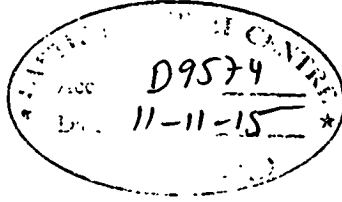


ANNUAL REPORT

2000 - 2001



Pakistan Science Foundation



PAKISTAN SCIENCE FOUNDATION

**ANNUAL REPORT
2000-2001**

**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 2000-2001, 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. Shahzad A. Mufti
Chairman
Pakistan Science Foundation
Islamabad

Secretary
Ministry of Science and Technology
Government of Pakistan
Islamabad

PAKISTAN SCIENCE FOUNDATION

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Prof. Dr. Khalid Mahmood Khan (up to April 17, 2001)
Prof. Dr. Shahzad A. Mufti (since April 18, 2001 onward) *Additional Charge*

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LIST OF ABBREVIATIONS

Provinces

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

Sponsoring Institutions

AKU	The Aga Khan University, Karachi
ARIQ	Agriculture Research Institute, Quetta
P-AU	Agricultural University, Faisalabad
BU	Balochistan University, Quetta
BZU	Bahauddin Zakaria University, Multan
CEMB	Centre of Excellence in Molecular Biology, Lahore
CEME	College of Electrical and Mechanical Engineering, Rawalpindi
CEWRE	Centre of Excellence in Water Resources Engineering, Lahore
GC	Government College, Lahore
GU	Gomal University, D.I. Khan
KU	Karachi University
NARC	National Agricultural Research Centre, Islamabad
NIBGE	National Institute for Biotechnology and Genetic Engineering Faisalabad
NSFC	National Science Foundation of China
PMNH	Pakistan Museum of Natural History, Islamabad
PINSTECH	Pakistan Institute of Nuclear Science and Technology, Islamabad
F-PU	Peshawar University
P-PU	Punjab University, Lahore
QAU	Quaid-i-Azam University, Islamabad
SALU	Shah Abdul Latif University, Sindh
SIUT	Sindh Institute of Urology & Transplantation, Karachi
SU	Sindh University, Jamshoro
PCCC	Pakistan Central Cotton Committee, Sakrand
UAA/UAAR	University of Arid Agriculture, Rawalpindi

Disciplines

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

EXECUTIVE SUMMARY

PAKISTAN SCIENCE FOUNDATION (PSF)

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

- i) To promote basic and fundamental research in universities and research institutes on scientific problems related to socio-economic needs/development of the country.
- ii) To increase public awareness about science through science promotion activities by establishing museums, clubs, herbaria and planetaria etc.
- iii) To establish centers for comprehensive scientific and technological information systems.

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

RESEARCH SUPPORT:

Research support is the principal programme of the Foundation for the promotion of basic and fundamental research relevant to the socio-economic needs of the country. During 2000-2001, a total of 114 projects in the fields of Agriculture, Biology, Biotechnology, Chemistry, Earth. Engineering, Environment, Medicine and Physics remained under consideration for funding. Among these, 43 projects were newly received while 71 had been carried over from the previous year. Out of these, 29 projects costing to Rs.16.207 million were sanctioned in various fields. In addition, an amount of Rs.0.113 million was released to various institutions as institutional support grant for purchase of laboratory equipment, and accessories.

Monitoring and evaluation of the on-going research projects sponsored by PSF is an important function of the Research Support Programme. During the year, 67 technical reports of on-going studies including semi-annual and annual reports were received and assessed by the staff and experts. During the period under report, 26 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 2000-2001 are as under:

- Management of onion downy mildew under IPM in the NWFP Pakistan.
- Evaluation of cotton germplasm for the development of multipurpose variety.
- Breeding of important commercial shrimps of Pakistan in captivity.
- Biology and management of black scurf of potato.

- Mating types, races and genetic variability in *Phytophthora infestans*, the cause of late blight of potato.
- Studies on the entomopathogenic nematodes in Sindh.
- Evaluation of the role of salt-tolerant bacteria in developing resistance of plants to salt stress conditions.
- Biology and host pathogen interaction in powdery scab of potato in Pakistan.
- Citric acid fermentation by mutant strain of *Aspergillus niger* GCM-7 in stirred fermenter.
- Eco-taxonomic studies on algal flora of Pakistan (Punjab & Islamabad).
- Physico-chemical studies on the biologically active constituents of ferus on Pakistan.
- Studies of biologically active rogon compounds containing silicon & germanium.
- Isolation & characterization of antibiotics from soil fungi for the development of drugs.
- Characterization of plasma membrane glycoproteins of rabbit corneal epithelium.
- Determination of lateral and vertical penetration of canal water in Rechna Doab using environmental isotopes.
- Impact of irrigation management on nitrate leaching at farmers field.
- Design and fabrication of rock bed storage system for a solar air heated, hospital at Goma-Skardu, Pakistan.
- To evaluate suitability of sewage sludge as organic manure for crop production in Potohar region.
- Studies on metals eco-toxicity of the River Ravi.
- Analysis of morphological, immuno-histochemical and genetic prognostic determinants in predicting disease free survival of breast carcinoma patients.
- Low urinary citrate, a major risk factor for calcium stone in Pakistan is it diet induced.
- Ricci collineations of space times.
- Particle production & nuclear fragmentation in $O^{16} + S^{32}$ collision at 14.6, 60 & 200GeV energies.
- Optical studies of liquid crystals.
- Optical & electrical properties of germanate glasses
- Laser assisted atomic structure studies.

One of the main achievements and usefulness of any research is the publication of its results in scientific journals. As many as 61 research papers from PSF funded projects were published in different scientific journals. In addition, 11 Ph.D. and 10 M.Phil. degrees were awarded to the Research Associates employed under 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.0.427 million to various Universities and R&D Organizations for organizing 19 National and International Science Conferences, Seminars, Symposia, etc.

Scientific research is further supported by giving annual grant-in-aid to various societies for publication of technical journals. During the year, a total amount of Rs.0.375 million was released for this 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 a nation. In order to achieve this objective the Foundation has taken up a number of programmes including science exhibitions, fairs, science film shows, popular science lectures and science quiz competitions etc. as summarized below:

Science Caravan is a Mobile Science Exhibition that has been designed to increase public awareness about science and to motivate the younger generation of Pakistan 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. During the year under report, various Caravan Units organized 23 mobile exhibitions and planetarium shows, wherein 516 schools brought their students to see the exhibition and planetarium/film shows.

