomic Coherence Effect in Laser and Quantum Optics
18.	C-PINSTECH/Phys(97)	Study of Heavy Ion Reactions using Dielectric Track Detector.

ii) Brief Summaries of Completed Projects

Project No: **AJK-UCR/Agr (142)**
Project Title: **Studies on the Nature and Application of Fungi and Bacteria Controlling Insect Pests of Azad Jammu and Kashmir.**

Duration: 3-Years

Date of Initiation: 01-05-1995

Date of Completion: 30-04-1998

Location of Scheme: University College of Agriculture, Rawalakot, AK.

Principal Investigator: Syed Riaz Ali Gardezi

Total Expenditure: 538,852/-

Main Objectives:

- To collect pathogenic fungi and bacteria and to work out their possible use as biocontrol agents for agricultural pests.
- To identify their toxin producing symbionts responsible for the mortality of insect pests of agricu ture and economic importance, and to determine their chemical structure for possible synthesis.
- To formulate and establish quality control of microbial insecticides in the laboratory and to test in the field for insect pest control.

Summary of work done:

The diversity of interrelationship between fungi, bacteria and insects presents unlimited opportunities for studying antagonistic fungi and bacteria causing mortality in insects by producing disease and toxins which are detrimental to insect life. These can be used to control harmful insects. Fungal and bacterial parasitism has been used effectively for controlling the agricultural pests all over the world. Its application has great advantage, like ineffectiveness of synthetic insecticide can be controlled by using entomogenous fungi and bacteria as insecticides. Fungi and bacteria from different localities of Azad Jammu and Kashmir were collected and their insecticidal properties were searched out. Total 40 species of fungi and two bacterial species were tested for their insecticidal habits on maize stem borer (*Chilo partelhus*). These species were; *Aspergillus clavatus, A.fumigatus. A.fischeri, A.ruber, A. unguis A sydowi, A. versicolor, A.flavipes, A. ustus, A. terreus, A. niger, A. wentii, A. flavus, A. bisporus, A. candidus, A. oryzae,*

A. ochraceous, A giganteus, A. tamarii. A. huchuensis, Penicillium chrysogemum. P. expansum, P. viridicatum, P. commune, P. soltium, P. roquefortii, Paecilomyces elegans, P.earnes, P. varioti, , P.flavescens, P. fumoso-roseus, Metarrhizium anisopliae, M. brunneum, Venturia inaequalis, Helminthosporium maydis, Alternaria temlissima, Ceratocystis paradoxa, Colletotrichum capsici, Diplodia maydis, Beauveria bassiana, Bacillus thuringiensis and *Bacillus sphaericus.* Eleven species; *Aspergillus flavus, A. fumigatus, A. oryzae, A. candidus, A. bisporus, A. tamarii, Metarrhizium anisopliae, M. brunmeusm, Beauveria bassiana. Bacillus thuringiensis* and *B. sphaericus* caused mortality in larvae, pupae, de-waxed pupae and adult of maize stem borer *(Chilo partellus).*

Eight species of insects were collected from natural conditions and their susceptibility was measured for all the described species of fungi and bacteria. Five species of insects; *Trporhiza incertula, T. innotata,Cydia pomonella,, Pieris brassicae,* and *Mythimna seperata* showed susceptibility to *A.flavus. A. fumigatus, A. oryzae, A. tamarii, A. bisporus, M. anisopliae, M. brunmeum, Bacilhus thuringiensis* and *B. sphaericus.* Food substrate of fungi and bacteria were also used against maize stem borer. Nine fungi and two bacterial species herein described gave positive results. Field trials of fungi and bacteria were also performed against maize stem borer.

Project No: **P-AU/Agr(157)**
Project Title: **Free Living Nematode Rhabditis as Heliminth Vaccine against *Toxocara vitulorum.***

Duration:	3-years
Date of Initiation:	01.02.1995
Date of Completion:	31.01.1998
Location of Scheme:	University of Agriculture, Faisalabad
Principal Investigator:	Dr. Sikarndar Hayat
Total Expenditure:	472,094/53

Main Objectives:

- To prepare vaccine against *Toxocara vitulorum* in buffalo calves and adults which will help in reducing the neonatal mortality & morbidity in adult animals.
- *In-vivo* and *in-vitro* assessment of immune status produced by crude and sub-unit vaccines prepared from free living Nematodes Rhabditis species.
- To replace the commonly available antihelminths with the vaccines, and to test its safety and feasibility for commercial use.

Summary of work done:

Free living nematode *Rhabditis axei* were cultured on blood agar at 37^0C and 70-80 per cent humidity. Soil samples obtained from canal channels and cultivated fields were found positive for *Rhabditis axei* Supplementation of 2-3 grams of glucose in the culturing media significantly enhanced the growth of the *Rhabditis axei*. Sub-culturing of the *Rhabditis axei* was maintained upto 42 generations, by making transfers into the fresh blood agar media. Sterile hatching of *Toxocara vitulorum* larvae was accomplished in 0.5 per cent formalin, incubated at 28^0C for 18 days. Crude, protein sub-unit and lipopolysaccharide sub-unit vaccines were prepared with and without Freund's complete adjuvant. The evaluation of the vaccines were determined on the basis of humoral, cellular and challenge responses in a rabbit model. No significant difference (P=0.01) in the humoral response was found among whole larvae pellet (WLP) and whole larvae supernatant (WLS) with and without Freund's complete adjuvant compared to control. There was a highly significant difference (P=0.01) among lipopolysaccharides sub-unit (LPS) and protein sub-unit (PS) with and without adjuvant compared to the control. The best response was produced by the LPS followed by PS,WLS and WLP. A similar cellular response was observed viz. the LPS being the best followed by PS,WLS and WLP. There was no significant difference (P=0.01) in the response induced by the vaccines with and without Freund's complete adjuvant. Challenge infection with 20,000 L3 of *Toxocara vitulorum* indicated that all the vaccines were effective against *Toxocara vitulorum* with variable level of protection being lower to higher from crude to subunit vaccines.

Project No: **JK-UCR/Agr(159)**
Project Title: **Some Physicochemical Studies on Alternate Bearing in Apple in Azad Kashmir**

Duration: 2-years

Date of Initiation: 07.07.1995

Date of Completion: 06.07.1997

Location of Scheme: University College of Agriculture, Rawalakot

Principal Investigator: Dr. Yusuf Ali

Total Expenditure: 185,171/-

Main Objectives.

- To increase the apple yield in Azad Kashmir and thus give incentive to the farmers to grow more apple through the technology package developed under this project.
- To find out a suitable growth regulator which could be used for thinning of flowers in an "on year".
- To find out a suitable growth regulator for thinning of fruits in an "on year" to avoid heavy crippling.
- To find a suitable growth retardant for delaying of flowering time, so that the danger of cold and stormy weather could be avoided.
- To find out the suitable combination of nutrition and time of application to overcome this problem.
- To determine the best time of pruning which could perhaps be the best cultural practice to solve the problem of biennial bearing.

Summary of work done:

The project was conducted during 1996-98 to study the effect of cultural practices on the alternate bearing on apple in apple growing districts; Rawalakot and Bagh of Azad Jammu & Kashmir. Ringing and bending showed a significant effect on flowering in Starking Delicious cultivar of apple as compared to control. In heavy ringing and bending number of flowers were maximum as compared to control. Because due to ringing and bending in the plants accumulation of carbohydrates was increased. While maximum fruit set percentage was recorded in light ringing as compared to control and heavy ringing and bending. In heavy ringing and bending may be the plant goes under stress. Maximum yield was obtained in the light ringing and bending plants which was 30% more as compared to control.

Different treatments of pruning showed the non significant difference in the first year but in the later years there was significant increase in the number of flowers, fruit set percentage,

average fruit weight and yield. The plants in the later years attained proper care in respect of fertilizer and other cultural practices. Different treatment of farm yard manure showed a significant effect on the number of flowers, fruit set percentage, average fruit weight, yield and total soluble solids. To show a significant increase in number of flowers, fruit set percentage, average fruit weight and yield over other treatments. This may be due to the proper dose of fertilizer which provides proper amount of nutrients and also helps the plant to maintain proper C:N Ratio.

Different treatments of F.Y.M. + fertilizers showed the super performance in all these experiments. In T2 although number of flowers (7951) was less as compared to T3 (8140) but it remained dominant on all treatments in other parameters. It may be due to the C:N Ratio and availability of maximum amount of nutrients at proper time to the plants due to the combination of F.Y.M. and other cultural practices throughout the growing period. Fertilizer treatment also showed a significant increase in yield as compared to control. In control and T3 where the plants were fertilized once showed less flowering and fruit set percentage as compared to T2 where the plants were fertilized before and after flowering but excessive fertilization also resulted in low yield as compared to T2 which may be due to the disturbance in C:N Ratio. This was because the plant after flowering were exhausted, the additional dose of fertilization after flowering helps the plants for better fruit set. Heavy fruit setting, automatically resulted in heavy yield.

Different treatments of NAA showed a significant effect on the delaying of flowering time, number of flowers, fruit set percentage and yield. 100 ppm spray of NAA showed a highly significant effect on delaying of flowering which was 20 days as compared to control. Delay in flowering provided favourable temperature for blooming and less rain fall during the flowering of these plants. Due to the best environmental conditions for pollination and fruit setting, these apple plants gave more than double yield as compared to control.

Finally, it was concluded that with light ringing and bending, with good fertilization and by delaying flowering time with the use of plant growth regulator NAA, the problem of alternate bearing in Azad Jammu & Kashmir can be overcome. By controlling this problem, the per capita income of the farmers can then be increased.

Project No: **S-PARC/Agr(207)**
Project Title: **Identification and Control of Plant Parasitic Nematodes Associated with Rice using Organic Amendments in Thatta District, Sindh.**

Duration: 2-years

Date of Initiation: 01.06.1997

Date of Completion: 31.05.1999

Location of Scheme: Crop Diseases Research Institute, PARC, Karachi

Principal Investigator: Dr. Aly Khan

Total Expenditure: 143,379/36

Main Objectives:

- To identify the nematodes associated with rice in Thatta.
- To find out non-chemical organic amendments which will be safe and cost effective remedy for the control of nematodes.

Summary of work done:

Rice is infested by a number of pathogens including nematodes which eventually reduce its yield. During the study a total of eight nematodes namely; *Hirschmanniella oryzae, Tylenchorhynchus annulatus, Hoplolaimus indicus, Pratylenchus zeae, Basiria graminophila, Aphelenchus avenae* and *Tylenchus* sp. were isolated from rice variety IRRI-6 and Lateefy, while from variety Kharai Ganja; *Hirschmanniella oryzae, Hoplolaimus indicus* and *Tylenchorhynchus annulatus* were recorded. The association of nematode species was disclosed by principal component ordination. Distribution pattern of different nematodes species was also studied from ordination of localities. Density data of *H. oryzae* was compared of all the three varieties and it seemed to be non-significant.

In the second year, effect of nine organic amendments viz., castor oil cake, mustard oil cake, sugarcane bagasse, horse manure, farmyard manure, sawdust, poultry manure, neem leaves (coarsely crushed) & wheat straw and a chemical nematicide Carbofuran on the growth parameters of rice and population density of *Hirschmanniella oryzae, Tylenchorhynchus annulatus, Hoplolaimus indicus* and *Pratylenchus zeae* were investigated. Poultry manure, horse manure and neem leaves significantly increased shoot length while root length was markedly increased by castor-oil cake, poultry manure, neem leaves and horse manure as compared to control. Shoot weight was significantly elevated by poultry manure and horse manure and root weight by poultry manure only over the controls. Grain yield was significantly enhanced over the controls by Carbofuran, castor-oil cake, mustard-oil cake, poultry manure and horse manure.

Population density of *H. oryzae* was significantly reduced over the controls by carbofuran, mustard oil cake, sawdust, neem leaves, and wheat straw, that of *T. annulatus* by castor-oil cake, mustard oil-cake, carbofuran, sugarcane bagasse and farmyard manure. Soil amendments alongwith herbicides showed that carbofuran either alone or in combination with the herbicide "gesapex" significantly increased plant growthshoot length. The population density of *H. oryzae* was significantly decreased over the controls by gesapex alone or in combination with carbofuran as rice husk. The density of T. annulatus was reduced by gesapex together with rice husk and carbofuran. Carbofuran alone did not reduce the population density of both the nematodes.

Project No: **P-NIBGE/Bio(219)**

Project Title: **Construction of Genetically Engineered Noval Cellulolytic Yeast Strain for Step Conversion of Biomass Produced on Saline Land for Ethanol Production.**

Duration: 3-years

Date of Initiation: 10-8-1994

Date of Completion: 9-08-1997

Location of Scheme: NIBGE, Faisalabad

Principal Investigator: Dr. Shoukat Parvez

Total Expenditure: 244,139/-

Main Objectives:

- Cloning of structural genes for cellobiohydrolases endoglucanase and B-glucosidase in *E.coli* and *Saccharomyces cerevisiae* using shuttle vectors.
- Identification and characterization of cloned genes by DNA hybridization and Colony hybridization
- Western blotting analysis and the localization of the cellusases produced by the recombinant yeast.
- Restriction site identification and mapping of recombination plasmid.

Summary of work done:

Genes for B-glucosidase (Bgl) isolated from a genomic library of the cellulolytic bacterium. *Cellulomonas biazotea*, were cloned in pUC18 in its Sac I cloning site and transformed to *E.coli*. Ten putative recombinants showed blackening zones on esculin plates, yellow zones on pNPG plates, liquid culture and on native polyacryamide gel electrophoresis (PAGE) activity gels. They fell into three distinct groups. Three representative *E.coli* clones carried recombinant plasmids designated pRM 17. The genes were located on 5.6-3.7- and 1.84-kb fragments. Their location was obtained by deletion analysis which revealed that 5.5,3.2, and 1.8 kb fragments were essential to code for BglA, BglB, and BglC respectively and conferred intracellular production of B-glucosidase on *E. coli*. Expression of the bgl genes results in overproduction of *B.glucosidase* in the three clones. Secretion occurred into the periplasmic

fractions. The *E.coli* recombinants showed higher substrate uptake rate (0.442+0.015 g/l/h), cell mass biosynthesis rate (0.231+0.13 g cells/l/h), cell mass biosynthesis rate (2.231+0.013 g cells/l/h) and product formation rate (8.83 IU/l/h) compared with the donor (0.215,0.235 and 6.2 respective values).

Three inserts carrying bgl genes from the representative recombinant *E.coli* were isolated with Sac 1, ligated in the shuttle vector pYES 2.0 in its Sac 1 site and transformed to *E. coli* and *S. cerevisiae*. The recombinant plasmids were redesignated pRPG1, pRPG2 and pPG3 coding for Bg1A1, Bg1B1 and Bg1C1. The cloned genes conferred extra cellular production *of* B-glucosidase on *S.cerevisiae* and enabled it to grow on celldobiose and salicin. Gal 1-promoter of shuttle vector pYES 2.0 enabled the organisms to produce two-fold great B-glucosidase than that supported by Lac Z-promoter of pUC 18 plasmid in *E. coli*. These *E. coli* recombinants showed higher substrate uptake rate (0.442+0.015 g/l/h), cell mass biosynthesis rate 90.231+0.13 g cells/l/h) and product formation rate (compared with the donor). Gal 1-promoter of shuttle vector enabled the *E. coli* recombinants (18.17+4.IIU/l/h) and yeast recombinant organisms (13.02+6.89 IU/l/h) to produce 2.13- and 1.5-fold greater B-glucosidase respectively than that supported by Lac- promoter of pUC18 plasmid (8.83+2.05 IU/l/h) in *E. coli*. The cloned gene can be used as a selection marker for introducing recombinant plasmids in wild strains of *S. cerevisiae*. The enzyme produced by bgl+ yeast and *E. coli* recombinants resembles that of the donor with respect to temperature and pH requirement for maximum activity. Other enzyme properties of the B-glucosidases from *S. cerevisiae* were substantially the same as those from C. biazotea.