Other Science Promotion activities are listed as under:

- 11th Intra & Inter Board Science Essay Competition & 12th Intra Board Science Poster Contests were arranged during the report period.
- For National Science Olympiad 2001, twelve (12) Boards of Intermediate and Secondary Education were financed for organizing the Quiz Competition. Prize money for winners was released to the respective Boards.
- Under the Institutional Support programme an amount of Rs. 154,000/- was released to Fatima Jinnah Medical College, Lahore, whereas, Lab equipments worth Rs.127,332/- was purchased for donation to high schools of Balochistan and Sindh Provinces.
- A Video Projector along with sixty-seven Urdu dubbed science films in eight cassettes was donated to National Museum of Science & Technology, Lahore.
- Twenty books entitled "Diseases of Fishes and their Treatment" were purchased and provided to twenty universities of the country.

- Dr. Richard Fuchs, Head of Programme, International Foundation for Science (IFS), Sweden, delivered a lecture on “The Funding Procedure of IFS, Sweden”.
- An amount of Rs.700, 000/- was released to Children Library Complex, Lahore for the establishment of Science Corner.

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.

Pakistan Museum of Natural History remained engaged in the collection, curation and preservation of natural history specimens and research on flora, fauna and geology of Pakistan. The scientists of the three Divisions of PMNH viz., Botanical, Earth and Zoological Sciences Divisions carried out 18 field tours to various localities of Sindh, Punjab, NWFP, Northern Areas and AJK. About 20,000 natural history specimens, comprising of plants, animals, rocks minerals and fossils were collected. The collected material was curated and preserved in the reference collection of PMNH. Besides samples, numerous photographs showing details of the area of study were also taken. Research was conducted on various aspects of the natural history of the country, which resulted in the production of many research articles. During this period 10 research articles were published in national and international journals.

PMNH continued international collaboration with various Universities and Research organizations of USA, France, Japan, Canada and Switzerland. Expert help was provided to agencies like IUCN, WWF, UNESCO, etc. Several University students were guided in their research work.

The preparation of new display dioramas and other exhibits of PMNH Display Halls was continued. The work was carried out by Design section with technical assistance from the scientists of the three Divisions of PMNH.

PAKISTAN SCIENTIFIC AND TECHNOLOGICAL INFORMATION CENTRE (PASTIC)

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

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

During report period, more than 2605 requests for supply of articles were received, against which 2128 were honored. More than 589 bibliographies were supplied to the researchers.

PASTIC publishes "Pakistan Science Abstracts" on regular basis. During the report period, PSA 1997 Vol. 37 No. 1-4 were published, whereas PSA 1998 Vol. 38 No. 1-4 were sent for printing and for PSA 1999, 210 abstracts were scanned and classified according to UDC schedule. Under Reprographic Services of PASTIC, about 8,67,870 impressions, 4,444 pages and 1,71,243 copies were produced against 92 jobs received from 16 S&T organizations. PASTIC library added to its collection some 154 books, 72 documents and 624 periodical issues during the report period. The subscription of 5 databases on CD-ROM was renewed. A development project entitled, "Establishment of National Science and Technology Database/Information Network of PASTIC", at a total cost of Rs. 39.70 million was approved by the Government of Pakistan. Chief Editor, PASTIC visited 22 libraries in Lahore, 11 in Karachi, 15 in Quetta and 15 in Peshawar and collected/received serial holding record of 26 libraries.

International liaison is the prominent activity of PASTIC as it is the National Focal Point for International/Regional Information Networks, like SAARC Documentation Center, WHO/CEHANET and UNEP/INFOTERRA. The PASTIC also acts as coordinating/collaborating body for UNDP/TIPS, UNESCO/ASTINFO etc. During the report period, information/data from these organizations was collected and disseminated to various institutions and professionals. In addition, WINISIS was provided to eight organizations. PASTIC also trains information specialists in modern information handling and management techniques. In this connection, PASTIC provided five days training on WINISIS and 2 weeks training on MS Office in Islamabad during the report period. A computer Lab. was established at PASTIC, Islamabad under development project entitled "Establishment of National Science and Technological Database/Information Network at PASTIC".

PASTIC's allied Technological Information Promotion System (TIPS) always remains 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, TIPS has provided 586 technological abstracts form 42 countries to its subscribers in Pakistan. Similarly, information from fifty-five Pakistani companies about their products and services was disseminated to 50 TIPS member countries. TIPS organized Computer & Office Exhibition from 16-17, September, 2000, at Rawalpindi. It has published "White Meat " journal Vol. 4, No. 2&3, Vol.5 No. 1, 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 of National Assembly (Annexure I) 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.
- 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.
- 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 programmes 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. While other functions i.e., research support and 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/funding of Scientific Societies/Learned Bodies
4. Funding of Conferences, Symposia, Seminars & Workshops.
5. Travel Grants
6. International Liaison
7. Awards and Fellowships
8. Survey and Statistics
9. Scientists Pool
10. Planning and Development Programme

(II) Science Popularization Section, which carries out science popularization activities including Science Caravans, Science Clubs, Science Fairs and holding Popular Science Lectures, Workshops, Conferences and Symposia.

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 2000-2001 is summarized in the following pages.

PAKISTAN SCIENCE FOUNDATION (PSF)

I. RESEARCH SUPPORT

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 programmes 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 programmes.
- (d) Travel grants to scientists to present their research results in international conferences around the world.

a) Grants for Research Projects

Research Support is the principal programme of the Pakistan Science Foundation for the promotion of basic and fundamental research having relevance to the socio-economic needs of the country. Under this programme, research proposals are received on a structured format and processed for funding by the Foundation. The criteria for funding of research projects by the Foundation are; competence of the scientific personnel to carry out research, institutional capabilities i.e., availability of basic equipment and laboratory facilities, scientific merit of the proposed research projects and likelihood of completion of the proposed research within the stipulated time. Each proposal, after getting review report from expert in the particular field, is placed before the relevant Technical Committee for technical evaluation and recommendations regarding provision of funds under various heads of expenditure proposed by the researchers. The proposal, if recommended by the Technical Committee, is then submitted to PSF Executive Committee for final approval.

During the report period, a total of 114 proposals remained under active consideration of the Foundation. Out of those, 43 were new proposals requesting funds totaling to Rs. 39.510 million in the fields of Agriculture, Biology, Chemistry, Biotechnology, Earth Sciences, Engineering, Environment, Medical, and Physics. While 71 proposals, at various stages of their processing were carried over from previous year.