Project No: **S-KU/Bio (233)**
Project Title: **Cage Culture of *Lutjanus Johni* (Snapper) and *Pomadasys kaakan* (grunt) Marine Commercial Fishes.**

Duration:	2 years
Date of Initiation:	23-6-1996
Date of Completion:	22-6-1998
Location of Scheme:	University of Karachi, Karachi
Principal Investigator:	Dr. S. Makhdoom Hussain
Total Expenditure:	323,849/-

Main Objectives:

- To design handing cages to be installed in coastal water.
- To manufacture low cost diets and use it as main diet during the culture. The diet formula may be commercialized for use in hatcheries and in culture of other fish species.
- To estimate per unit production of cultured fishes.
- Finally attempt will be made to breed two species in captivity so as to provide a source of seedling for future farming purposes.

Summary of work done:

The objectives of the present study were to design suitable, cheaper and durable cages, survey suitable sites to place floating cages, and to study growth of juvenile fishes (*Lutjanus johni & Pomadasys kaakan*) in cages. The entire coast of Karachi can be separated as, (i) extending from Keamari towards Hub River (Balochistan) and (ii) extending from Clifton to the Korangi creek and to Keti Bunder. Under the available funds and facilities, the primary task of this study was to explore coastal areas nearer to the main city, easily approachable and useful to conduct mariculture experiment.

The mangrove forests along the Sindh coast were surveyed. The routine weekly hydrographic data from the region (Marine Academy) taken before starting the experiment showed pollution, since lot of fishes such as mullets, grunts, snappers and larvae of other commercial fishes were found in the region. The cages were then placed at selected site. Various sea shores like Paradise point, Hawks Bay etc. were found to be easily approachable by general public creating surveillance problems. Thus the area along Cape Monze under the naval control, restricted for general public was selected.

Four different types of cages made up of various materials (wood or PVD pipes with synthetic or metallic nets) and of varying sizes were designed. All types of cages were lowered in seawater with anchors and tied to floating buoys. Data on durability of cages and the survival rate of fishes was collected during the study. The most useful and durable cage with better fish survival rate was that described as rectangular shaped cage made up of Dhial wood. Other cages were very often damaged by water currents and needed frequent repairs. The common predators *Tetradon sp.* (puffer/globe fishes), *Murenosox sp.* (rock eels) and *Portunid crabs* etc. were usually responsible for major damage of cages.

Experiments were designed as monoculture setup (*Lutjanus johni, Pomadasys kaakan* and *Sillago sihama* in separate cages); biculture setup *(L. johni* and *P. kaakan* in same cage) and

polyculture setup *(P. kaakan, L. johni, Serranus sp.* and *Pomadasys operculare* in same cage). The better results were observed in monoculture setup and *Pomadasys kaakan* showed highest production.

It is suggested that culture of these fishes is practical and will fetch economical gains. Efforts, however, are required to establish hatcheries/nurseries from where young/juvenile fishes could be supplied to farmers. Fishermen/women can stock these two species along protected shores in locally hand made cages for few months in order to increase their livelihood and simultaneously increase fish productions

Project No: **C-QU/Bio(264)**
Project Title: **Study of Hereditary Disorders in Pakistani Kindreds-II.**

Duration: 1 year

Date of Initiation: 1-11-1997

Date of Completion: 31-10-1998

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

Principal Investigator: Dr. Muhammad Ahmad

Total Expenditure: 115,473/-

Main Objectives:

- To diagnose and record the syndrome, work out its mode of inheritance and develop measures for prenatal diagnosis with an aim to eradicate the disease.

Summary of work done:

Recently we have described a large inbred family from a remote area of Balochistan with a distinct, recessively inherited form of spondyloepimetaphyseal dysplasia (SEMD; American Journal of Medical Genetics 78.468-473,1998). This newly described entity, termed SEMD Pakistani type, is characterized by short, bowed lower limbs, enlarged knee joints, kyphoscoliosis, a mild generalized brachydactyly, irregularity of the epiphyses and metaphyses, delayed epiphyseal ossification and platypspondyly. In a later publication (Nature Genetics 20:157-162,1998) typing a total of 381 microsatellite DNA markers, the PI localized the disease gene for SEMD Pakistani type to human chromosome 10q23-24, a region syntenic with the brachymorphic (bm) locus on mouse chromosome 19. Orthologous genes encoding a previously undescribed ATP sulfurylase/APS kinase enzyme were identified in the respective syntenic regions of the human and mouse genomes. A nonsense mutation and a missense mutation in

these genes were defined as the underlying cause of the human SEMD and mouse brachymorphic phenotypes, respectively.

A family from Gujranwala District has congenital generalized alopecia as a single abnormality without any associated defects, a condition distinct from congenital alopecia universalis. Analysis of the pedigree is suggestive of autosomal recessive inheritance, the parents of the affected sibship being first cousins and apparently normal.

A large inbred kindred from Swat showed acromesomelic dysplasia i.e. severe dwarfism with shortening of the extremities but normal trunk. As a result of clinical examination and X-rays, the condition was diagnosed as chondrodysplasia Grebe type. Analysis of the pedigree is strongly suggestive of autosomal recessive inheritance. The family has been compared with another Pakistani family from Sarghoda with Du Pan Syndrome previously described by the Principal Investigator (American Journal of Medical Genetics 36:292-296;1990). Two families designated as Family A and Family B, showing different types of autosomal recessive ectodermal dysplasia, have been studied.

In family A, the affected persons showed hypotrichosis, and dental, nail and skin abnormalities. As a result of clinical and histopathological examinations, the condition was diagnosed as hyphidrotic ectodermal dysplasia. The disorder in family B was diagnosed as hidrotic ectodermal dysplasia, with abnormal nails and skin, but the hair and teeth were normal. The pedigree is compatible with autosomal recessive mode of inheritance.

Project No: **B-BU/Chem/(211)**

Project Title: **Biotechnological Potential of Immobilized Enzymes: Application of Immobilized Enzymes in the Synthesis of Valuable Compounds.**

Duration:	3-Years
Date of Initiation:	1.9.1992
Date of Completion:	31.10.1999 (The project was suspended twice for unavoidable reasons.)
Location of Scheme:	Institute of Biochemistry, University of Balochistan, Quetta
Principal Investigator:	Prof. Dr. Masoom Yasinzai.
Total Expenditure:	3,07,169/-

Main Objectives: To establish immobilized enzyme technology and utilize it for certain biotechnological processes. If found successful at laboratory scale, these processes can be upscaled for application in industry.

Summary of work done:

Enzymes are very effective catalysts, which selectively transform biological substrates to products. The major drawback associated with these biocatalysts is their high cost and low thermal and operational stability. Immobilization of enzymes not only reduces the cost of these catalysts but also results in an increase in their thermal and operational stability.

The Investigators have successfully achieved the project objectives, developed a facile procedure for the isolation and purification of enzymes from biological sources, and prepared phenolic resins (solid support for the immobilization of enzymes). Moreover, a bioanalytical method for the estimation of phospholipids and their analogs were developed which include, estimation of phosphoryl choline, choine, phospholipase D, Glycerol-3-phosphate and glycerophosphoryl choline using electrochemical, spectrophotometric, chemiluminscent detector systems. Furthermore, lipase enzyme isolated from sheep/bovine pancreas were purified to electrophoretic homogeniety as conformed by polyacrylamide gel electrophoreses. These enzymes were immobilized on a suitable support and utilized for the production of biosurfactants. A microemulsion based flow injection method (FIA) was developed for the assay of lipases, which can be applied for the estimation of lipases from different sources.

Eight (8) research papers have been published under this project in journals of repute. Moreover, one Ph.D. and one M. Phil. thesis has been produced out of this research work

Project No: **S-CSIR/Chem (248)**
Project Title: **Evaluation of Aqueous Extracts of Sea Weeds as an Elicitor of Plant Defence Mechanism**

Duration: 3-years

Date of Initiation: 1.3.1994

Date of Completion: 28.2.1997

Location of Scheme: PCSIR Laboratories Complex, Lahore.

Principal Investigator: Dr. Fatima Bi.

Total Expenditure: 2,73,194/-

Main Objectives:

- To isolate and characterize any possible elicitor molecule from the sea weeds collected from Arabian Sea and their possible use in inducing Phytoalexin in plants to enhance their resistance against plant pathogens.
-

Summary of work done:

Algal plants were collected from Karachi coastal area, dried and then treated with water, dilute alkali and acid. High Molecular Weight Crude Elicitor Preparations (HMWCEP)were obtained by ethanol precipitation and lyophilisation. Yields were high in NaOH fractions for brown, red and green algae. Chemical composition of these HMWCEP were aslo determined. These preparations were analyzed for total sugar, protein, sulfate group and uronic acid contents. Identification of constituent monosaccharides was carried out by acid hydrolysis and paper chromatography. Galactose was found as major sugar component of red algae. Significant amount of fructose was found in brown and green algal plants along with glucose, mannose, arabinose, xylose and rhamnose in varying proportions. Monosaccharide composition of various algal polysaccharide was determined by acid hydrolysis, alditol acetate derivatisation and gas chromatographic analysis.

Eliciter activity of seaweed polysaccharides was determined and established for the first time. Both quantitative and qualitative differences were observed in terms of induced browning and phytoalexin production by the cotyledones of *Cicer arietinum* i.e. chickpea. A variable dose response was observed for various elicitor preparations. The level and timing of induced browning and induced metabolites were estimated as a function of time. In repeated experiments high molecular weight elicitor preparations were found to be the most active elicitors.

Based on the research conducted under this project, three (3) papers have been published whereas four (4) papers have been submitted for publication.

Project No: **C-QU/Chem(256)**
Project Title: **Synthesis of Biologically Active Organotin Derivatives: Their Characterization and Application.**

Duration: 2-years and 3-months

Date of Initiation: 1.4.1995

Date of Completion: 30.6.1997

Location of Scheme:	Department of Chemistry, Quaid-i-Azam University, Islamabad
Principal Investigator:	Dr. Saqib Ali
Total Expenditure:	2,45,209/-
Main Objectives:	• Synthesis and characterization of some new organotin derivatives of substituted pyridines containing organosilican moiety

Summary of work done:

Substituted pyridine and pyridine derivatives are structural units in many natural products of Biological Importance. There is a large class of pharmacologically important substituted pyridine and amino pyridines which act as antiallergic, antitumor, antibiotic, antifungal , and antiinflamatory agent. Furthermore, some amino pyridine are useful as bleaching agent. The present study is aimed at the synthesis and characterization of substituted pyridines and its derivatives which could be used as biologically active compounds.

In order to prepare the organotin derivatives, the ligand were synthesized by the reported methods, complexed with pyridine or substituted pyridine under suitable reaction conditions and the compounds 1b-4b were prepared in two methods.

Later on, these compounds were used as the starting materials for synthesis of other complexes via lithiation and reaction of lithium amides with Me_3SnCl respectively. A total of 14 organotin derivatives were prepared and characterized by IR and NMR spectroscopy. It was observed that ligand, i.e. 2 alkyl amino pyridin, possess antihistamine activity. Therefore, it is expected that the complexes of these compounds should be biologically active.

Project No: **P-PU/Chem(278)**
Project Title: **Synthesis of N,N-Dialkylbenzylamine Derivatives and Their Evaluation as Chelating Organic Reagents.**

Duration:	1-year
Date of Initiation:	1.7.1996
Date of Completion:	30.6.1997
Location of Scheme:	Institute of Chemistry, University of the Punjab, Lahore

Principal Investigator: Prof. Dr. Mohammad Zafar Iqbal

Total Expenditure: 1,09,720/-

Main Objectives:

- Reaction of N,N-dialkylbenzylamine and their substituted derivatives, i.e. Cl, Br, NO2, -CHO etc. with transition metals, e.g. group IB,IIB, VIIIB and inner transition metals
- Structural evaluation of the cyclometalated or chelated compounds by using techniques such as UV, IR, NMR, MS, XRD, XRF etc.
- Study the reaction of N,N-dialkylbenzylamine and their substituted derivatives with transition metals of group IB, IIB, and IIIB and inner transition metals.
- Evaluation of N,N-dialkylbenzylamine as analytical reagents under varying conditions of pH, temperature and, solvent etc.,

Summary of work done:

The aromatic substitution reactions are not limited to azobenzene and bezylidene but are even more facile with N,N-dialkylbenzylamine and its derivatives containing –OH, $-NH_2$, -SH can act as effective chelating agents. These compounds are capable of forming five or six membered ring system which enhance the stability of the complexes formed with metals in favourable oxidation states.

Under the present project N,N-dialkylbenzylamine and their substituted derivatives were synthesised and evaluated as chelating organic reagents. The ligands obtained were isolated by chromatography and some of their physical parameters such as melting point, decomposition points, relative density, surface tension, viscosity, refractive index, % yield etc were determined. Structural evaluation of some of the ligands was done by using UV, IR, NMR, MS etc Thermal stability of some of the metal derivatives was also determined.

Project No: **F-PU/Chem(285)**
Project Title: **Flash Pyrolysis of Indigenous Coal Utilizing Effective Radical Transfer.**

Duration: 2-years

Date of Initiation: 1.8.1996

Date of Completion:	31.7.1998
Location of Scheme:	NCE in Physical Chemistry, University of Peshawar, Peshawar.
Principal Investigator:	Dr. Iftikhar Ahmad Awan
Total Expenditure:	3,36,278/-

Main Objectives:

- To study the flash pyrolsis of coal samples in the presence of hydrogen donor solvents;
- To carry out quantitative and qualitative estimation of total volatile matter and liquid products including Benzene, Toluene, and Xylene for both the raw and solvent treated coal.

Summary of work done:

In order to develop reliable coal conversion technology, it is important to understand the conversion behaviour of coal and the relationship between the conversion technology and measurable sets of coal properties. Since pyrolysis is the first step of all coal conversion processes, its understanding is essential for the effective use of coal.

Under the present project flash pyrolysis method has been developed for increasing the yield of gaseous and liquid hydrocarbon products under mild conditions. The method involved the effective hydrogen transfer from hydrogen donor solvent tetralin to the coal fragments during pyrolysis. The contact at the molecular level between tetralin and the coal functional groups was achieved by swelling the coal in solvent at 25 – 214°C with pressurized atmosphere (1 Mpa). Representative coal samples from Middle Seam Sibi, Top Seam Sibi, Lakhra 3 and Lakhra 6B coal mines were swollen by tetralin. Pyrolysis of the swollen coal by Shimadzu PYR 2A pyrolyzer over the temperature range 500-800°C in nitrogen stream resulted in the higher yield of (C_1-C_6) hydrocarbons and Benzene, Toluene and Xylene (BTX) liquids than from the raw coal.

It was observed that high BTX yield from tetralin treated coal than the raw coal clearly indicate the effectiveness of the proposed method of treating coal with tetralin prior to pyrolysis. The validity of the method depends on the contact at molecular level between the tetralin and coal for effective hydrogen radical transfer from tetralin to coal fragments during pyrolysis.

Two research papers, based on the work carried out under this project, have been submitted for publication. One student was registered for Ph.D. under the project and the research work will constitute a part of her Ph.D. Thesis

Project No: **F-PU/Chem(287)**
Project Title: **Draining and Long Range Interaction in Polymer Solutions.**

Duration:	2-years and 6-months
Date of Initiation:	1.1.1996
Date of Completion:	30.6.1998
Location of Scheme:	NCE in Physical Chemistry, University of Peshawar, Peshawar
Principal Investigator:	Dr Mohammad Saleem Khan
Total Expenditure:	1,72,925/-
Main Objectives:	• To carry out detailed study of Poly (ethylene oxide) solution in aqueous and non- aqueous solvents using viscometric and light scattering techniques for clear understanding of the properties of the long range and draining properties of dilute polymer solutions.