Out of the reviewed projects, during the year, 29 succeeded in getting the approval of the Foundation at a total cost of Rs.16.207 million, list of the approved projects is at 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. for 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 those institutions to enable them to conduct research directed towards the solutions of the problems of national importance. During the report period, grants amounting to Rs. 0.113 million were sanctioned to the following institutions for the purchase of equipments.

<u>S. No.</u>	<u>Institution</u>	<u>Purpose</u>	<u>Amount</u>
1.	University of Agriculture, Faisalabad.	Purchase of one computer (P-III) and laser printer.	Rs.85, 000/-
2.	Government College, Lahore	Purchase of one computer (P-III) and laser printer HP-1100.	Rs.28, 331/-

2. RESEARCH MONITORING AND EVALUATION

The Foundation evaluates the technical progress as well as financial position of on-going projects continuously till the completion of the projects. During the report period, 92 semi-annual, 1st annual, 2nd annual and final reports were received and their progress evaluated as per procedures laid down by the Foundation.

a) On-Going Projects

During the year, 67 reports (semi-annual, 1st annual and 2nd annual) were received. The PSF relevant staff scrutinized the semi-annual reports, whereas the annual reports, after initial scrutiny, were sent for evaluation to the subject experts to assess the interim progress of the projects. It may be mentioned that due installments of on-going projects are released only if their interim progress at the end of each project year is satisfactory. An amount of Rs.6.054 million was released on account of due installments of ongoing and newly approved projects. A list of the semi-annual and annual reports is given in Annexure-III.

b) Completed Projects

Final Technical Reports of 26 research projects were received during the year under report. The subject experts evaluated these reports and were subsequently submitted along with their evaluation reports to the relevant PSF Technical Committees for consideration and adoption. A list of the completed projects followed by their summaries is given below.

i) List of Completed projects

<u>S. No.</u>	<u>Project No.</u>	<u>Project Title</u>
1.	F-AU/Agr (182)	Management of onion downy mildew under IPM in the NWFP Pakistan.
2.	P-AU/Agr (191)	Evaluation of cotton germplasm for the development of multipurpose variety.
3.	S-KU/Agr (200)	Breeding of important commercial shrimps of Pakistan in captivity.
4.	P-UAAR/Agr (209)	Biology and management of black scurf of potato.

5. C-NARC/Agr (216) Mating types, races and genetic variability in *Phytophthora infestans*, the cause of late blight of potato.
6. S-KU/Agr (217) Studies on the entomopathogenic nematodes in Sindh.
7. P-PU/Bio (228) Evaluation of the role of salt-tolerant bacteria in developing resistance of plants to salt stress conditions.
8. C-NARC/Bio (271) Biology and host pathogen interaction in powdery scab of potato in Pakistan.
9. P-GC/Bio (283) Citric acid fermentation by mutant strain of *Aspergillus niger* GCM-7 in stirred fermenter.
10. C-PMNH/Bio (311) Eco-taxonomic studies on algal flora of Pakistan (Punjab & Islamabad).
11. B-BU/Chem (279) Physico-chemical studies on the biologically active constituents of ferrus on Pakistan.
12. C-QU/Chem (303) Synthesis of biologically active organotin compounds containing germanium and silicon.
13. S-KU/Chem (311) Isolation & characterization of antibiotics from soil fungi for the development of drugs.
14. S-KU/Chem (321) Characterization of plasma membrane glycoproteins of rabbit corneal epithelium.
15. C-PINSTECH/Eng (41) Determination of lateral and vertical penetration of canal water in Rechna Doab using environmental isotopes.
16. P-CEWRE/Eng (43) Impact of irrigation management on nitrate leaching at farmers field.
17. P-CEME/Eng (73) Design and fabrication of rock bed storage system for a solar air heated, hospital at Goma-Skardu, Pakistan.
18. P-UAAR/Envr (42) To evaluate suitability of sewage sludge as organic manure for crop production in Potohar region.
19. P-AU/Envr (44) Studies on metals eco-toxicity of the River Ravi.
20. S-AKU/Med (160) Analysis of morphological, immuno-histochemical and genetic prognostic determinants in predicting disease free survival of breast carcinoma patients.
21. S-AKU/Med (161) Low urinary citrate, a major risk factor for calcium stone in Pakistan is it diet induced.
22. C-QU/Math (21) Ricci collineations of space times.
23. PSF/NSFC/Res (6)/Phys Particle production & nuclear fragmentation in $O^{16} + S^{32}$ collision at 14.6, 60 & 200GeV energies.
24. S-KU/Phys (74) Optical studies of liquid crystals.

25. P-BZU/Phys (95) Optical & electrical properties of germanate glasses
 26. C-QU/Phys (104) Laser assisted atomic structure studies.

ii) Brief Summaries of Completed Projects

Project No.	F-AU/Agr (182)
Project Title:	Management of onion downy mildew under IPM in the NWFP.
Duration:	3 Years
Date of Initiation:	01.07.1997
Date of Completion:	30. 06. 2000
Location of Scheme:	Department of Plant Pathology, NWFP Agricultural University, Peshawar.
Principal Investigator:	Dr. Shabeer Ahmad
Total Expenditure:	Rs. 593,771/-
Main Objectives:	<ul style="list-style-type: none"> • To identify proper chemical and cultural methods that best suits onion downy mildew control. • To determine the yield stabilizing effect of downy mildew control methods. • To develop an IPM approach for onion downy mildew in the NWFP.

Summary of work done:

The importance of downy mildew that attacks onion in the North West Frontier Province (NWF) of Pakistan can be judged very well from its estimated loss of more than 50% to the crop. This disease affects both quality and quantity of the produce in the form of undersized, deformed and/or less number of bulbs per unit area. The farmers of this province use different fungicides unscrupulously to control the disease, as they are unaware of alternatives such as cultural and biological, which may reduce the disease inoculums and environmental pollution. These methods are easy to adopt and less expensive. This project was designed to test different host management practices and to combine the best into an Integrated Disease Management Model (IDMM) for testing during the second phase.

Results of first two years indicate that use of NPK fertilizer 120:90:60 kg/ha, plant population 0.5 million plants/ha, 8 irrigations/season, fungicides; Ridomil @ 250 g/100 L. plus Antracol/Dithane M-45 @ 200/300 g/100 L. and herbicide "Roanstar" @ 5 ml/L decreased downy mildew severity substantially and stabilized onion yield. During the third year, the above-mentioned best treatments were combined into an IDMM. This model was verified against farmers' own practices (FOPs) of disease control. The multi-location testing of IDMM proved its superiority over FOPs in minimizing the disease attack and improving the crop yield.

The IDMM is easy to be adopted by the farmers, as it does not require much professionalism. The use of fertilizers, good variety, optimum plant population and suitable pesticides are common among the farmers. With some modifications as suggested in the model, these practices can be conveniently used for downy mildew control. Through the use of IDMM, the productivity will be increased as well as the quality of onions will be improved. This may increase marketing of the produce within & outside the country.

Three research papers have been published out of the project work and one has been submitted for publication.

Project No.	P-AU/Agr (191)
Project Title:	Evaluation of cotton germplasm for the development of multipurpose variety.
Duration:	3 Years
Date of Initiation:	01. 05.1997
Date of Completion:	30. 04.2000`
Location of Scheme:	Department of Plant Breeding and Genetics, University of Agriculture, Faisalabad
Principal Investigator:	Prof. Dr. Iftikhar Ahmed Khan
Total Expenditure:	Rs. 512,417/-
Main Objectives:	<ul style="list-style-type: none">• Collection, multiplication and maintenance of cotton germplasm available in Pakistan.• Screening of the germplasm to identify the lines with desirable characters.• Establishment of correlation between desirable characters.• Utilization of identified genotypes with desired characters in the process of hybridization for the development of multipurpose variety.

Summary of work done:

Main objective of the project was evaluate the available cotton germplasm in Pakistan for seed, oil and protein content with the purpose to raise the breeding material for the development of cotton variety having oil and protein contents alongwith acceptable yield and fiber quality traits.

Under the project, 300 lines/varieties of cotton were collected from various cotton research stations/institutes of Punjab and Sindh as well as some lines developed in the Department of Plant Breeding and Genetics, University of Agriculture, Faisalabad evaluated. Of the 300 lines, 250 collected during first two years, were planted in the field in May and harvested in December 1998. Another lot of 50 lines was collected during the 3rd year, planted during May harvested in December 1999. The data for various plant characters like, yield of seed cotton, ginning outrun, staple length and fibre fineness were recorded. Data for oil and protein content were recorded using the soxhlet and kjeldahl techniques.

The characters generally indicated non-significant correlation (positive or negative) among them except between yield & staple length, staple length & fibre fineness where it was positive and significant. Positive correlation between staple length & fibre fineness is undesirable though, as lower values (Micronaire) indicate greater fibre fineness. The oil content results revealed that total of 36 accessions were recognized having high oil content and an acceptable level of yield.

One student completed his Ph.D. thesis under the project while another completed his course work for Ph.D. In addition, four M.Sc. (Hons) were produced through the project. One research paper has been submitted for publication.

Project No.	S-KU/Agr (200)
Project Title:	Breeding of important commercial shrimps of Pakistan in captivity.
Duration:	3 Years
Date of Initiation:	15. 07.1997
Date of Completion:	14. 07.2000
Location of Scheme:	Department of Zoology, University of Karachi.
Principal Investigator:	Prof. Dr. Habib-ul-Hassan
Total Expenditure:	Rs. 497,400/-
Main Objectives:	<ul style="list-style-type: none"> • Surveys on different fishing/angling sites to know the peak breeding seasons of important species on the coast of Pakistan. • Abundance of gravid females in different months of the year. • Under what ideal conditions of salinity, temperature, pH in culture tanks, best survival of different phases of shrimp species could be achieved? • Culturing and testing of food to select a group of combination or combinations best suited for the survival and growth of different phases. • Selection of best cultivable species or groups

Summary of work done:

Algal culture is a part of hatchery operation for providing basic food for the growing larvae. Under the present study, efforts were made to develop and maintain a sustained algal culture in the laboratory to feed the growing larvae. The algae were not cultured in the same tank in which the larvae were cultured previously, because it was realized that the chemicals added in the tank for promotion of the algal growth were harmful for the larvae. In all, 21 experiments were conducted on six species of micro-algae. *Phaeodactylum tricornutum* was grown to 3.5x10 cell/ml in 438 h. *Nanochloropsis oculata* 4x10 cells/ml, in 336 h, *Palova lutheri* 8x10 cell/ml in 607 h, *Isochrysis*

galbana 4.2x10 cell/ml in 390 h, *Tetraselmis tetrahele* 5x10 cell/ml in 631 and *Chaetoceros calcitrans* 11x10 cells/ml in 633 h.

Experiments were also conducted on various types of feed, *Artemia nauplii*, cooked egg micro particles, crumbled and palletted feed, microparticulate and microencapsulated diet. Experiments were also conducted on lunar periodicity on spawning and maturation of penaeid shrimps and eye ablation for facilitating spawning. These techniques were helpful in increasing the spawning frequency and production of viable eggs in captivity. Algal culture is a part of hatchery operation for providing basic food for the growing larvae. One student was enrolled for PhD under the project.

Project No.	P-UAAR/Agr (209)
Project Title:	Biology and management of black scurf of potato.
Duration:	3 Years
Date of Initiation:	01.07.2000
Date of Completion:	31.12.2000
Location of Scheme:	Department of Plant Pathology, University of Arid Agriculture, Rawalpindi.
Principal Investigator:	Mr. Abdul Rauf
Total Expenditure:	Rs. 411,131/-
Main Objectives:	<ul style="list-style-type: none">• To study the incidence and distribution of black scurf disease of potato in various agro-ecological zones of Pakistan.• To study the genetic variability of <i>Rhizoctonia solani</i> isolates.

Summary of work done:

Potato (*Solanaum tuberosum* L), a member of family Solanaceae, is fourth major crop of Pakistan and rates fifth in the world. Three crops of potato are cultivated in a year, in Pakistan, during spring and autumn in plains and summer planting in the upland in eight different potato production agro-ecological zones. These zones provide excellent conditions for potato cultivation. This crop of high nutritional value still has great potential to enhance its production to save foreign exchange through export and also gain self-sufficiency. Among the soil borne diseases causing production losses, *Rhizoctonia* canker, commonly called black scurf, caused by the fungus *Rhizoctonia solani* has been a serious problem in all potato growing areas. This project was initiated to study the biology of black scurf of potato.

During the project period (1997-2000), 525 potato tuber samples were collected from 176 sites at 110 locations of eight potato production agro-ecological zones of Pakistan. It was observed that black scurf is a common disease in all the potato production zones with the highest disease prevalence of 99.50% in the major potato production zone, comprising of Sahiwal, Okara, Pakpattan, Sialkot, Setharja, Tharushah, Ghotki and Shikarpur and 95.23% in Quetta, Mastung, Kalat, Qila Saifullah, Pishin and Zirat areas of Balochistan province.