Summary of work done:

Under the present study four different molecular weight samples of poly (ethylene oxide) were studied by light scattering and dilute solution viscosity measurement. The weight average molecular weight M_w, the second varial coefficient A_2, the radius of gyration, the intrinsic viscosity $[\eta]$, and the Huggin's coefficient K_H were determined for all the samples using water and CH_3OH as solvents for the polymer. The intrinsic viscosity, using Huggin's equation were found to be 2–4 times as large as observed for linear flexible polymers in good solvents. All Huggin's plots showed a slight curvature indicating the presence of some aggregates in the concentration range. The unperturbed chain dimension were determined using the method of Burchard-Stockmayer-Fixman equation by plotting $[\eta]/M_w^{1/2}$ vs M_w. Using value of ϕ determined from many experimental studies these results lead to a characteristics ratio, C_∞ averaging around a value of 7.557. This value is typical with a value 8 -10 found for linear flexible polymer in good solvents. The parameters "k" and "a" in a Mark-Howink-Sakurada equation $[\eta]=KM^a$ are also determined for the polymer in water at different temperatures.

Viscosity results in conjunction with light scattering data, the interpenetrating function ψ, and the dimensionless ratio II ($II = M A_2/[\eta]$) in water and methanol were obtained. Their values

were in the usual range of non-draining limit as are observed for other linear flexible polymer in good solvents. These results of ψII are in contrast to the earlier findings of Woodley et al for the drainage effects in polyethylene oxide coils in water.

Project No: **S-KU/Phys(72)**
Project Title: **Electronic Spectra of Diatomic Molecules.**

Duration:	3-years
Date of Initiation:	1.7.1991
Date of Completion:	30.6.1994
Location of Scheme:	Department of Physics, University of Karachi, Karachi
Principal Investigator:	Prof. Dr. M. Rafi Dr. Iqbal Ahmad Khan
Total Expenditure:	3,04,980/-
Main Objectives:	• To study the emission and absorption spectra of diatomic molecules like Cs_2, Rb_2 and hydrides and deuterides of elements of group I, II and III

Summary of work done:

Under this project the emission and absorption studies of diatomic molecules were undertaken. It is known that the AΣ state of alkali hydride molecules has an abnormal character. The anharmonicity parameter is negative for all the members of alkali hydrides in contrast to that of other molecules. The rotational and vibrational study of this state was, therefore, undertaken for the molecules of Lithium, Potassium, and Sodium near dissociation energy, which has not been done earlier. In absorption, molecules of Lithium, Potassium, Bismuth, Lithium-Potassium have been studied. Several new electronic states have been found in these molecules. Band system of hydrides of Lithium, Potassium and Sodium molecules have been extended to higher vibrational statesclose to the dissociation limits. Rotational and vibrational analysis have been performed for these band systems.

Preliminary data have been taken on the spectra of oxides of Aluminum, Gallium and Indium. Work has also been directed towards laser spectroscopic techniques. In particular an experiment is being set up for laser induced fluorescence (LIF) spectroscopy of diatomic molecules. For this purpose a Czerny-Turner type monochromator has been designed and fabricated.

Out of this work five (5) papers have been published in journals of repute or presented in conferences.

Project No: **C-QU/Phys(89)**
Project Title: **Numerical/Theoretical Study of Laser Light Propagation and Energy Deposition and Thermal Transport in Laser-Produced Plasmas and Computational Study of Z-θ Pinch Plasma.**

Duration:	3-years
Date of Initiation:	1.6.1995
Date of Completion:	31.5.1998
Location of Scheme:	Department of Physics, Quaid-i-Azam University, Islamabad.
Principal Investigator:	Dr. Arshad Majid Mirza
Total Expenditure:	1,86,171/-
Main Objectives:	• The project aimed at developing the field of plasma physics at the Quaid-i-Azam University, Islamabad and training of manpower in fusion related problems.

Summary of work done:

During the report period studies were undertaken on the following topics:

a) Numerical study of Z-θ pinch

To achieve optimum plasma parameters, in the context of controlled fusion or x-ray lasers, the stability of the pinching plasma is vital. Thick gas-puff implosion seems practically suitable to suppress short wave length perturbations causing hydrodynamical stability in staged pinch devices. The snow-plow effect, which the researchers have incorporated in their model, will provide a strong influence on the onset of the instabilities. The perturbation whose wave length is of the order of the sheath thickness will never grow due to the increasing current sheath thickness. Another advantage of the snow-plow effect is the peaking of implosion before the current saturates. This provides stabilization and will help in coupling of the driver energy to the target. In some cases the switching of the main discharge current to the target have been observed. In such a situation, to ensure efficient coupling of the discharge current and energy of driver to the target, the implosion process needs to be completed before the current saturates.

b) Microturbulence/energy loss of energetic alpha particles in thermonuclear fusion/dusty plasmas.

Within the linear dielectric approach the electrostatic potential and the stopping power of the two projectiles are computed for different values of Kd (the normalized effective wave number) and R (the separation between the two projectiles) retaining two-ion-correlation effects. The enhancement in the energy loss is observed and it is compared with that of a single ion projectile case. These results are useful to explain the crystallization of dust grains in astrophysical and laboratory plasmas.

The linear and non linear properties of electrostatic and electromagnetic waves in the presence of high energy alpha particles in magnetically confined fusion plasmas was studied and it was found that Boltzmannen alphas can introduce new classes of electrostatic and electromagnetic wave spectra.

c) Thermomagnetic instability.

A local dispersion relation for electromagnetic modes in a non uniform collisional magnetized electron plasma with fixed ion background is derived, taking into account equilibrium magnetic field and pressure gradients, as well as impurity radiation losses. It was found that for a low β-plasma the principal source for the generation of unstable modes is the impurity radiation loss, whereas for a high β-plasma the various effects such as the electron streaming, the electron ion collisions, finite electron thermal conductivity and impurity radiation losses are shown to be responsible for unstable perturbations.

d) Nonlinear waves in non uniform magnetoplasma.

The linear and nonlinear properties of drift ballooning modes in the presence of an equilibrium electric field and stationary charged dust grain were studied and it was found that the presence of these two contributes to the stability of the ballooning modes. Furthermore the non-linear coupling between finite amplitude drift ballooning modes gives rise to different types of coherent vortex structure, which can effect the transport properties of an inhomogenous magnetized plasma. A set of coupled nonlinear equation for dispersive Alfven waves (DAWs) in nonuniform magnetoplasmas with two ion species, was derived, by employing a multifluid model.

Nine (9) research papers were published under this project. Moreover, one M.Phil. degree was also awarded on the basis of research work done under this project.

Project No: **P-PU/Phys(91)**
Project Title: **Elastic and Diffractive Scattering and QCD Based Phenomenology**

Duration: 2 years and 6 months

Date of Initiation:	1.7.1995
Date of Completion:	31.12.1997
Location of Scheme:	Centre of High Energy Physics, University of the Punjab, Lahore.
Principal Investigator:	Dr. Fazal-e-Aleem.
Total Expenditure:	1,56,580/-
Main Objectives:	• Based on Eikonal picture and by taking into consideration the idea of Quantum Chromo Dynamics, the project aimed at making an attempt to give a comprehensive picture of the elastic and diffractive scattering phenomenon to explain the results from Tavatron and other accelerators along with the results already measured at Intersecting Storage Ring (ISR)

Summary of work done:

Theoretical study of elastic scattering was carried out and it was observed that Eikonal picture and Regge theory gives good results and account for a wide variety of data. Ideas of QCD are incorporated in geometrical picture and there seems to emerge a plausible picture of elastic scattering consistent with the ideas of standard models.

Five (5) research papers based on the results of study undertaken under this project have been presented in various international conferences and subsequently published. Moreover one Ph.D. degree has also been awarded.

Project No: **C-QU/Phys(93)**
Project Title: **Atomic Coherence Effect in Laser and Quantum Optics**

Duration:	3- years
Date of Initiation:	1.7.1996

Date of Completion:	30.6.1999
Location of Scheme:	Department of Electronics, Quaid-i-Azam University, Islamabad
Principal Investigator:	Dr. Suhail Zubairy
Total Expenditure:	Rs.2,55,899/-

Main Objectives:

- To investigate the effect of phase fluctuations of the driving field on the "Lasing without Inversion" and the enhancement of the Refractive Index
- To investigate the effects of cooperative atomic interaction on the possibility of generating steady state squeezing in single photon micromaser and Photon statistics in a micromaser.
- To investigate the possible physical system in quantum optics in which GHZ equalities can be observed and to design a simple test in the framework of quantum optics to measure three particle GHZ correlation.

Summary of work done:

During the report period , research work was carried out on the problems of Quantum state measurement of radiation field (light). Wigner function, Quantum logic gate, Quantum teleportation of field state, entangled .state preparatio , and Quantum non-demolition measurements.

(1) In recent years, a large class of the states of the radiation field has been studied. Several of them display non-classical features, such as the squeezed state and the Schrodinger cat statge. These states exhibit interesting gfeatures in their quantum statistical properties. For example, they may have oscillatory photon distributions. An interest in this subject stems from the possibility of studying non-classical states of the radiation field, such as the squeezed state and the Schrodinger Cat State. A number of schemes have recently been proposed to obtain information about the quantum state of the radiation field. In this report it has been showed that quantum state of the radiation field (light) can be directly recovered from the spectrum of the resonance fluorescence from two-level atgoms driven by the quantized field. The proposed scheme relies on the fact that the atomic level display splitting in the presence of the driving field. The splitting is proportional to the intensity of the light.

We have shown how the information about the field inside the cavity is obtained by the knowledge of the splitting of atomic levels.

(2) The Wigner function of a quantum state of the radiation field inside a cavity can be measured via Autler-Townes spectroscopy. This causes a displacement of the initial state of the cavity field in phase space. There are several advantages of the proposed scheme over some of the earlier methods. First, in the proposed method the complete state is reconstructed without much mathematical manipulation of the experimental data. Secondly, there is no requirement on the preparation of the atomic systerm in the coherent superposition of states for the determination of Wigner function. Thirdly , the proposed method is insensitive to detector efficiency, which poses serious problems in observing the n on-classical aspects explicty in some schemes. The investigators proposed a conceptually simple schem of the quantum logic gate that consists of a beam of two-level atoms of well-defined momentum-state passing through a standing wave cavity. The controlled bit is characterized by the well-defined atomic mementum states in the direction of wave propagation representing the center-of-mass motion of the atom.

(3) The normal counting or measuring process reduces the field thus successive measurements of the intensity, yield different results, when it was tried to measure parameters. Of a quantum system, probe noise is fedback to it. Thus for an idenal measurement, the noise should not fedback into the variable to be measured and alter its dynamics, such a scheme of measurements is known as quantum non-demolition (QND) measurement scheme. Therefore a simple scheme of QND measurements of photon number was proposed. The scheme for the QND measurement of the photon number lies within the realm of the presently accessible experimental limits. The scheme proposed in th is report can also be applied for the formation of quantum logic gate.

(4) An interesting application of quantum nonlocality is quantum teleportation. Bennett et al. Proposed a scheme for teleporting an unknown quantum state from one observer to another. In this scheme, the sender and receiver prepare an entangled pair of states. The sender makes a joint measurement of the unknown quantum state with the EPR particl and transmits the classical result of this measurement to the receiver. Druing this process the unknown quantum state is destroyed at the receiver's end but the knowledge of the joint measurement enables the receiver to convert his unknown quantum state.

(5) In this report, the general question of teleporting an arbitrary field state from a cavity to another cavity was considered. First, the general considerations for the teleportation of an arbitrary superposition of states between two observers were discussed then, a viable scheme for the teleportation of a field sate was proposed, which is a superposition of Fock states, from one cavity to another using methods based on cavity quantum electrodynamics.

(6) An experimentally viable scheme for the quantum teleportation of a field state from a cavity at the sender's end to another cavity at the receiver's end was proposed. The proposed schem relies on the preparation of quantum-entangled states between two cavities. All these lie within the realm of the presently accessible experimental methods.

(7) Significant findings:

It was found that the photon statistics of the radiation field can be directly measured from; a) the absorption and emission spectra in driven three-level systems using a quantized driving field and the deflection of the non-resonant atom when it passes through the cavity which is in number state.

We also show that well-defined momentum states can be used to construct quantum logic gate for any arbitrary quantum computational network. We further show that an unknown quantum state can be teleported to a fgar away location by first disassembling it into purely classical information and purely non-classical Einstein-Podolsky-Rosen (EPR) correlations, and then reconstructing it back at some other location.

We also present scheme, for the teleportation of a field state in the form of superposition of Fock states from one cavity to another, based on cavity quantum electrodynamics. We show that the Wigner function of a cavity field can be constructed from the spontaneous emission spectrum in driven three-level atomic systems. In the proposed method, the Wigner function of the driving field is recovered in a straightforward manner, without much mathematical manipulation of the experimental data, from the spontaneous emission spectra.

Project No: **C-PINSTECH/Phy(97)**
Project Title: **Study of Heavy Ion Reactions Using Dielectric Track Detector**

Duration:	2-years and 3-months
Date of Initiation:	1.7.1996
Date of Completion:	30.9.1998
Location of Scheme:	PINSTECH, Islamabad.
Principal Investigator:	Dr. H.A.Khan
Total Expenditure:	2,52,420/-

Main Objectives:

- To devise better techniques for counting and measuring the tracks formed by nuclear reaction products in dielectric track detectors.
- To develop necessary software or improve upon existing programs for the conversion of track data (length, angles, diameters) into kinematerical data.(masses, energies, scattering angles).
- To understand the nature of nuclear reaction process and possibly extract nuclear structure information from the data.

Summary of work done:

Understanding the structure of nucleus of an atom and its behaviour under different conditions is the main objective of the Nuclear Physics research. One of the major information source about the nucleus are the high energy particles scattered by the nucleus or which trigger changes inside the nucleus as a result of collision. With the advent of the particle accelerators the conventional light projectiles have been replaced by heavier particles with large velocities and hence high energies. The projectiles heavier than α-particles, dubbed as ' heavy ions', interact with target nucleus to initiate nuclear processes of different characteristics.

The present project aimed at studying nuclear reactions, using a particle detector system called 'Dielectric Tract Detector' (DTD). These detectors are capable of registering and storing the tracks of all the particles with charge numbers Z greater than the Z-thresholds for different materials. Complete kinematical analysis is , therefore, possible by the measurement of correlated tracks pertaining of the reaction products of an isolated reaction event.

Using the heavy ion accelerator, UNILAC at GSI (Darmstadt, Germany) the exposure of uranium ion on gold targets with mica sheets serving as DTD was investigated. The energy of incident ion was 16.7 MeV/Nucleon. The experimental and theoretical work done involved the following steps:

- Target-detector assemblies were prepared at PINSTECH and sent for exposure at the accelerator facility. The exposed detectors were retrieved for off line analysis at PINSTECH
- The optical scanning was done after optimizing track etching process. Each individual event was fully recorded with the help of a tracing tube and a depth measuring instrument.
- Computer programmes were developed to convert geometrical parameters of tracks into kinematical parameters such as masses and energies.

The observed data was used for achieving the following results of basic importance in nuclear physics:

- Determination of total and partial cross sections for different reaction channels..
- Separation of elastic events from the total set of binary data.
- Determination of masses, velocities and scattering angles of reaction products.
- Interpretation of kinematical data on the basis of models such as sequential fission and fusion-fission models.

The experimental procedure developed for this study along with theoretical models and computer codes would be useful for the analysis of heavy ion reactions using DTD in future studies.

Five research papers have been published out of research work conducted under this project.

iii) Scientific Publications Produced through PSF-Supported Projects

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 72 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, 4 Ph.D. and 6 M. Phil degrees were awarded through the completed projects as detailed below.