Pathogenicity tests revealed 100% eye germination inhibition caused by SL-41 (AG³) and SL-60 (AG 1-1) isolates, whereas, collectively, isolates of AG 1-1/A caused 71% inhibition in eyes germination.

Three papers based on the project work were published in a local journal whereas one paper was presented in a local workshop. One more paper has been submitted for publication.

Project No.	C-NARC/Agr (216)
Project Title:	Mating types, race and genetic variability in <i>Phytophthora infestans</i>, the cause of late blight of potato.
Duration:	3 Years
Date of Initiation:	01.07.1997
Date of Completion:	30.06.2000
Location of Scheme:	Crop Diseases Research Institute, NARC, Islamabad.
Principal Investigator:	Dr. Iftikhar Ahmad
Total Expenditure:	Rs. 520,608/-
Main Objectives:	<ul style="list-style-type: none">• To monitor the temporal and geographical distribution of A¹ and A² mating types of <i>P. infestans</i> in Pakistan.• To further investigate the population structures and races of <i>P. infestans</i> and relationship of local populations with populations elsewhere especially the European ones. Linked with this the evidence for mating of A¹ and A² populations via hybridization in nature.• To investigate the displacement of <i>P. infestans</i> populations in Pakistan.

Summary of work done:

Late blight of potato caused by the fungus, *Phytophthora infestans* is a significant threat to potato, which is an important vegetable crop of Pakistan and has assumed strategic significance from food security point of view due to its high-energy value & yield per unit area of production. Studies in Pakistan have shown the presence of both A¹ and A² mating types. This necessitated the investigation of temporal and geographical distribution of the mating types and analysis of the resistance of *P. infestans* to widely used fungicide metalaxyl for developing appropriate management strategies.

Thirty-nine races were identified in a population of 140 isolates of the fungus, indicating a high degree of variability. Complex races were more common, showing a high level of aggressiveness in population of *P. infestans*. Occurrence of different races in all the areas may be due to the occurrence of sexual reproduction and import of different strains through international seed. Mating types A¹ and A² are both widely distributed, however A¹ is predominant. High level of genetic variability was observed among isolates of *P. infestans* by using molecular methods.

Out of the project work, one research paper was published in a local journal whereas two papers were presented in conferences. One student earned M.Phil through the project work.

Project No.	S-KU/Agr (217)
Project Title:	Studies on the Entomopathogenic Nematodes in Sindh.
Duration:	3 Years
Date of Initiation:	01.07.1997
Date of Completion:	30.06.2000
Location of Scheme:	National Nematological Research Centre, University of Karachi.
Principal Investigator:	Dr. Shahina Fayyaz
Total Expenditure:	Rs. 481,400/-
Main Objectives:	<ul style="list-style-type: none"> • To investigate the occurrence of entomopathogenic nematodes in Sindh and their identification for further use against insect pests.

Summary of work done:

Entomopathogenic nematodes have been recognized as one of the most effective biological control agents for the control of insect pests of agricultural crops. Till this study no systematic work had been conducted on this aspect in Pakistan. Under this project entomopathogenic nematodes belonging to steinernematid and heterorhabditid group, were extracted from soil using *Galleria mellonella* larvae as bait. Nematodes were recovered from infested larvae through "White trap" technique.

Total of 915 soil samples were collected from 35 different localities in Karachi, Hyderabad, Thatta, Badin and Mirpur Khas of Sindh and Sonmiyani beach, Sanghora sea shore of Balochistan. Out of 915 soil samples EPN were detected in 113 sampling sites, which include 90 isolates of Heterorhabditis and 23 isolates of Steinernema. These entomopathogenic nematodes were recovered only from sandy loam soils showing 100% recovery while EPNs could not be detected from clay loam soil.

Pathogenicity of an entomopathogenic nematode species *Steinernema pakistanensis* (BS266) n.sp was tested under laboratory condition against six important tropical Lepidoptera species viz., American bollworm of cotton (*Heliothis armigera*), spotted bollworm of cotton (*Earias insulana* and *E. vittella*), pink bollworm of cotton (*Pectinophora gossypiella*), lemon but terfly (*Papilio demoleus*), brinjal fruit borer (*Leucinodes orbonalis*) and pod borer (*Etiella zinckenella*) as well as against one Coleoptera species, the white grub (*Holotrichia consanguinea*) and two unidentified species of insects. *Steinernema pakistanensis* (BS266) n.sp. was most effective giving 100% mortality after 12 hr exposure with approximately 150 juveniles. These insect species were collected from field and the three insect species viz., American bollworm, spotted bollworm and pink bollworm of cotton were reared in laboratory on artificial diet for further investigation.

Out of the project work seven research papers were published. One student completed his PhD through the project.

Project No.	P-PU/Bio (228)
Project Title:	Evaluation of the role of salt-tolerant bacteria in developing resistance of plants to salt stress conditions.
Duration:	3 Years
Date of Initiation:	01.07.1997
Date of Completion:	30. 06.2000
Location of Scheme:	University of the Punjab, Lahore
Principal Investigator:	Dr. Shahida Husnain
Total Expenditure:	Rs. 679,171/-
Main Objectives:	<ul style="list-style-type: none"> • Isolation of more salt tolerant bacteria to be assessed for their contribution in increased stress tolerance of plants. • Evaluation of salt tolerant bacteria in hand for further studies.

Summary of work done:

Salt tolerant bacteria were isolated from the rhizosphere of *Scirpus maritimus* (RS-1, RS-2, RS-3), *Imperate* sp. (RI-1, RI-2, RI-4, RI-5), *Equisetum debile* (RE-1, RE-3) and *Helochloa shoenoides* (RH-4) growing in the area of salt range, Kallar Kahar and from saline soil samples (SP-1, SP-2, SP-3, SP-4, SP-5, SP-6, SP-7, SP-8) collected from saline patches around Kasoor area. Twenty two salt tolerant bacterial strains were also isolated from rhizoplane, histoplane of root and phylloplane of *Achyranthus aspera* (RAa1, RAa2, HAa1, HAa2, HAa3, PAa1, PAa2, PAa3, PAa4, PAa5, PAa6), *Euphorbia* (Reh1, Reh2, Reh1, Reh2, Reh1, Reh2) and *Malvestrum tricuspidatum* (RMt1, HMT1, HMT2, PMt1, PMt2) growing in the area of salt rang, Kallar Kahar, Pakistan. Except for HAa2, (Gram-positive) RI-1, PAa1, PAa5 (Gram variable) majority of the isolates were gram-negative rods except RH-4, SP-1, RAa1, HAa3, PMt1, which were cocci. The isolates; SP-5, PAa2, PAa3, PAa4, PAa5, RMt1 were strictly aerobic, while rest of the isolates were facultative anaerobic. They had catalane and cytochrome oxidase enzymes. Isolates exhibited variable results for other biochemical reactions. On this basis, the isolates could be affiliated with family Enterobacteriaceae (RS-1, RI-5, SP-2, SP-3, SP-4, SP-6, SP-7, SP-8, RAa2, HAa1, HAa6, Reh1, Reh2, Peh1, Peh2, HMT1, HMT2, PMt2), Pseudomonadaceae (SP-5, Paa2, PAA3, PAA4, RMt1), Vibrionaceae (RS-2, RS-3, RI-2, RI4, RE-1, RE-3), Nesseriaceae (PMt1) and Bacillaceae (HAa2), while RI-1, RH-4, SP-1, RAa1, HAa3, PAa1 and PAa5, remained uncertain.