S. No.	Name	Degree	Project No.
1.	Zakia Khatoon	M. Phil.	S-KU/Bio (233)
2.	Mohammad Yaqoob	Ph.D.	B-BU/Chem (211)
3.	Miss Tahira Mahmood	Ph.D.	F-PU/Chem (285)
4.	Niaz Mohammad Khan	Ph.D.	F-PU/Chem(287)
5.	Tariq Rafiq	M.Phil	C-QU/Phys (89)
6.	Imran Siddiqui	M.Phil	C-KU/Phys(72)
7.	Nazim Ali	M.Phil	C-KU/Phys(72)
8.	S. Shujaul Hussain	M.Phil	C-KU/Phys(72)
9.	Mohammad Latif	M.Phil	C-KU/Phys(72)
10..	Sohail Afzal Tahir	Ph.D.	P-PU/Phys(91)

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.0.56 million were released to the following Scientific Societies and Journals during the year 1998-99.

Name of Society/Association/ Journal	Amount of Grant
1 Biological Society of Pakistan	Rs. 20,000/-
2. Institute of Engineers, Pakistan	Rs. 20,000/-
3. Pakistan Academy of Sciences	Rs.1,00,000/-
4 Pakistan Association for the Advancement of Science	Rs. 50,000/-
5 Pakistan Association of Scientists and Scientific Professionals	Rs. 30,000/-
6 Pakistan Botanical Society	Rs. 35,000/-
7. Pakistan Chemical Society	Rs. 30,000/-
8. Punjab Mathematical Society	Rs. 15,000/-
9. Pakistan Medical Association	Rs. 15,000/-
10. Pakistan Phytopathological Society	Rs. 15, 000/-
11. Pakistan Society of Biochemistry & Molecular Biology	Rs. 25,000/-
12. Pakistan Society for Semiconductors Science & Technology	Rs. 15,000/-
13. Pakistan Thalassaemia Welfare Society	Rs. 25,000/-
14. Society of Economic Geologists and Mineral Technologists (SEGMITE)	Rs. 20,000/-
15. Pakistan Society of Nematologists	Rs. 15,000/-
16. Zoological Society of Pakistan	Rs. 40,000/-

Publications/Journals

1. International Journal of Physics	Rs. 10,000/-
2. Journal of Natural Science & Mathematics	Rs. 10,000/-
3. Mehran University Res. J. of Engineering & Tech.	Rs. 10,000/-
4. Pakistan Journal of Pharmaceutical Sciences	Rs. 10,000/-
5. Pakistan Journal of Pharmacology	Rs. 20,000/-
6. Pakistan Oral & Dental Journal	Rs. 10,000/-
7. Pakistan Veterinary Journal	Rs. 20,000/-
Total:	**Rs.5,60,000/-**

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. 0.39 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 GRANT

The Foundation provides travel grants to Pakistani scientists for their participation in international conferences, seminars, symposia etc. for presentation of their research findings at these international forums. However, this activity of the Foundation remained suspended during the report period due to ban imposed by the Govt. on utilization of GoP funds for travel abroad for participation in meetings, conferences, seminars etc.

6. SCIENTIST POOL

Three scientists who had earned Ph.D. degrees and were looking for job suited to their qualification were placed on PSF Scientist Pool Officer @ Rs.5000/- per month and their services assigned to the following Institutions:

S. No.	Name of the Scientist Pool Officer	Institution
1.	Dr. Abrar Ahmad	CABI Bioscience International, Pakistan Agriculture Research Council, Rawalpindi.
2.	Dr. Zarina Begum	National Nematological Research Centre, University of Karachi, Karachi.
3.	Dr. Maazullah Khan	NWFP Agricultural University, Peshawar.

7. 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, the Foundation has developed contacts with several agencies in those countries. During the report period the Foundation

extended assistance in arranging training programme of 10 scientists from Syrian Atomic Energy Commission at various Centres of Pakistan Atomic Energy Commission.

8. PLANNING AND DEVELOPMENT WORK

Establishment of Science Centre at Faisalabad

The Foundation has initiated a development programme for the establishment of 15 Science Centres at district level all over Pakistan. This will be done through Public and Private partnership by making optimum use of the available facilities in terms of land/building with the educational/R&D organizations and meeting the development cost by generating funds through PSF Science Promotion activities, financial/material inputs by local private sector. The first science centre has been established at Faisalabad. The Centre's building was completed during the report period. The exhibition hall and display rooms have been equipped with diorama, working models and exhibits pertaining to Biology, Physics, Engineering, Solar Energy, Computer Science, etc. The centre shall soon be opened for students and public.

Science Centre, Faisalabad

A view of the Country diorama

Biological Specimens at Display

A view of the Textile diorama

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. WORKSHOP ON TRAINING OF TRAINERS FOR SCIENCE POPULARIZATION IN SAARC MEMBER STATES - SAARC JAPAN FUND

A workshop on "Training of Trainers for Science Popularization in SAARC Member States" was organized by the Pakistan Science Foundation w.e.f. 5th-9th October, 1998, in the PSF Auditorium, Islamabad. The workshop was sponsored by the SAARC-Japan Fund.

Four SAARC Member States, i.e., Bhutan, Nepal, Sri Lanka & India sent two representatives each to attend the Workshop. Twelve representative from Pakistan were nominated.

The workshop was inaugurated by Syeda Abida Hussain, Federal Minister for Science & Technology and Population Welfare which was followed by presentations of country reports. Four distinct sessions namely i) Country reports, ii) Lectures and iii) Demonstrations was made in a school at Bharakahu, District Islamabad.

The participants of the workshop actively participated and formulated recommendations which were finalized in the 2nd last session and presented in the concluding ceremony.

Dr. Kauser A. Malik, Chairman, Pakistan Agricultural Research Council was the Chief Guest at the concluding ceremony of the workshop and gave away certificates to the participants of the workshop.

2. SCIENCE CARAVAN

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 towards 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 Balochistan, Sindh, NWFP, Punjab and Federal Areas. These caravan units continued their activities throughout the report period and organized science exhibitions in schools within their jurisdiction.

Science Caravan (Federal Unit).

- 12 High Schools, District Skardu. — 20-7-98 to 15-8-98
- On occasion of workshop on Training of Trainers for Science Popularization in SAARC Member States, Government Higher Secondary School, Bharakahu, Islamabad. — 5 - 9 Oct., 1998

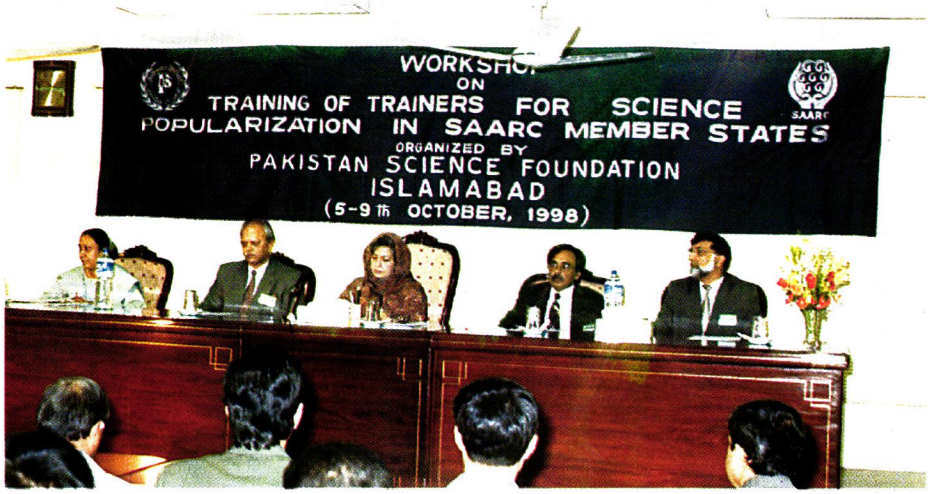
The science caravan federal unit also arranged planetarium and film shows in the PAF College of Education, Chaklala.

Science Caravan (NWFP Unit)

- 17 schools visited exhibition at GHSS, Shah Dand Mardan. — 9-2-1999 to 20-2-99
- 11 schools at Distt: Swat — 5-8-98 to 27-8-98
- 21 schools visited exhibition at Khyber Agency. — 10 - 27 Nov., 98
- 13 schools visited exhibition at GHSS, Nowshera Kalan. — 16 -3-99 to 25-3-99
- 11 schools visited exhibition at GHSS, Bathkhela, Malakand Agency. — 10-5-99 to 19-5-99
- 21 schools visited exhibition at GHS, Sumar Bagh, Lower Dir. — 20-6-99 to 11-7-99

Science Caravan (Sindh Unit)

- Scientific and Cultural Fair at Mirpurkhas. — 5-10-98 to 7-10-1998
- Children Fun Fair 1998 at Public School, Sukkur . — 26 - 28 Nov.,1998
- Taluka Faiz Gunj and Mirwah (Setharja), District Khairpur. — July -Sep., 1998.

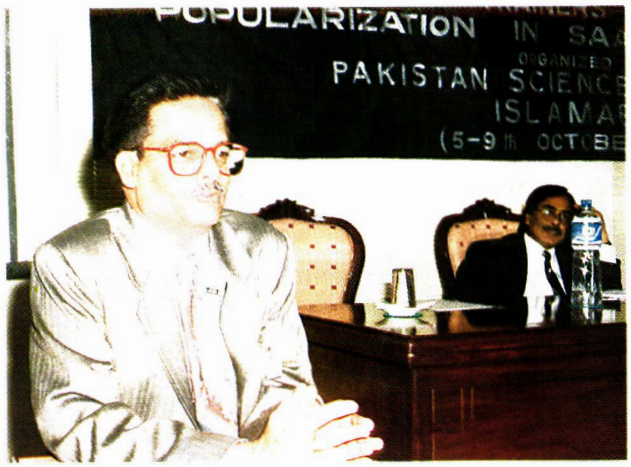


A view of the inaugural ceremony of the workshop

Syeda Abida Hussain,
Minister for Science & Technology
and Population Welfare inaugurating
the Workshop.

Dr. Khalid Mahmood Khan,
Chairman,
Pakistan Science Foundation
Presenting his welcome address

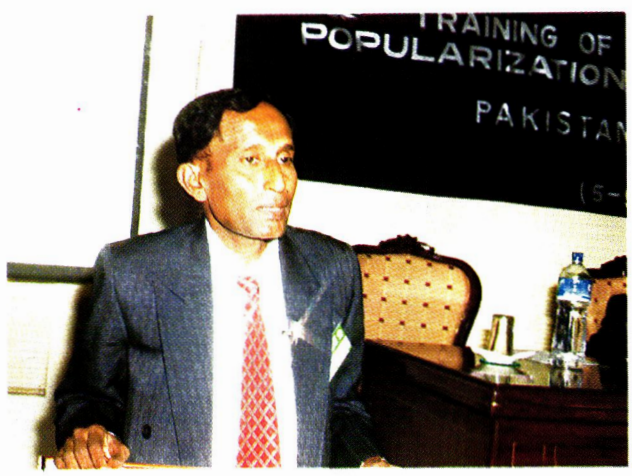
Mr. Phuntsho Dukpa, Bhutan



Dr. R. Sreedher, India

Ms. Parvati Pudasaini, Nepal

Dr. Munir Ahmed Bhatti, Pakistan



Mr. A.S.M. Farook, Sri Lanka

Senator Jamiluddin Aali presiding over one of the sessions

A view of the sessions

PRACTICAL TRAINING

Mrs. Shaheen Khan, Principal Scientific Officer, PSF, giving a brief account
At the Science Caravan Exhibition arranged in a school.

Mr. Javed Akhter, Operational Manager, Pakistan Museum of Natural History
demonstrationg Exhibition Display System

- 26 schools visited exhibition at Taluka Jacobabad. — 5 - 7 April, 1999
- 10 schools visited exhibition at Taluka Mirwah, District Khairpur. — 19 -to 23 April 99
- 38 schools visited Exhibition at Taluka Thul & Garhi Khairo. — 1-5-99 to 20-5-99

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 orders, amounts to Rs.9,01,000/- out of which (Rs. 8,55,950/-has been paid to NMST, Lahore, for8 models (five each).

Furthermore the Foundation has imported exhibits from M/S Science Kit & Boreal Laboratories, New York, worth US$ 6869.40. The exhibits have been received in the Foundation. These models have been displayed in the Science Centre, Faisalabad. On receipt of the models, some of the models which could easily be transported in the Science Centre have been selected & an order for the import of these have been placed with M/S Science Kit & Boreal Laboratories, New York. LC for US $ 5280.92 has also been opened. The delivery of the models shall be made by January, 2000.

3. INTRA/INTER BOARD SCIENCE ESSAY COMPETITION

The Foundation organized the 9th Intra Board Science Essay Competition for awareness of science among students in three languages i.e., Urdu, English and Sindhi. Theme of the competition was "Impact of Scientific Development on Modern World". Nine Boards of Intermediate & Secondary Education participated and sent their best three essays in English, Urdu and Sindhi. An amount of Rs.37,800/- was sent to the BISE, Multan, Faisalabad, Sargodha, Gujranwala, Lahore, Sukkur, Islamabad, Swat and Karachi for distribution as prize money among the students.

The Inter Board Science Essay Competition was organized by the Foundation and the position holder sent by the Boards were evaluated by a committee of judges constituted by the Foundation for the purpose. The following students secured first, second and third positions.

English Language:

1. Miss. Sana Tariq — 1st Position
   SMS Aga Khan School, Karimabad Karachi.
   (BISE, Karachi)

2. Miss Tooba Neveed — 2nd Position
Laural Bank Public School,163, G.T Road,
Baghbanpura, Lahore.
(BISE, Lahore).

3. Miss Asma Mahmood — 3rd Position
Pak. Islamia Higher Secondary School, Al- Ain UAE.
(FBISE, Islamabad)

Urdu Language:

1. Mr. Muhammad Aslam — 1st Position.
Govt. High School. Maghi Sultan, Shorkot,
Distt. Jhang, (BISE, Faisalabad)

2. Miss. Sahrish Arshad — 2nd Position
Govt. Comp. High School, Sargodha
(BISE, Sargodha)

3. Mr. Haider Ali, — 3rd Position
Bulsan public School, Multan (BISE, Multan).

4. INTRA BOARD SCIENCE POSTERS COMPETITION

Foundation 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 10th Intra Board Science Posters contest on the theme "Use of solar energy in the 21st century" was organized. 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 to be held in the Foundation. Cash prizes amounting to Rs.18000/- have been sent to the prize wining students through their respective Boards.

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

The Foundation continued subscription to National monthly "Science Digest" and an amount of Rs.1,98,000/- was released to the Publisher for purchase of the magazine. The magazine is being regularly distributed to 1000 High Schools in the country. The Foundation has also added another monthly urdu science magazine "Global Science", 500 copies are being distributed among the schools. An amount of Rs.1,35,000/- was released to the Publisher for purchase of this magazines.

6. DONATION OF SCIENCE BOOKS

Three hundred sets of seventeen informative Science Books have been purchased costing Rs.1,99,800/- from Urdu Science Board, Lahore, for donation to selected High Schools of the country.

7. STRENGTHENING OF SCIENCE LABORATORIES

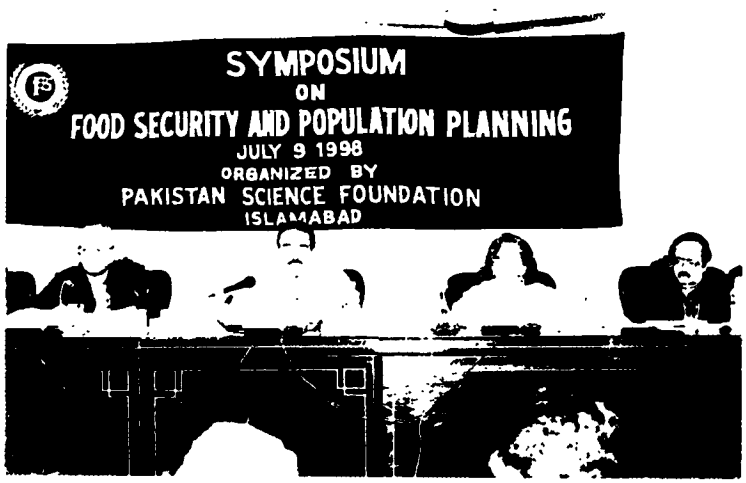
The National Education Equipment Centre, Lahore has completed the order for the supply of equipment. The following two schools each in district Haripur and Mansehra have been selected for distribution of equipment/glassware and chemicals for performing experiment at High School level. The remaining schools shall be selected from Bahawalpur Division.

8. PARTICIPATION IN PAKISTAN DAY PARADE (23RD MARCH, 1998)

The foundation participated in the Pakistan Day Parade on 23rd March, 1998 and displayed its exhibits on the float of the Ministry of Science & Technology.

Mr. Abdul Sattar Lalika, Federal Minister for Food & Agriculture, inaugurating the Symposium

Begum Abida Hussain, Federal Minister for Population Welfare and Science & Technology addressing the audience



A view of the Symposium

A view of float of Ministry of Science & Technology on
23rd March, 1999 in Pakistan Day Prade at Islamabad

PAKISTAN MUSEUM OF NATURAL HISTORY (PMNH)

The main task of PMNH is the collection, storage, curation and research on plants, animals, rocks, minerals and fossils of the country. The three Scientific Divisions viz.: Botanical Sciences, Earth Sciences and Zoological Sciences Divisions undertook 36 field trips to various localities of Pakistan and added a large number of floral, faunal and geological samples to the PMNH reference collection. Laboratory studies of the collected material and analyses of data were carried out by the scientists of the three Divisions. Their endeavours resulted in the publication of 11 articles in the national and international research journals. The book " Biodiversity of Pakistan" jointly published by Pakistan Museum of Natural History, Islamabad and Florida Museum of Natural History, Gainesville was formally launched by the Federal Minister for Science & Technology. The book is edited by Dr. Shahzad A. Mufti, Dr. Charles A. Woods and Dr. S. Azhar Hasan. Three new international and national collaborative research projects were initiated during the period under review.

The Public Services Division personnel remained engaged in designing the interior of the new display block of the PMNH. Layout plans of the preparation of various exhibits were completed. Most of the work of palaeontology gallery has been completed. Similarly Children Discovery Room, Ocean Diorama and Salt Range Diorama have been partially completed. Work is in progress for the Biodiversity of Pakistan exhibit. The Science Center, Faisalabad has been designed and completed. A revised PC-I, Phase II has been prepared for the construction of the remaining portion of Blocks II, IV, V and VII.

A Division wise account of activities during the year 1998-99 is given below.

1. BOTANICAL SCIENCES DIVISION (BSD)

a) Reference Collection

During the period under review 12 field trips were undertaken by the botanists of PMNH to Faisalabad, Murree and adjoining areas, Kurram Agency, Chitral, Cholistan and Nara Deserts, Deosai Plateau and Hyderabad and surrounding areas to collect higher and lower plants for the PMNH Herbarium. As many as 2770 higher plants, 700 fungi and 280 algal specimens were added to the reference collection of the Museum.

b) Laboratory Work

After preservation and indexation, the plants were identified. About 2500 higher plants, 1100 mycological and 220 algal bottles were accessioned and added to the reference collection. Identified 2000 higher plants upto species level and 1200 upto family level. Also identified 645 algal and 50 mycological specimens.

c) Extension work and Services Rendered to other Agencies

- Identified 985 plant specimens for the students and researchers of various institutions of Pakistan.
- Completed consultancy with NORCONSULT International on the project "Aquatic Studies and Review of Kohala Hydroelectric Project on the Jhelum River".
- Also submitted the report on the project entitled "Vegetation of Deosai Plateau" in collaboration with Cambridge University counterparts.
- Two projects "Economically important plants of Cholistan Desert" and "Floristic Studies of Nara Desert, Sindh" are in progress with NARC, Islamabad and Khairpur University, Sindh, counterparts, respectively.

d) Publications

Leghari, M.K. (1999). Freshwater algae of Sindh - IV. The genus *Closterium* Nitsch and *Pleurotaenium* Nargh from Lakes and Ponds of Sindh, Pakistan. Sindh Univ. Res. J. (Sci. Sr.) 20: 113-128.

Leghari, M. K. (1999). Ecological Survey of Phytoplankton in freshwater Lake Bakar, Distt. Sanghar, Sindh, Pakistan. Sindh Univ. Res. J. (Sci. Sr.) 20 (2): 83-94.

Sultana, K. N. (1998). Diversity of genus *Verpa* Swartz of North Western Himalayas. Pak. J. Pl. Sci. 4(2): 85-93.

Sultana, K., Z. K. Shinwari, M. Shah and B. Inam (1997). Occurrence of rust species on four hosts of the family Labiatae. Pak. J. Pl. Sci. 3(1): 47-52.

2. EARTH SCIENES DIVISION (ESD)

a) Reference Collection

In all 9 field trips were undertaken by the geologists of PMNH to Mansehra, Azad Jammu and Kashmir, Salt Range, Malakand, Kaghan, Kohistan, Chelas, Swat, Besham, Bunair and Deosai Plateau. Collected 300 rock, 600 mineral and 450 fossil specimens during these trips.

b) Laboratory Work

Catalogued 300 mollusc fossils and photographed 30 for the reference collection. Identified 75 invertebrate fossil specimens, 20 clay minerals were identified from the rocks. About 1250 samples of rock/mineral were subjected to megascopic studies, while 40 were petrographically studied and 10 by XRD. Also prepared thin sections of 200 rock/mineral specimens.

c) Extension Work and Services Rendered to other Organizations

- Three M.Sc. students of AJK University, are being guided in their research endeavours.
- Identified more than 100 rock/mineral/gemstone specimens for students and other visitors.
- International collaborative project with Dr. P.J. Burg, ETH, Switzerland and Dr. Nawaz Chaudhary, Punjab University continued during the report period.

d) Publications

Baqri, S.R.H. and Nayyar Iqbal (1998). Quelques Sur Arc donners Permian Inferieur de Pakistan. Geoverstas 20 (4): 723-730.

Burg, J. P., Bodinier, J., L., Chaudhry, M. N., Hussain, S. S., Dawood, H. (1998). Infra-arc mantle crust transition and intra-arc mantle diapirs in Kohistan complex (Pakistan Himalayas): petro structural evidence, Terra Nova., 10: 74-80.

Hussain, S. and H. Dawood. (1998). Stratigraphy and structure of the Indus Suture in the Lower Swat, Pakistan, N. W. Himalaya. J. Asian Earth Sci., 10, (2-3): 225-238.

Roohi, G. (1998). Biostratigraphy and Paleontology of the Subis limestone (Early Miocene) Sarawak, East Malaysia and its correlation with the Neogenes of the Indus Basin, Pakistan. Pak. J. Hydrocarbon Res. 10: 81-104.

3. ZOOLOGICAL SCIENCES DIVISION (ZSD)

a) Reference Collection

The zoologists of the Museum carried out 12 field trips to Sialkot, Bahawalpur, Faisalabad; Kurram Agency, Murree Hills, Rohtas, Azad Jammu & Kashmir, Gilgit etc. for making faunal collections. Added 3846 fish, 950 insects, 80 bird, 33 mammal and 12 amphibian specimens to the PMNH collection.

b) Laboratory Work

Preserved 3846 fish, 12 amphibians and 20 mammals, mounted and catalogued 1085 insects, identified and curated 410 invertebrates, stuffed 37 birds and 13 mammals, prepared 5 replicas of fish and 2 of snakes, articulated a complete skeleton of Giraffe.

c) Extension Work and Services Rendered to other Agencies

- Two Ph.D. and one M.Sc. student of Quaid-i-Azam University, Islamabad are being supervised in their thesis and research work.

- Identified 70 animals for students and researchers of various institutions.
- Two international projects "The biology of butterflies of Northern Pakistan: Gilgit to Khunjerab" and "Exploration and Conservation of animal and plant resources of Pakistan" are being carried out with Oxford University Museum, UK and Florida State Museum, USA, respectively.
- Environmental impact assessment studies of Kohala Hydroelectric project completed and final report in this regard submitted to NORCONSULT INTERNATIONAL

d) Publications

Baig, K. J. (1998). A new species of *Tenuidactylus* (Sauria: Gekkonidae) from Balochistan, Pakistan. Hamdard (India) 20: 127-132.

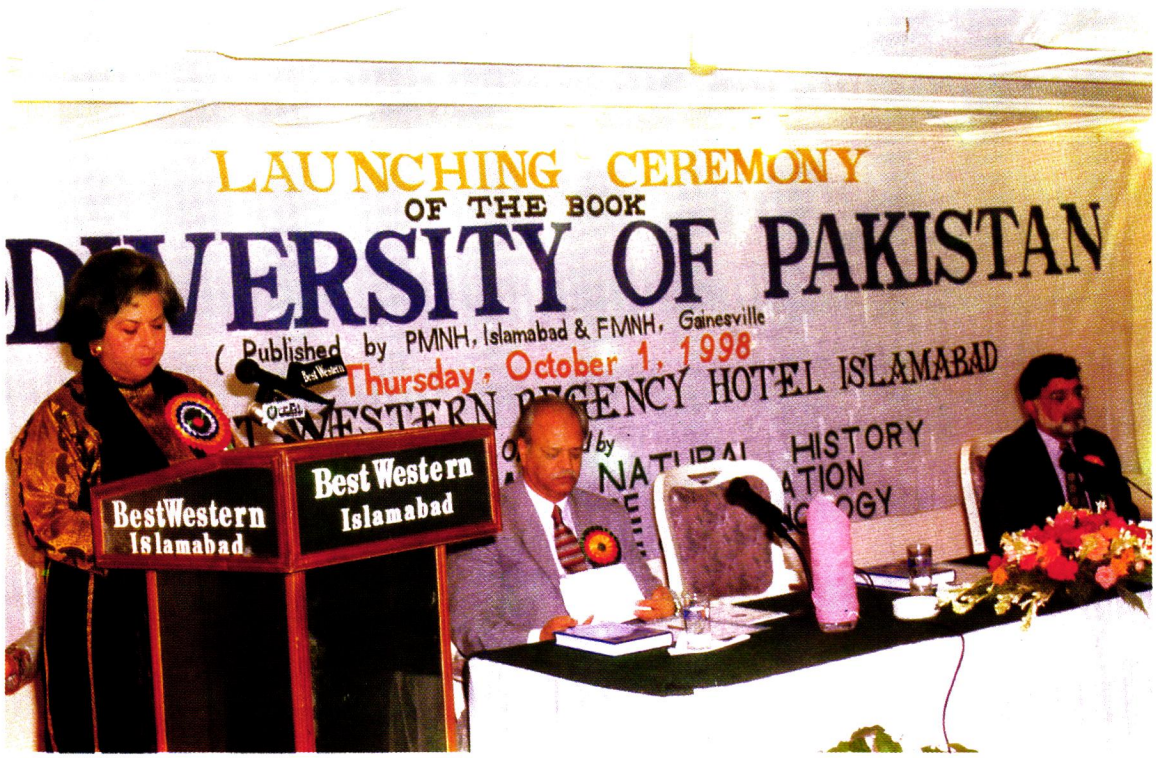
Baig, K. J. (1998). The amphibian fauna of Azad Jammu & Kashmir with new records of *Paa Liebigii*. Proc. Pak. Acad. Sci. 35: 117-121.

Baig, K. J. (1999). Description and ecology of a new sub species of Black Rock Agama, *Laudakia melanura* from Balochistan, Pakistan. Russian Herpetology 6(2): 81-86.

4. PUBLIC SERVICES DIVISION (PSD)

a) Museum Display and Maintenance

- Prepared a consolidated yearly display schedule for the next fiscal year. Also prepared drawings of description panels and blow up panels, showing the side and perspective views for the display schedule of the Museum's palaeontology gallery.
- Completed painting depicting prehistoric wildlife for the periods 65 million years to 40 million years. Also prepared information key of the "Prehistoric wildlife and Human Story Diorama".
- Prepared structure of Salt Range Diorama.
- Carried out maintenance work of PMNH Audio-visual Center.
- Completed layout design of PMNH Newsletter vol.10, Jan.'98 to June'98.
- Painted 25 showcases of minerals and fossils.
- Setting of offices and Design Studio for Public Services Division officers and staff was completed in the New Block-II of the Museum.
- Made arrangements for the display of precious stones, florescent minerals, birthstone table and hardness scale for display in the gemstone gallery.



Begum Abida Hussain, Federal Minister for Population Welfare and Science & Technology addressing the audience

- Designed the visuals and artwork for the invitation card and its envelope and leaflet for the launching ceremony of the book "Biodiversity of Pakistan".
- Exposed 240 photographs and 80 transparencies for various PMNH activities.

b) Educational Activities

- Provided 22 rock/mineral samples including some gemstones properly identified, to Pakistan Islamia High School for display and educational purposes. More than 2000 students belonging to various educational institutions of Pakistan were provided guided tours of the Museum. Different film shows were also organized for some of the student groups at the PMNH Audio-visual Center.

c) Services Rendered to other Organizations

i) Pakistan Science Foundation

Started the display plan for Faisalabad Science Center by making working drawings of the displays after taking internal measurements of the building. Prepared layout plans for various exhibits, the most outstanding being the "Country Diorama". After the approval of the plans the showcases/structures were prepared, background was painted and products were displayed i.e., plants, animals, rocks etc. The write-ups and information keys were also pasted. Designed and prepared artwork of 3-folds introductory leaflet for Science Center. Designed the shields to be presented to the Prime Minster of Pakistan and Scientists at the Convention of Scientists and Engineers on Yaum-e-Takbeer at Convention Center, Islamabad.

ii) PASTIC

Prepared two posters for PASTIC for the popularization of science through posters. Also designed a poster having the images of Muslim scientists. Completed the artwork of the poster including colour scheme for printing.

iii) Pakistan Academy of Sciences (PAS)

Prepared four different designs of logo and cover of publication for PAS. The designing and layout of the text was also completed.

d) Number of visitors

A total of 62000 persons visited the Marghazar Display Corner of the Museum.

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.

The National Centre is housed in its own building located at the Quaid-i-Azam University Campus, Islamabad. It has four Sub-Centers at Karachi, Lahore, Quetta and Peshawar. It employs about 100 persons which include Technical and Administrative Staff.

AIMS & OBJECTIVES:

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

TECHNICAL SERVICES AND ACTIVITIES

PASTIC offers the following specialized services to the scientific community of Pakistan. During the Year 1998-99 the activities undertaken by PASTIC are briefly 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 1993 S&T documents were procured and supplied against 2300 requests received.

2. BIBLIOGRAPHY SERVICE

References from International databases on CD ROM are supplied to users according to their research topics on request. Against 520 orders, 15018 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 120 S&T journals of Chemistry, Biology, Physics, Computer, Earth Sciences, Mathematics and Medicine were provided to 528 scientists. During the period under review, copies of 68 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 PSA 1997 Vol 37 No. 1-4(combine issue) was processed, prepared, finalized and composed.

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 updating.

6. PASTIC NATIONAL SCIENCE REFERENCE LIBRARY

About 444 issues of various S&T periodicals, 245 documents and 57 books were received in the library 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) ISI Current Contents (Physical Chemical & Earth Sciences) and vi Sociofile.

7. REPROGRAPHIC SERVICES

The Reprographic Section of PASTIC has facilities ranging from photocopying to offset printing. During 1998-99, about 1,731,505 impressions, 5,133 pages and 135,864 copies were produced by the Unit against 111 jobs received from 15 organizations.

8. COMPUTERIZATION ACTIVITIES

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

I. 5859 laser, 1400 D.M. pages and 47 color printout & slides were composed for PSF, PMNH, Quaid-i-Azam University and various S&T organizations.