The isolates could tolerate 2.5-3.5 M NaCl in the solid medium as well as in the liquid medium. Maximum Na⁺ uptake by the bacterial cell was detected between 1.0-0-3.0 M NaCl. Optimum growth temperature was 32 °C, 37 °C or 42 °C, while optimum pH ranged from 7-10 in NaCl free (without extra salt) and 6-9 in NaCl supplemented medium. The isolates had multiple antibiotic and heavy metal resistances. Single plasmid band (excluding RS-2 where two plasmid bands were observed) was detected in all the isolates. Plasmids residing in these strains could not be transformed to *E. coli* strains through conjugation and transformation (except a few cases) experiment.

To evaluate the role of salt tolerant bacteria in improving plant growth and developing resistance of plants to salt stress, mono and mixed cultures of bacteria from rhizosphere, rhizoplane, histoplane of roots and phylloplane of plants were taken. Experiments were carried out in four

phases. In phase I, monocultures of bacteria isolated from rhizosphere, rhizoplane, histoplane of roots and phylloplane of *Mazus* sp., *Launea nudicolus*, and *Astragalus* sp were used to inoculate *Triticum aestivum* varieties (Inqlab 91 and Rawal 87) under 0, 50 and 100 mM NaCl treatments. In Phase II-A, impact of mono and mixed cultures (from one source) of *Mazaus* sp. and in Phase II-B mono and mixed cultures (from different sources) of *Astragalus* sp. on *Triticum aestivum* var Inqlab 91 under 0 and 100 mM NaCl was studied.

In phase III, mono and mixed cultures of salt tolerant bacteria exhibiting maximum growth stimulation in *T. aestivum* (in Phase II-A & B) were selected to evaluate their role in growth promotion of different plants (*Vigna radiate* var NM-92, *Helianthus annuus* var Slobal-1) under 0 and 100 mM NaCl stresses. Phase IV included the inoculation effect of freshly isolated bacteria conferring resistance to 2.5 and above NaCl on *T. aestivum* var Inqlab 91 under salt (0, 100 mM NaCl) stress. NaCl stress caused reduction in germination and growth parameters of different plants. Increases in dry weight parameters (dry weight and dry weight per gram fresh weigh), Na^+ and K^+ contents, auxin and soluble protein contents and enzyme (peroxidase and acid phosphatase) activities, were observed under NaCl stress. Generally, mono and mixed culture bacterial inoculations promoted (in all the four phases), over non-inoculated respective treatments, germination and length parameters (shoot, root and seedling lengths) under salt stress.

In phase I, although germination and growth parameters of *T. aestivum* variety Inqlab 91 were more severely affected by salt stress, but enhancement with bacterial inoculations was more pronounced as compared to variety Rawal 87. In phase II-A, all mixed culture bacterial combinations (from one source) significantly stimulated growth of *T. aestivum* var Inqlab 91. While in phase II-B, although bacterial combinations (from different sources) promoted seedling growth of *T. aestivum* var Inqlab 91, but increases were not significant in most of the cases. These studies reveled that mixed culture combinations of bacteria from one source promoted seedling growth relatively more than the mixed culture combinations from different sources under salt stress. In phase III, inoculations effect of mixed culture bacteria was more pronounced in *Helianthus annuus* as compared to *Vigna radiata*. Some mixed culture bacterial combinations in Phase II-A (ST-4,4, ST-1,2,4, ST-1,3,4, ST-2,3,4, HT-1,2, HT-1,3, HT-2,3, HT-1,2,3, RT-1,3, PT-1,2, PT-1,3, PT-2,3, PT-1,2,3), II-B (2b; 3e) and III (ST-2,3,4 inoculation in *Helianthus annuus* and HT-1,2,3 inoculation in *Vigna radiata*) had synergistic growth stimulatory effects on seedling growth relative to their respective monoculture inoculations under salt stress. Some bacterial inoculations (mono and mixed cultures) have slightly deleterious effect on shoot, root (most of the inoculations) and seedling lengths (in all the four phases) at 0 mM NaCl treatment relative to non-inoculated respective treatment. Under salt stress some bacterial combinations also caused decrease in shoot, root and seedling lengths. With bacterial inoculations increase in fresh weight and decreases in dry weight accumulation (except phase IV, where both increases and decreases were recorded), over non-inoculated respective treatment, were recorded at 100 mM NaCl treatment. Bacterial inoculations caused reduction in Na^+ uptake (except *T. aestivum* var Rawal 87 in phase I and *Vigna radiata* in phase III at 100 mM NaCl) by the seedlings at 100 mM NaCl, relative to non-inoculated respective treatment. Under salt stress, stimulation in auxin and soluble protein content (except a few cases) was recorded with bacterial inoculations. Activity of enzymes peroxidase and acid phosphatase (excluding some cases) decreased with mono and mixed culture bacterial inoculations under salt stress. These results suggest that decreased dry weight accumulation, Na^+ content and enzyme (peroxidase and acid phosphatase) activities and increased auxin and soluble protein contents might be involved in stimulating the growth of plants under NaCl stress.

Project No.	C-NARC/BIO (271)
Project title:	Biology and host pathogen interaction in powdery scab of potato in Pakistan.
Duration:	3 Years
Date of Initiation:	01.07.1997
Date of Completion:	30. 06.2000
Location of Scheme:	Crop Diseases Research Institute, NARC, Islamabad.
Principal Investigator:	Mrs. Shamim Iftikhar
Total Expenditure:	Rs. 320,288/-
Main Objectives:	<ul style="list-style-type: none"> • To study the biology of powdery scab fungus <i>Spongospora subterranea</i> & host-pathogen interaction so as to provide a basis for further long-term research to devise strategies for management of powdery scab in Pakistan.

Summary of work done:

Probing of soils of potato growing areas was conducted to determine the geographical distribution of pathogen of powdery scab in the soils. Prevalence of *S. subterranea* was confirmed through bioassay test in potato growing soils of Gilgit and Hunza valley, Balochistan, Chitral, Kaghan, NWFP and the potato growing areas of Punjab. This wide prevalence of pathogen in varied agro-ecologies of Pakistan is an alarming situation for potato seed production as pathogen is seed and soil borne and once introduced in an uncontaminated area, is difficult to be eradicated. Bioassay and serological techniques were standardized for detection of *S. subterranea* from potato tubers and soil. Polyclonal antisera against spore balls of local isolate of *S. subterranea* were developed for further use in ELISA (enzyme-linked immunosorbant assay).

Morphology of pathogen was studied by light and scanning electron microscopy. Microscopy of resting spores revealed the structure of typical honeycomb, spongy spore balls of *S. subterranea*. Infection of pathogen was studied by observing the zoosporangia formation in root of tomato plants through bioassay technique. Scab lesions on tubers containing resting spores of *S. subterranea* and nodule like galls on roots were observed in micro-plot (sick-plot developed at NARC) experiments. Among the cultivars tested, Cardinal showed scab symptoms during autumn 1997-1998 whereas the symptoms were not observed when same trial was repeated in 1998-1999 at same micro-plot. It was noticed that disease was not developed in second year because that year's temperature was high with low rainfall as compared to previous year. Conclusions were thus drawn that the disease development depends on low and wet climatic conditions. Same conclusion was also drawn from pot experiment conducted at CDRI substation Murree that more irrigation favors disease development.

Studies on transmission of pathogen through soil and seeds were conducted by using the infested soil and infected seed or soil to uncontaminated area. It also depended on climatic conditions (extensive irrigation). *S. subterranea* is an obligate parasite and is difficult to culture on synthetic media. Therefore, a bioassay technique was developed to get pure (contaminants free)

fungal material for immunogen in serology and for molecular work. Cardinal variety showed best result in galls production for this purpose.

It is concluded that crops other than potatoes can play an important role to minimize the risk of powdery scab and in the survival of the fungus between successive potato crops in an area by reducing the inoculum density in the soil. Thus, hosts of *S. subterranea* were investigated through bioassay technique and found that maize, oat, sorghum, soybean, tobacco, datura and pea had zoosporangial formation in their roots without formation of resting spores. Maize, oat, sorghum, soybean and pea are found to be new hosts of the fungus.

Project No.	P-GC/Bio (283)
Project Title:	Citric acid fermentation by mutant strain of <i>Aspergillus niger</i> GCM-7 in stirred fermenter.
Duration:	2 Years
Date of Initiation:	01. 08.1998
Date of Completion:	31. 07.2000
Location of Scheme:	Government College, Lahore
Principal Investigator:	Dr. Ikram-ul-Haq
Total Expenditure:	Rs. 467,960/-
Main Objectives:	<ul style="list-style-type: none">• To optimize molasses treatment, ferrocyanide level, sugar concentration and nitrogen and phosphorus concentration in shake flasks.• To optimize citric acid fermentation such as rate of agitation and aeration (or dissolved oxygen concentration), pH and foaming control.• Further studies of citric acid fermentation in the stirred Fermenter for translation of the pilot project into industrial operation, leading to development of this industrial process at commercial level.

Summary of work done:

Citric acid fermentation of cane-molasses by submerged fermentation in 15 L stirred ferment (working volume 9 L) was carried out. The mutant strain of *Aspergillus niger* GCMC-7 was used in the present study and ferrocyanide treated molasses (200 ppm) medium containing sugar 150 g/l was employed as the basal fermentation medium. Different cultural conditions such as volume of fermentation medium (60%), temperature (30 °C), pH (6.0) aeration (1.0 l⁻¹ min⁻¹) and agitation (200 rpm) and rate of acid production were employed to enhance citric acid production. Twenty-four hours old vegetative inoculum was used at a level of 4%. Methanol, as a stimulating agent, was added 24 hours after inoculation at the rate of 1% based on the total working volume of fermentor.

Among the mineral nutrients tested, ammonium nitrate (0.2%), potassium dihydrogen phosphate (0.10%) and magnesium nitrate (0.2%), potassium dihydrogen phosphate (0.10%) and magnesium sulphate (0.015%) were optimized as the best nitrogen, phosphorus and magnesium

sources, respectively. Calcium chloride (0.04%) and copper sulphate (0.02%) were found to affect the mould morphology, and thus have a positive effect on citric acid production. Fed-batch culture study was also carried out and was found to give consistent yield of citric acid. Maximum amount of anhydrous citric acid obtained during the course of study was 77.65 g/l with a sugar consumption of 117 g/l. Final pH, ferrocyanide concentration and dry cell mass were 2.7, 40 ppm and 16.5g/l, respectively. The mycelia were small round pellets in their morphology.

Project No.	PMNH/BIO (311)
Project title:	Eco-taxonomic studies of algal flora of Pakistan (Punjab & Islamabad)
Duration:	One Year
Date of Initiation:	01. 06.2000
Date of Completion:	31. 05.2001
Location of Scheme:	Pakistan Museum of Natural History (PMNH), Islamabad
Principal Investigator:	Dr. Muhammad Khan Laghari
Total Expenditure:	Rs. 141,880/-
Main Objectives:	<ul style="list-style-type: none">• Collection, preservation, identification and ecology and liminological study of algal flora of Pakistan, especially Islamabad and the Province of Punjab.

Summary of work done:

A preliminary survey about eco-taxonomical study of algal flora of Islamabad and Punjab was carried out from 1st June 2000 to 31st May 2001. During this period, fresh water algal flora along with waters samples were collected from 3 (three) localities of Islamabad, Lotus Lake, Rawal dam and Ratta Hotar and 46 (forty six) localities from the Punjab province including Faisalabad, Jhang, Multan, Bahawalpur, Bahawalnagar, Lahore Nagal, Wah Garden, Kalar Kahar Lake, Jatli, Swan River, Hazro, National Ayub Park, Rawalpindi etc. Some other necessary parameters like; time, date, name of locality, temperature (soil, air, water surface & water bottom temperature), pH, T.D.S. and humidity etc. were also recorded at the time of sample collection. The altitude, latitude and longitude of each locality were also recorded.