II. Miscellaneous jobs of PASTIC were undertaken.
III. PASTIC and PSF budget for the financial year 1998-99 and 1999-2000 were composed.
IV. Data of 8 libraries entered on computer for Union Catalogue.
V. Secretariat duties carried out for workshop on "Training of Trainers for Science Popularization in SAARC member states and also composed all the related matter.
VI. Secretariat duties carried out for workshop on "Integrated Pest Management of Agricultural Pests from OIC Member countries in Asia"
VII. Duties and work for the convention of Scientists and Engineers.
VIII. Software/Hardware Services: Computer Software, Desktop publishing services & Hardware repair facilities were provided to other S&T organizations.

9. 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.

a) INFOTERRA

Queries were handled on topics such as Trace Metals in Paints & pigments, Trace metals in ground water, Drinking water bacteriology, Urban development, Environmental chemistry, Insecticide/pesticide, Trace elements in coffee & tea, Pesticides & immunology, Medicinal plants, Water pollution odor removal, (pbs, Zn) in fuel particulate matter in Rawalpindi, Air pollutant & plasma catalysis, Lead & Zinc, Dust control and Hydrology. Toxic effects of heavy metals on Wheat, Goiter; microflora effects on monuments,; effects of heptachlor on blood; drinking water quality; heavy metals; trace elements and hypertension; menopause and prolactin; atmospheric pollution; smoke and lead pollution; ozone depletion; global warming; industrial wastes; pesticides and blood; CFCs; leather industry pollution; heavy metals in vegetables; disasters and emergencies; sugar industry pollution, Analysis of water determination of aresenate, arsenate, Determination of trace metals in coal, Water pollution, Imbientar, Industrial effluents, Occupational hazards, Trace Metals in Fruit & Food; environmental Pollution Heavy metal detection in plant leaves on road sides; Milk analysis, Milk and trace elements; Heavy metals & Physical, Chemical parameters of drinking water; Atomic absorption; Tannery waste treatment; Nuts and trace metals, Atomic absorption; Water contamination in Rawalpindi & Islamabad, Spices (Pepper and trace elements); Cellular phones; Occupational hazards; Heavy metals in fruits, Comparison of yield and yield traits of body varieties; Environmental economics etc. The total number of clients served was 58. 19 NGOs on Environment were identified and contacted for Infoterra Source Registration during the year.

b) CEHANET

I. About one hundred references were identified and were entered in the database.
II. Correspondence was undertaken regarding future plans.
III. General Correspondence and filling out of questionnaires from various national and international agencies was carried out.

c) ASTINFO

i. ASTINFO publications were distributed.
ii. CDS/ISIS Package was provided to one organization.

d) SAARC DOCUMENTATION SYSTEM

i. Information was procured for users under the SAARC Program.
ii. SDC Newsletters and brochures were distributed.
iii. New SDC NFP Cell Coordinator was nominated by PASTIC/PSF and approved by the MoST.
iv. 8 articles were produced from SDC, India for Documentation Service.
v. A write-up on Arbitration facilities and trade related guidelines for FICCL, Inida was prepared.
vi. Work was carried out for UNEP to organize a competition on the Environment "Focus on your World" 1999-2000.
vii. A proposal for a workshop "INTERNET & Scientific Research" for APDC was prepared.
viii. Apprised the Sindh Rural Development Society about the activities of PASTIC.

e) BILATERAL COOPERATION

Prepared a proposal on " Holding of 4th Session of Pak-Syria Joint Ministerial Commission.

10. MEETINGS/VISITS/FUNCTIONS

Dr. Mohammad Afzal, Director General, PASTIC attended the Sixth Meeting of the Governing Board of SAARC Documentation Centre, (SDC) held from 5-6 February, 1999 at New Delhi, India.

11. TRAININGS

a) Training received

- A training course on "INTERNET for Ladies" was attended by Mrs. Kausar Sohail, Manager Technology Information, from 3-17 August, 1998 from COSMATS Institute of Information Technology..

- Mr. Nisar Ahmad, Systems Analyst attended a workshop on " Web Authoring held on 20-30 April, 1999 jointly organized by SDNP and Hamdard University at Islamabad.

b) Training/Lectures Imparted

- Organized computer training course for PSF, Science Caravan Units Sukkur from 7-12 August, 1998.
- Organized computer training course for Science Caravan Units Peshawar from 3-8 October, 1998.
- Training of trainers course on ICT applications for library & information management 23-26 November, 1998 Islamabad.

12. 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 database 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 1998-99, 1500 technology/trade offers and requests came from 39 countries and were supplied to users in Pakistan. Pakistani entreprenеurs/business organizations provided information on 200 products/processes/technologies which were advertised abroad through TIPS network.

Organized a workshop on "Quality Assurance and Total Quality Management with reference to ISO 9000" from 21-22 July, 1998.

Organized a Computer and Office Equipment Exhibition in Peshawar from 13-14 March, 1999.

The third issue of "White Meat Journal" published.

Chief Minister, N.W.F.P. inaugurating the
Computer Exhibition in Peshawar.

CHAPTER 2

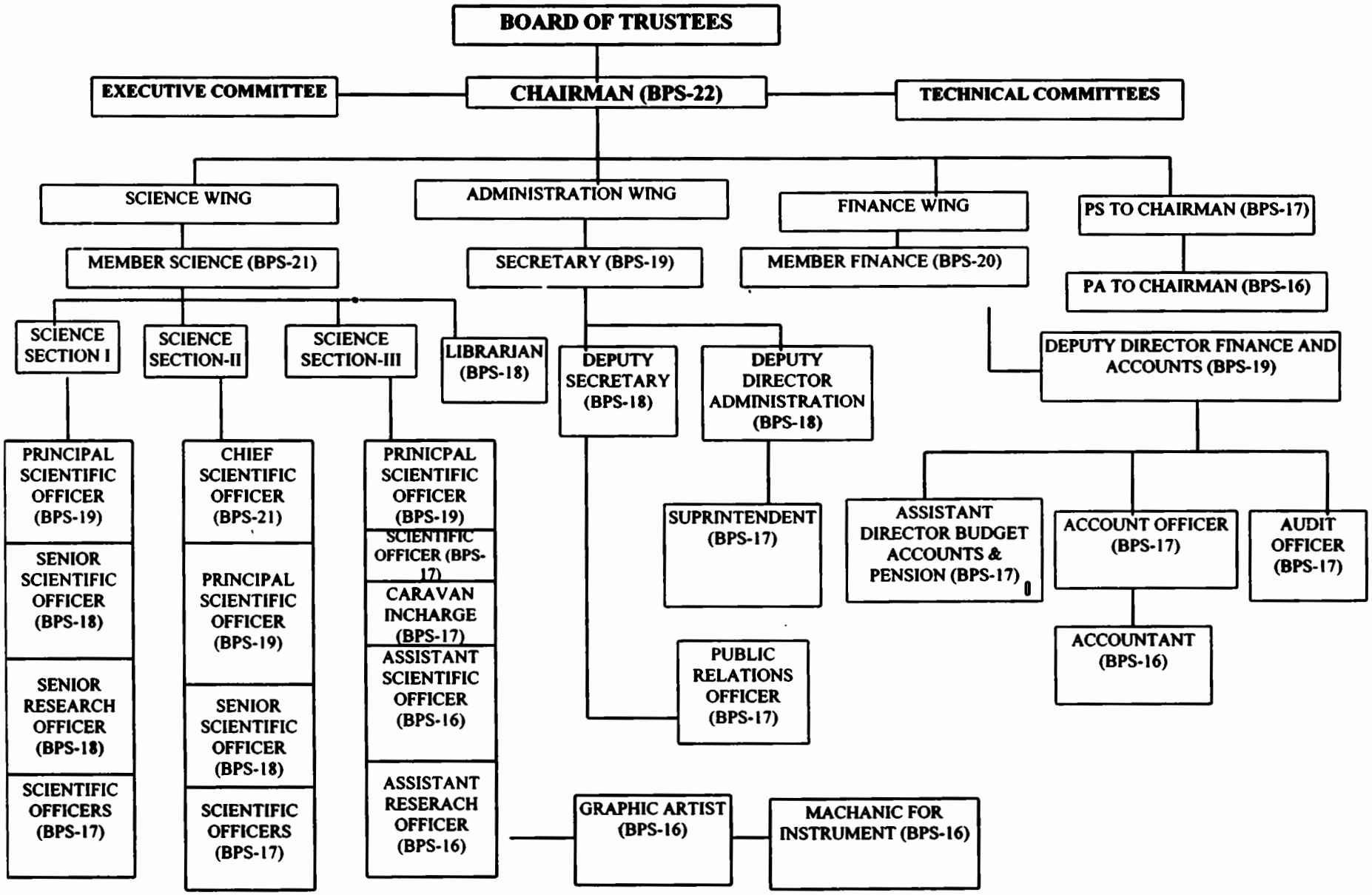
ORGANIZATION AND ADMINISTRATION

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.	Translating 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**

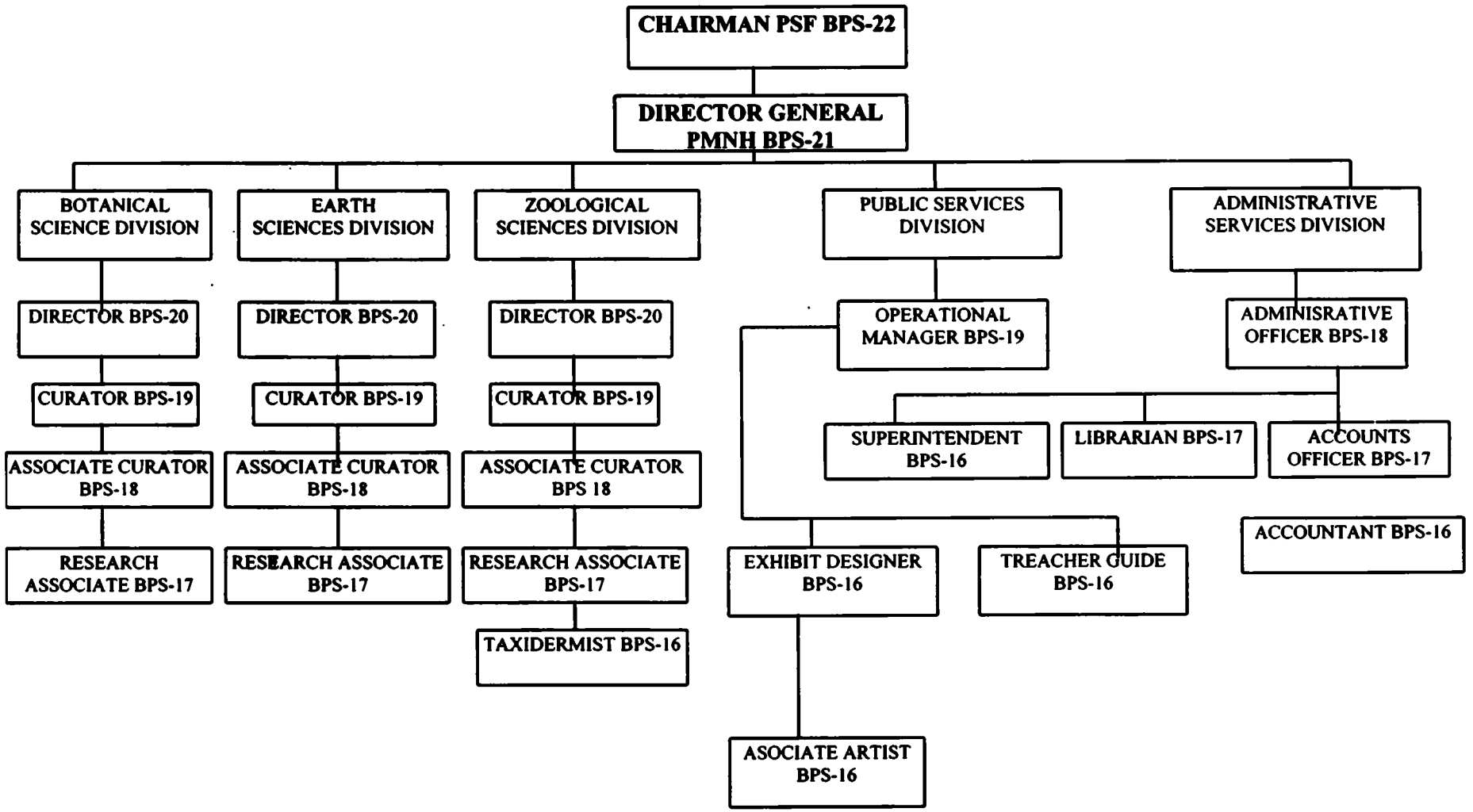
PAKISTAN SCIENCE FOUNDATION
ORGANIZATIONAL CHART



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**

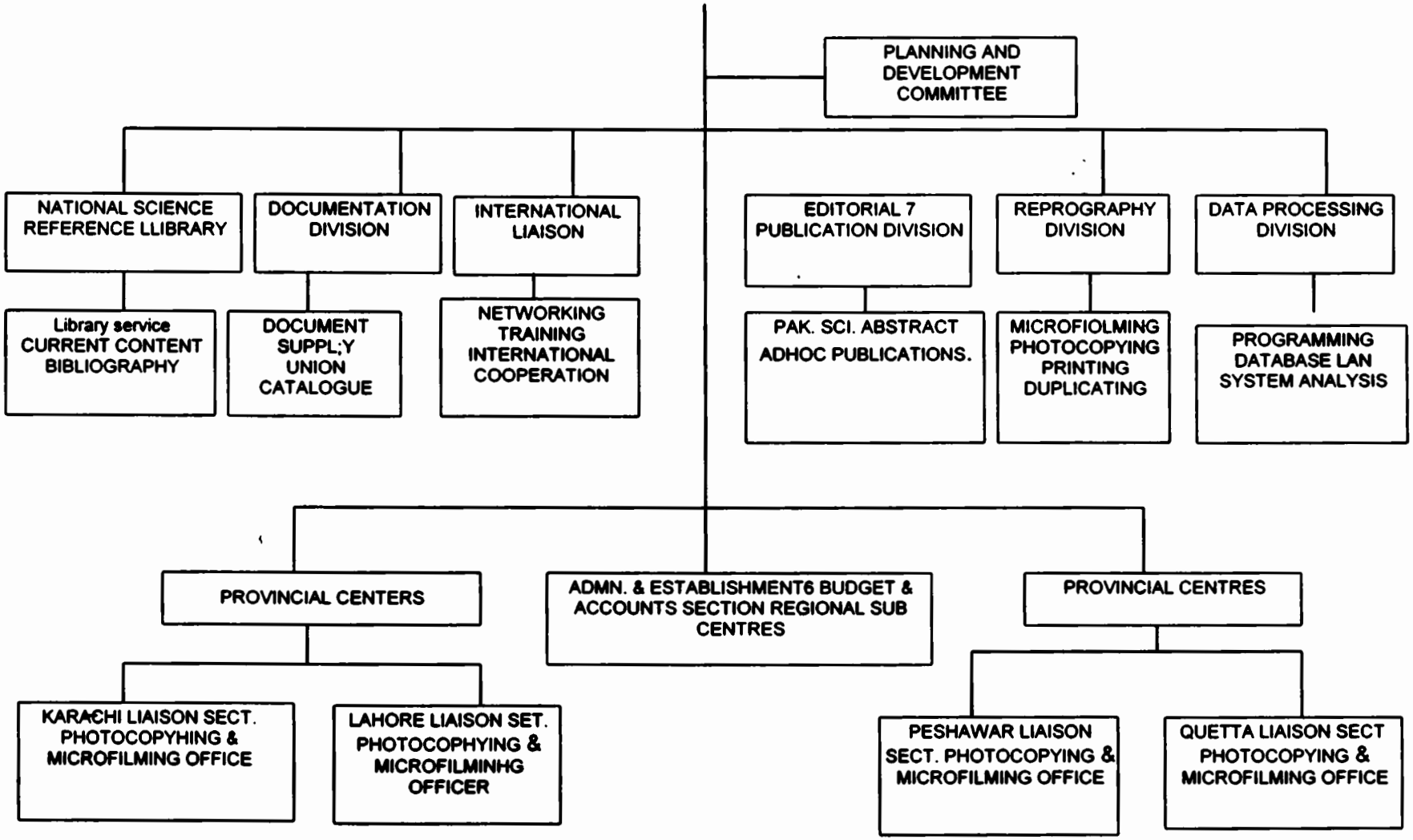
PAKISTAN MUSEUM OF NATURAL HISTORY
ADMINISTRATIVE CHART



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**

ORGANIZATIONAL STRUCTURE OF PAKISTAN SCIENTIFIC & TECHNOLOGICAL INFORMATION CENTRE



CHAPTER-3

PAKISTAN SCIENCE FOUNDATION
FINANCIAL STATEMENTS
JUNE 30, 1999

AUDITORS' REPORT TO THE BOARD OF TRUSTEES

We have audited the accompanying Balance Sheet of the PAKISTAN SCIENCE FOUNDATION as at June 30, 1999 and the related receipts and expenditure account together with the notes forming part thereof for the year then ended. These financial statements are the responsibility of the Foundation's management. Our responsibility is to express an opinion on these financial statements based on our audit.

We conducted our audit in accordance with International Standards on Auditing. Those Standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion.

In our opinion, the financial statements give a true and fair view of the financial position of the Foundation as at June 30, 1999 and of the results of its activities for the year then ended.

S.M. MASOOD & CO.,
Chartered Accountants

ISLAMABAD
_____1999

PAKISTAN SCIENCE FOUNDATION
BALANCE SHEET AS ON JUNE 30, 1999

	NOTE	1999 Rupees	1998 Rupees		NOTE	1999	1998
GRANT AND LIABILITIES				**PROPERTY & ASSETS**			
GENERAL FUND	3	27,209,017	27,510,676	TANGIBLE FIXED ASSETS	6	24,617,600	25,298,233
RESEARCH SUPPORT GRANT	4	43,263,597	38,675,783	RESEARCH PROJECTS IN PROGRESS		43,263,597	38,675,783
CURRENT LIABILITIES				LONG TERM DEPOSITS	7	1,617,195	1,617,195
Creditors		-	28,681				
Accrued and other liabilities	6	380,276	1,470,985	CURRENT ASSETS			
		380,276	11,499,666				
				Advances	8	1,078,105	638,409
				Cash and bank	9	276,393	1,456,505
						1,354,498	2,094,914
		70,862,890	67,686,126			70,862,890	67,686,126

Auditors' report to the Board of Trustees is annexed.

These accounts should be read in conjunction with the annexed notes which form an integral part thereof.

TRUSTEE CHAIRMAN

PAKISTAN SCIENCE FOUNDATION
RECEIPT AND EXPENDITURE ACCOUNT
FOR THE YEAR ENDED JUNE 30, 1999

	Note	1999 Rupees	1998 Rupees
RECEIPTS			
Grant from Federal Government		29,871,000	31,795,000
Grant from Ministry of Science & Technology		100,000	-
		29,971,000	**31,795,000**
EXPENDITURE			
Scientific Functions	10	13,343,191	14,984,425
Administrative Expenses	11	16,929,468	17,375,777
		30,272,659	**32,375,777**
EXCESS OF EXPENDITURE OVER RECEIPTS		**(301,659)**	**580,777)**

Auditors' report to the Board of Trustees is annexed.

These accounts should be read in conjunction with the annexed notes which form an integral part thereof.

TRUSTEE CHAIRMAN

PAKISTAN SCIENCE FOUNDATION, ISLAMABAD
NOTES TO THE ACCOUNTS FOR THE YEAR ENDED JUNE 30, 1999

1. STATUS AND OBJECTS

PAKISTAN SCIENCE FOUNDATION (Foundation) is a statutory organization established under Pakistan Science Foundation Act, 1973 on the 2nd day of February, 1973. The main objects of its establishment is to promote and finance scientific activities having a bearing on the socio-economic needs of the country.

2. ACCOUNTING POLICIES

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

2.1 GRANTS RECEIVED

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

2.2 RESEARCH SUPPORT GRANT

Research support grant has been accounted for on actual payment basis

2.3 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 6. Full year depreciation is charged on the assets acquired during the year and no depreciation is charged on the assets disposed off during the year.

		1999 Rupees	1998 Rupees
3. GENERAL FUND			
Balance as on July 01		27,510,676	28,091,453
Deficit transferred from Receipts and Expenditure Account		(301,659)	(580,777)
		27,209,017	**27,510,676**
4. RESEARCH SUPPORT GRANT			
Balance as on July 01		38,675,783	35,259,087
Add: Disbursement during the year	(4.1)	9,040,776	9,700,145
		47,716,559	**44,959,232**
Less: Project completed during the year	(4.2)	4,452,962	6,283,449
		43,263,597	**38,675,783**

	1999	1998
	Rupees	Rupees
4.1. DISTRIBUSEMENT DURING THE YEAR		
Mathematics and Computer Sciences	110,628	57,981
Physical Sciences	1,153,620	502,186
Chemical Sciences	1,582,753	1,538,027
Biological Sciences	1,517,707	1,663,722
Earth Sciences	682,183	456,346
Environmental Sciences	442,873	733,787
Engineering Sciences	191,603	756,793
Agricultural Sciences	2,574,391	2,433,636
Medical Sciences	75,325	1,121,180
Institutional Support	557,247	293,000
Board / Committee Meetings	152,446	143,487
	9,040,776	**9,700,145**
4.2 PROJECTS COMPLETED DURING THE YEAR		
Physical Sciences	1,155,699	1,304,258
Chemical Sciences	1,723,847	1,843,117
Biological Sciences	715,901	1,775,200
Agricultural Sciences	857,515	1,360,874
	4,452,962	**6,283,449**
5. ACCRUED AND OTHER LIABILITIES		
Accrued expenses	169,406	97,845
Advance for Conference	100,000	
Security deposits	64,795	1,163,600
Other liabilities	46,075	209,540
	380,276	**1,470,985**

6. TANGIBLE FIXED ASSETS

Particulars	COST			DEPRECIATION				Written down value as at June 30,1999
	As at July 01, 1998	Additions	As at June 30, 1999	RATE	As at July 01, 1998	For the year	As at June 30 1999	
Lease hold land	3,713,418	-	3 713,418	-	-	-	-	3,713,418
Building	19,484,50	-	19,484,540	5%	2,778,983	835,278	3,614,261	15,870,279
Motor Vehicles	3,496 059	210 750	3,706,809	20%	2 754,081	190 546	2,944,627	762,182
Office equipment	2,871,536	263,825	3,135,361	15%	1,586,812	232,282	1,819,094	1,316,267
Science equipment	1,504,548	281 727	1,786 275	15%	1,045 710	111,085	1,156,795	629,480
Furniture and fixture	1,957,216	-	1,957,216	6%	668,240	77,339	745,579	1,211,637
Air conditioners	194,974	-	194,974	15%	179,096	2,382	181,478	13,496
Library books and films	1,385,087	69,917	1 455,004	5%	296 233	57,939	354,172	1,100,832
Bicycle	680	-	680	20%	670	2	672	8
1999 Rupees	**34,608,058**	**826,219**	**35,434,277**		**9,309,825**	**1,506,851**	**10,816,676**	**24,617,600**
1998 Rupees	**33,948,612**	**659,446**	**34,608,058**		**7,795,016**	**1,514,809**	**9,309,825**	**25,298,233**

	1999 Rupees	1998 Rupees
7. LONG TERM DEPOSITS		
Electricity Connection (WAPDA)	1,472,195	1,472,195
Gas Connection (SNGPL)	145,000	145,000
	1,617,195	**1,617,195**
8. ADVANCES, DEPOSITS AND PREPAYMENTS		
TO STAFF		
- for vehicle/motorcycle	232,813	159,341
- for house rent	845,292	479,068
	1,078,105	**638,409**
9. CASH AND BANK BALANCES		
Cash at Bank	210,870	1,373,140
UNESCO Coupons	34,571	57,835
Cash In hand	30,952	25,530
	276,393	**1,456,505**

9.1 UNESCO COUPONS

The Foundation purchased UNESCO Coupons in May, 1998 for Rs.50,000 ($ 1,068.20) and were incorrectly charged under the head "Information and Documentation" in 1997-98 accounts The financial statements of 1997-98 have been restated to correct the error.

10. SCIENTIFIC FUNCTIONS		
Research and Support Grant	9,040,776	9,700,145
Scientific Societies and Professional Bodies.	560,000	605,024
Scientific Conferences, Meetings and Seminars.	348,000	427,400
Operation of Science Caravan.	1,814,965	1,693,072
Science centres & herbaria	400,000	-
International Liaison	-	69,104
Science Promotion Activities.	1,059,450	1,414,705
Science Fair	-	1,000,000
Exchange of Visits of Scientists and Technologists	-	74,975
Scientists Pool	120,000	-
	13,343,191	**14,984,425**

	1999 Rupees	1998 Rupees
11. ADMINISTRATIVE EXPENSES		
Salaries and other benefits	9,949,275	10,503,841
Travelling	121,092	122,190
House rent facility	1,943,626	1,865,424
Ground rent to CDA	17,944	
Electricity, gas and water.	543,633	399,032
Postage, telephone and telegram	907,612	952,148
Printing & stationery	270,373	268,336
Vehicle running and maintenance	1,039,164	1,063,967
Newspapers and advertisement	148,023	129,992
Liveries and uniforms	14,000	2,400
Entertainment	49,515	67,118
Repair and Maintenance	191,076	185,971
Audit fee	12,500	32,500
Legal charges	34,500	35,000
Depreciation	1,506,851	1,514,809
Maintenance of office building	114,546	186,496
Staff welfare fund	27,500	25,000
Miscellaneous	38,238	37,127
	16,929,468	**17,391,352**

12. FIGURES

a) Figure have been rounded off to the nearest of Rupee.
b) Figures of the previous year have been regrouped and rearranged wherever deemed necessary.

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;

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 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

iii) 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 1998-99

No.	Title and Number of Project	Name of PI and the Organization Supported:	Project Cost
	a) *Agricultural Sciences:*		
1.	Development of Commercial Diet for Rearing of Lacewing, *Chrysoperla carnea*- A Biological Control Agent. P-AU/AGR(223)	Dr. Muhammad Yousaf Professor University of Agriculture, Faisalabad	317,608/-
2.	Studies on the Control of Codling Moth, *Cydia pomonella* (Tortricidae: Lepidoptera), in Murree Hills of Punjab. P-UAAR/Agr (230)	Dr. Abdul Khaliq Associate Professor University of Arid Agriculture, Rawalpindi.	428,777/-
3.	Assessment of Soil Losses, Runoff Estimates and Changes in Some Physico-chemical Properties of Soil Under Different Cropping Systems. F-AU/Agr (232)	Dr Farmanullah Khan Lecturer NWFP Agricultural University, Peshawar	341,440/-
4.	Dynamics of Microbial Biomass C, N and P in Rainfed Soils in Relation to Wheat and Maize Production. P-UAAR/Agr (234)	Dr. Khalid Saifullah Khan, Lecturer University of Arid Agriculture, Rawalpindi.	253,837/-
5.	Fungi as Bio-control Agents Against Weeds: i) Bio-control of weeds of rice crop ii) Bio-control of weeds of wheat crop P-PU/Agr (248)	Dr. Rukhsana Bajwa Associate Professor University of Punjab, Lahore	461,927/-
6.	Identification and Field Evaluation of Bio-control Agents of the Family Braconidae (Hymenoptera) Against Important Crop Pests of Pakistan F-AU/Agr (258)	Dr. Inayatullah Associate Professor NWFP Agricultural University, Peshawar	242,678/-
	b) Biological *Sciences:*		
7.	Taxonomy, Ecology of Spider Communites of Citurs Orchards and the Role of Spiders as Predators. P-AU/Bio (286)	Dr. Shakila Khalid Assistant Professor University of Agriculture, Faisalabad	323,319/-
8.	Studies on Taxonomy and Taditional Uses of Economically Important Plants of Chitral. C-PMNH/Bio (295)	Dr. M. Rashid Awan Curator, Botanical Sciences Div. PMNH, Islamabad	294,984/-

c) *Chemical Sciences:*

9	Studies on Biologically active organic compounds containing Silicon and Germanium C-QU/Chem (303)	Dr. M. Mazhar, Associate Professor, Department of Chemistry, Quaid-i-Azam University, Islamabad.	343,046/-
10	Influence of Long Chain Branching and High Molecular weight components on Elongational and shear properties of Polyolefins S-KU Chem (342)	Dr. Riaz Ahmad, Lecturer, Department of Applied Chemistry, University of Karachi, Karachi	414,079/-
11.	Leishmania and Leishmaniasis in Pakistan B-BU/Chem(346)	Prof. Dr. M. Masoom Yasinzai, Institute of Chemistry, Univedrsity of Balochistan, Quetta.	819,218/-

d) Earth sciences:

12	Geological Bibliography of the Himalayan-Korakoram Hindukush Region of Pakistan F-PU/Earth(51)	Dr. M. Qasim Jan, Director, National Centre of Excellence in Geology, University of Peshawar, Peshawar	369,913/-
13.	Geology and Mineral Potential of Nagar Parkar Area, Tharparkar, Sindh C-PMNH Earth(56)	Mr. Shahid Hussain, Curator, Earth Sciences Division, Pakistan Museum of Natural History, Islamabad	34,302/-
14	Facies Distribution, Paleao-enviropnmental Analysis and Petroleum Prospects of the Foreland Basin Sediments in the Kirthar Fold Belt, Balochistan, Pakistan B-BU Earth(57)	Dr. Abdul Salam Khan, Associate Professor, Centre of Excellence in Mineralogy, University of Balochistan, Quetta	523,550/-
15.	Structural and Stratigraphic Analysis of Himalayan Fold-Thrust Belt in Kohat, Karak and Bannu Transect, North Pakistan F-PU Earth(66)	Dr. Iftikhar Ahmad Abbasi, Associate Professor Department of Geology, University of Peshawar, Peshawar	90,367/-
16	Revision and Compilation of the Stratigraphy of Pakistan F-PU/Earth (68)	Dr. Ali Hamza Kazmi, C O National Centre of Excellence in Geology, University of Peshawar, Peshawsar.	257,244/-

e)Physical Sciences:

17.	Fabrication & Study of Mechanical Properties of High Strength, High Temperature Zirconia based composites. P-OY Phys(106)	Prof. Dr Salah-ud-Din, Cente for Solid State Physics, University of the Punjab, Quaid-i-Azam Campus, Lahore.	434,459/-

18.	Generation and Characterization of Hydrogen Methane cold Plasma. P-IU/Phys(110)	Dr. Khaleeq A. Chaudhry, Assistant Professor, Department of Physics, Islamia University, Bahawalpur	552,095.40
19.	Numerical study of Pinch Dynamics stability and study of Nonlinear wave propogation in Magnetized plasma C-QU/Phys(111)	Dr. Arshad M. Mirza, Assistant Professor, Department of Physics, Quaid-i-Azam University, Islamabad	428,896/-
20.	Investigation in Quantum Chromodynamics and Proton spin Structure. C-QU/Phys (112).	Professor Dr. Pervaz Amirali Hoodbhoy Department of Physics, Quaid-i-Azam University, Islamabad	378,797.40
21.	Quantum State Measurement. C-QU/Phys(115)	Prof. Dr. Suhail Zubairy, Department of Physics, Quaid-i-Azam University, Islamabad.	378,797.40
		Total:	**8697334/-**

Annexure-III

DETAILS OF MONITORING AND EVALUATION OF ON-GOING PSF PROJECTS DURING 1998-99

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

No.	Project No.	Project Title	Reports
1.	S-SEARC/Agr (141)	Host Plant Resistance of Bioregulator Treated cotton to Bollworms & Sucking Complex and Its Impact on Yield and Yield Components.	3rd Semi annual
2.	S-AU/Agr(169)	Population Ecology of Whitefly and Fruit fly on Cucurbits in Sindh	2nd semi annual
3.	P-AU/Agr(175)	Factors Affecting Successful In Vitro Maturation, Fertilization and Culture of Buffalo Follicular Oocytes.	3rd semi annual
4.	F-AU/Agr(182)	Management of Onion Downy Mildew under IPM in the NWFP, Pakistan	2nd semi annual
5.	S-PCCC/Agr(183)	Breeding for Glandless Cotton.	3rd semi annual
6.	S-KU/Agr(184)	Investigation on the Diseases of Betal Vine and their Cotrol.	3rd semi annual
7.	P-AU/Agr(191)	Evaluation of Cotton Germplasm for the Development of Multipurpose Variety.	2nd semi annual
8.	P-PU/Agr(192)	Development of Maize Population for Fodder Purposes.	2nd semi annual
9.	P-AU/Agr(195)	Electrophoretic Identification of Pakistani Wheats for Gliadin and HMW Glutenin Subunit Composition and their Relationship with End Use Quality.	2nd semi annual
10.	F-GU/Agr(198)	Enhancement of Post Harvest Quality and Stability of Dhakki Date Using Advanced Technology.	2nd semi annual
11.	S-KU/Agr(200)	Breeding of Some Important Commercial Marine Shrimps of Pakistan in Captivity	2nd semi annual
12.	C-IIBC/Agr(201)	Management of *Pentalonia nigrovosa*, a Vector of Banana Bunchy Top Virus Diseases in Sindh Province.	3rd semi anual
13.	P-BAC/Agr(209)	Biology and Management of Black Scurf of Potato.	2nd semi annual
14.	C-NARC/Agr(216)	Mating Types, Races and Genetic Variability in *Phytophthora infestans*, the cause of Late Blight of Potato.	2nd semi annual
15.	S-KU/Agr(217)	Studies on the Entomopathogenic Nematodes in Sindh	2nd semi annual
16.	P-PU/Bio(228)	Evaluation of the role of salt tolerant bacteria in developing resistance of plants to salt stress conditions	2nd semi annual

17.	P-AU/Bio (246)	Development of Subunit Recombinant Vaccine(s) and Sensitive Diagnostic Tests for Controlling Infectious Bursal (Gumboro) Disease of Poultry.	1st semi annual
18	P-PU/Bio (251)	Biodiversity: I. studies on termites of Gilgit and Skardu with emphasis on Heterotermitinae.	1st semi annual
19.	S-KU/Bio (277)	Assessment of Biological Activity in the Marine Cyanobacterial Species from Coastal and Near-Shore Environments.	1st semi annual
20.	P-GC/Bio (283)	Citric Acid Fermentation by Mutant Strain of *Aspergillus niger* GCM-7 in Stirred Fermenter.	1st semi annual
21.	C-NARC/Bio(271)	Biology and host pathogen interaction in powdery scab of potato in Pakistan	2nd semi annual
22.	B-BU/Chem(211)	Biotechnological potential of Immobilized enzymes: Application of Immobilized Enzymes in the Synthesis of valuable Biological compounds.	3rd semi-annual
23	S-KU/Chem(321)	Characterization of Plasma Membrane Glycoprotiens of Rabbit Corneal Epithelium.	Ist semi-annual
24	S-KU/Chem(294)	Spectrophotometric & high performance Liquid Chromatographic Determination of Copper, Nickel, Iron, Cobalt, Vanadium, Cadmium, Lead and Mercurry using New semi-carbazones as comoplexing reagents.	Ist semi-annual
25	F-PU/Chem(284)	A study on the Lubricity of Lubricating oils produced in Pakistan.	2nd semi-annual
26.	S-KU/Chem(311)	Isolation & characterization of Antibiotics from soil Fungi for the Development of Drugs.	2nd semi-annual
27	C-PINSTECH/Engg(41)	Determination of Literal and Vertical Penetration of Canal water in Rechna Doab using Environemental Istopes.	Ist semi-annual
28	P-CEWRE/Engg(43)	Impact of Irrigation Managhement on Nitrate Leaching at Farmers Field.	2nd semi-annual
29	P-CEME/Engg(73)	Design and Fabrication of Rockbed storage system for a solar Air Heated Hospital at Goma-Skardu, Pakistan.	Ist semi-annual
30	F-PU/Earth(50)	Crustal evolution of the Kohistan Island Are: study of structure, Lithostraticgraphy and Valcainism in Are-Related Basins.	Ist semi-annual
31	C-QU/Phys(93)	Atomic Coherence Effects in Laser & Quantum Optics.	3rd semi-annual
32	P-PU/Phys(94)	Theoretical/computational studies of Fractals in Material.	3rd semi-annual
33	Biotech/P-NIBGE/Med(4)	Study of Hepatitis C Virus genotypes prevelant in Pakistan.	Ist semi-annual
34	Biotech/P-NIBGE/Env(5)	Biotechnological solution of Liquid effluents from Leather Industry.	Ist semi-annual

35	Biotech/S-AKU/Med(12)	Determination of Leishmania species using Molecular Biology Techniques.	1st semi-annual
36	C-QU/Envr(5)	Biological control of termites with Pheromones and Pathogenic Fungi.	1st semi-annual
37.	P-PU/Envr(36)	Assesment of Physiological and Genetic defacts in human population exposed to industrial polutants in the industrial area of district Kasur , Punjab.	2nd semi annual
38.	P-PARC/Envr (37)	Economically Important Plants of Cholistan Desert	1st semi-annual
39.	P-UAA/Envr (42)	To Evaluate Suitability of Sewage Sludge as Organic Manure for Crop Production in Potwar Region.	1st semi-annual
40.	P-AU/Envr (44)	Studies on Metals Eco-toxicity of the River Ravi.	1st semi-annual
41.	S-SALU/Envr (45)	Floristic Study of Arid Zone (Desert - Nara Region) Sindh	1st semi-annual
42.	S-AKU/Med (161)	Low Urinary Citrate, a Major Risk Factor for Calcium Stone in Pakistan- Is it due to low Alkali Intake?	1st semi-annual
43.	C-PINSTECH/Med (172)	Clinical Application of ^{13}C Urea Breath Test for Diagnosis of *Helicobacter pylori* Infection and Confirmation of Eradication Following Therapy.	1st semi-annual

b) ***First Annual Reports***

1.	S-AU/Agr(169)	Population Ecology of Whitefly and Fruit fly on Cucurbits in Sindh
2.	F-AU/Agr(182)	Management of Onion Downy Mildew under IPM in the NWFP, Pakistan
3.	P-AU/Agr(195)	Electrophoretic Identification of Pakistani Wheats for Gliadin and HMW Glutenin Subunit Composition and their Relationship with End Use Quality.
4.	F-GU/Agr(198)	Enhancement of Post Harvest Quality and Stability of Dhakki Date Using Advanced Technology.
5.	P-AU/Agr (199)	Epidemiological and Aetiopathological Investigations of Neonatal Lamb Mortality
6.	S-KU/Agr(200)	Breeding of Some Important Commercial Marine Shrimps of Pakistan in Captivity
7.	P-BAC/Agr(209)	Biology and Management of Black Scurf of Potato.
8.	F-AU/Agr (214)	Characterization of Soyabean Mosaic Virus and Screening of Soyabean Germplasm for the Source of Resistance to it.
9.	C-NARC/Agr(216)	Mating Types, Races and Genetic Variability in *Phytophthora infestans*, the Cause of Late Blight of Potato.
10.	P-PU/Bio(228)	Evaluation of the role of salt tolerant bacteria in developing resistance of plants to salt stress conditions

11.	P-PU/Bio (251)	Biodiversity: I. studies on termites of Gilgit and Skardu with emphasis on Heterotermitinae.
12.	C-NARC/Bio(271)	Biology and host pathogen interaction in powdery scab of potato in Pakistan
13	F-PU/Chem(315)	Ion Exchange Properties of Metal-III Phosphates
14	S-KU/Chem(321)	Characterization of Plasma Membrane Glycoprotiens of Rabbit Corneal Epithelium.
15	P-CEWRE/Engg(43)	Impact of Irrigation Management on Nitrate Leaching at Farmers Fields.
16	P-AU/Engg(52)	Comparison of Modern Irrigation system with Primitive Flooding Irrigation.
17	C-QU/Phys(104)	Laser Assisted Atomic Structure studies.
18	P-BZU/Phys(95)	Optical & Electrical properties of Germanate Glasses
19	C-PINDTECH/Engg(70)	Stress Analysis of piping system subjected to Dynamic Loading.
20	P-PU/Envr(36)	Assessment of Physiological and Genetic defects in human population exposed to industrial pollutants in the industrial area of district Kasur , Punjab.
21.	P-UAA/Envr (42)	To Evaluate Suitability of Sewage Sludge as Organic Manure for Crop Production in Potwar Region.
22.	P-AU/Envr (44)	Studies on Metals Eco-toxicity of the River Ravi.
23	S-AKU/Med (161)	Low Urinary Citrate, a Major Risk Factor for Calcium Stone in Pakistan- Is it due to low Alkali Intake?

c) Second Annual Reports

1.	S-KU/Agr(184)	Investigation on the Diseases of Betal Vine and their Control.
2.	P-AU/Agr(191)	Evaluation of Cotton Germplasm for the Development of Multipurpose Variety.
3	C-IIBC/Agr(201)	Management of *Pentalonia nigrovosa*, a Vector of Banana Bunchy Top Virus Diseases in Sindh Province.
4.	S-KU/Bio (193)	Use of Rhizobia in the Integrated Control of Root Rot Diseases of Crop Plants.
5.	P-AU/Bio (238)	Potential of Owls as Controlling Agents of Rats and Mice.
6.	S-AKU/Bio(239)	Elucidation of the Structure and Function of a New form of Dihydropolate Reductase.
7.	F-GU/Bio (247)	Development of Salt Tolarant Sugarcane Cultivars through Genetic engineering.
8.	C-QU/Phys(93)	Atomic Coherence effects in Laser & Quantum optics.
9.	P-PU/Phys(94)	Theoretical/computational studies of Fractals in Materials.
10	C-QU/Phys(104)	Laser Assisted Atomic structure studies.

LIST OF PUBLICATIONS PRODUCED THROUGH PSF SUPPORTED PROJECTS COMPLETED DURING 1998-99

A.A.Khan, and M.S.Zubairy. (1998) A Quantum Logic Gate via Atomic Scattering from thr Standing Wave Field in Bragg Regime; Fortschritte der Physik (Special Issue on Quantum Computing) Fortschr. Ohys. 46:417.

A.A.Khan, and M.S.Zubairy. (1999) Quantum Non Demolition Measurementof Fock States via Atomic Scattering in Bragg Regime; Physics Letters A, 254:301.

A.Akhan, and M.S.Zubairy. Quantum Computing via Atom Optics Phys. Rev. A, (Sbmitted)

A.Herkommer, W.P.Scheich, and M.S.Zubairy. (1997) Autler-Townes microscopy of a single atom; J. Mod. Opt. 44:2507.

Ahmad, M.M.F. Haque, W.Ahmad, H.Abbas, S. Haque, D.Krakow, D.L.Rimoin, R.S.Lachman and D.H.Cohn. (1998) Distinct, autosomal recessive form of spondyloepimetaphyseal dysplasia segregating in an inbred Pakistani kindred; Am. J. Med. Gen. 78:468-473.

Arshad M. Mirza, G. Murtaza, and P.K. Shukla. (1996) Electromagnetic Instability in Nonuniform Resistive Electromagneto dynamics; Phys. Plasma 3:731.

Arshad M. Mirza, N.A.D. Khattak, M. Salahuddin and G. Murtaza. (1996) Thermonuclear Fusion with a Spinning Gas-puff Staged Pinched; Plasma Phys. Control. Fusion 38: 847.

Arshad M. Mirza, Tariq, G. Murtaza and P.K. Shukla. Chaos in parallel velocity shear driven electromagnetic turbulence in a a non uniform resistive magnetoplasma; Physics of Plasma (submitted).

Arshad M. Mirza, Z. Ahmad, N.A.D. Khattak and G. Murtaza. (1988) Radiative Collapse in an Impurity Seeded Spinning Gas-puff Staged; J. plasma physics (accepted).

Cloning and Expression of B-glucose Genes in Escherichia coli and Saccharomyces cerevisiae Using Shuttle Vector pYE2.0

Effect of pathogenic fungi on the larvae and pupae of maize stem borer (Chilo partellus) Pak. J. Phytopath., Faisalabad (submitted).

Entomopathogenic fungi and their effect on maize stem borer (Chilo partellus) Pak. J. Phytopath., Faisalabad (submitted).

Fatima Bi and Seema Iqbal (1996) Studies of aqueous extracts of three green algae as an elicitor of plant defence mechanism; Pak. J. Bot., University of Karachi.

Fatima Bi and Seema Iqbal. (1995) Chemical composition and elicitor activity of polysaccharides of various seaweeds of Karachi coast; Proceeding of 7th National Chemistry Conference, organized by Chemical Society of Pakistan, Balochistan University, Quetta.

Fatima Bi and Seema Iqbal. (1995) Chemical composition and elicitor activity of polysaccharides of various brown algae of Karachi coast; 7th National Chemistry Conference, organized by Chemical Society of Pakistan, Balochistan University, Quetta.

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Annexure-V

GRANTS SANCTIONED FOR CONFERENCES, SEMINARS, SYMPOSIA ETC. DURING YEAR 1998-99

S.NO.	Name of Department	Name of Event	Amount Sanctioned
1	Department of Chemistry, University of Peshawar, Peshawar.	5Th National Conference on Analytical & Environmental Chemistry	20,000/-
2	Institute of Environmental Science & Engineering. National University of Science & Technology, Tamizuddin Road Rawalpindi. (NUST)	24th WEDC Conference on "Water & Sanitation for All."	25,000/-
3	HEJ Research Institute of Chemistry, UOK, Karachi	6th National Symposium on "Protein Structure Function Relationship"	25,000/-
4	National Museum of Science & Technology, Near Engineering University, G.T. Road Lahore.	Science Day, 98 Holding of Science Quiz, science Models Competition, & Essay Competition.	32,400/-
5	Department of Physiology & Pharmacy, The Aga Khan University, Karachi.	International workshop on Physiology Teaching.	25,000/-
6	Pakistan Physical Society, Department of Physics, Quaid-e-Azam University, Islamabad.	7th National Symposium on Frontiers in Physics.	20,000/-
7	Department of Statistics, University of Karachi, Karachi.	7th Statistical Seminar 99	15,000/-
8	Chemical Society of Pakistan University of Karachi, Karachi.	9th National Chemistry Conference	25,000/-
9	National Institute of Oceanography, Karachi.	3rd SEGMITE International Symposium	15,000/-
10	MRS./RC and Zoology Department, University of Karachi, Karachi.	Aquatic Biodiversity of Pakistan	20,000/
11	Zoological Society of Pakistan, C/o Pakistan Academy of Sciences, Islamabad.	19th Pakistan Congress of Zoology	30,000/-

12	Pakistan Society for Biochemistry & Molecular Biology, Institute of Biochemistry, University of Balochistan, Quetta.	5th National Conference of Pakistan Society for Biochemistry & Molecular Biology,	30,000/-
13	Pakistan Society for Biochemistry & Molecular Biology, Institute of Chemistry, UOP, Lahore.	5th National Conference of Pakistan Society for Biochemistry & Molecular Biology,	15,000/-
14	Agricultural Biotechnology Institute, National Agriculture Research Centre, Park Road, Islamabad.	2nd National Symposium on Applications of Plant tissue Culture and Genetic Engineering	20,000/-
15	University of Peshawar, Peshawar	10th All Pakistan Geographical Conference	20,000/-
16	Pakistan Atomic Energy Commission, Islamabad	24th International Nathiagali Summer College	25,000/-
17	College of EME, NUST, Rawalpindi	International Workshop on Silicon Technology	30,000/-
		TOTAL	**3,92,400/-**