Under the project, 579 algal species of 158 genera to 59 families to 29 orders belonging to 9 classes were identified. More than 300 microphotographs were taken of various important and rare algal species as well as qualitative and quantitative study of algal flora and seasonal succession of algal species of Rawal dam, Islamabad was done. Cosmopolitan species were found through out the localities, but some varied from locality to locality.

Project No.	B-BU/Chem(279)
Project Title:	Physio-chemical studies on the biologically active constituents of ferns in Pakistan.
Duration:	2 Years
Date of Initiation:	03. 09.1996

Date of Completion:	29. 09.1998
Location of Scheme:	University of Balochistan, Quetta
Principal Investigator:	Dr. Hamid Latif Siddiqui
Total Expenditure:	Rs. 390,948/35
Main Objectives:	<ul style="list-style-type: none"> • To classify the ferns correctly. • Structure–activity relationship of the constituents isolated from ferns. • Activity of novel constituents against the cereal crops widely cultivated in Pakistan

Summary of work done:

The research was focused on isolation and structure determination of constituents from a few ferns available in Pakistan by using physio-chemical methods. Most of the ferns are reported to have terpenes, terpenoids and glycosides. These compounds are of mono, di, or tri or pentacyclic terpenes and terpenoids. Some of them have been reported to possess steroidal compounds.

The present study was aimed at to extract and isolate organic compounds from the rootstalk of ferns available in various parts of Pakistan. A thorough survey during collection of the plants under investigation revealed that:

- i) These plants have hair like structure, i.e., rhizomes. While other ferns such as *Gleichenia japonica* and *Dicranopteris pedata* (two Japanese species) bear thick roots commonly referred to as rootstalks and are found in abundance in the Hiroshima Prefecture (Japan).
- ii) These plants occur in a very poor quantity only in the area of Swat and Abbottabad at a height ranging from 2000m to 2500m, on damp places under stones.
- iii) The leaves of *Adiantum incisum* are bi-pinnate, close together, pinnules delicate, petiole brown, blade ovate in outline, pinnae are broader than long. The lobes in the upper part are incised, glabrous, with broad rounded truncate lobes.
- iv) The leaves of *A. venustum* are tri-pinnate, sub-ovate, incise, petiole black and shining, pinnules widespread with black stalk, fan-shaped, broader than long, crenately lobed in the upper part, sori born close together along the veins of the recurved part of the lobes.
- v) The quantity of the ethanolic extract was not substantial.
- vi) However, the quantity of the newly and known compounds was a little bit appreciable.
- vii) The expected compounds, viz., terpenoids and steroids were isolated.
- viii) The isolated new compounds were also biologically tested using specific enzymes but unluckily no activity was observed.

Project No.	C-QU/Chem(303)
Project Title:	Synthesis of biologically active organotin compounds containing germanium and silicon.
Duration:	2 Years
Date of Initiation:	01. 03.1999
Date of Completion:	28. 02.2001
Location of Scheme:	Quaid-i-Azam University, Islamabad
Principal Investigator:	Dr. M. Mazhar
Total Expenditure:	Rs. 319,633/26
Main Objectives:	<ul style="list-style-type: none"> • To synthesize new drug of lower toxicity for the treatment of tumor and concur. Adding organosilicon group shall lower the toxicity of diorganotin compounds and organo-germanium shall stimulate body immuno system by proliferation of normal marrow cells in the tumor bearing animals 28.

Summary of work done:

Four different series of some new di- and triorganotin and organogermanium carboxylates have been prepared. Of them eight compounds of general formula $(R^1(CH_3)_2 SiCH_2) Sn(O_2CCH_2)(R^2)CHGeR_3^3)_2$ were $R^1=CH_3, C_2H_5$, $R^2 = C_6H_5, C_6H_4OMe_{3/4}$, $R_3 = CH_3, N(CH_2CH_2O)_3$ have been synthesized from $(R^1(CH_3)_2SiCH_2)_2 SnCl_2$ and $R_3^3 GeCH(R^2) CH_2CO_2H$ in the presence of triethylamine. Second series of new triorganotin carboxylates containing germanium with general formula $(R^1GeCHR_2CH_2COO)Sn(CH_2C(CH_3)_3)_3$ where $R^1=N(CH_2CH_2O)_3, C_6H_5$, $R_2=C_6H_5, p-C_6H_4OCH_3$ and $o/p-C_6H_4F$ were synthesized.

Another series of diorganotin (IV) derivatives of general formula $(R_3, GeCHRCH_2COO)_2SnR_2$ have been prepared by the reaction of diorganotin chlorides/oxides with substituted germyl propionic acids. A series of ten new organogermanium compounds with general formulae $C_{21}H_{16}RgeN_2O_4$ and $C_{13}H_{12}RgeNO_3$ have also been prepared from GeO_2 by hydrogermanation reaction in the presence of different substituted 3-trichlorogermyl propionic acids. Thus prepared substituted acids were complexed with 8-quinolinol and 2-methyl-8-quinolinol.

All above compounds have been characterized by various analytical techniques such as elemental analysis, IR, multinuclear NMR ($^1H, ^{13}C, ^{119}Sn$) and mass spectrometry. Some selected compounds have also been subjected to Mossbauer spectroscopy. The single crystal structures of precursors like $Ph_3GeCHRfCH_2COOH$ ($Rf = 4-FC_6H_4$) and $(p-CH_3 C_6H_4)_3 GeCH(Ph)CH(Me)COOH$ has been determined by X-ray diffraction. Biological studies like cytotoxicity, antibacterial, antifungal, enzyme-inhibition and antileishmanial activity have shown their potential in the treatment of leishmaniasis and ulcers.

Based on the results of above study, four research papers were submitted for publication.

Project No.	S-KU/Chem (311)
Project Title:	Isolation & characterization of antibiotics from soil fungi for the development of drugs.
Duration:	3 Years
Date of Initiation:	01. 06.1997
Date of Completion:	31. 05.2000
Location of Scheme:	University of Karachi, Karachi
Principal Investigator:	Dr. Viqar Sultana
Total Expenditure:	Rs. 471,515/-
Main Objectives:	<ul style="list-style-type: none"> • To discover new antibiotics for the control of infectious diseases, in view of the resistance developed in pathogens against certain antibiotics. • To isolate, identify and characterize anti-microbial compounds, which would lead to the discovery of new drugs for control of human and plant diseases.

Summary of work done:

The antibiotics, by virtue of their dramatic effect on bacterial and fungal infections have revolutionized medicine. This group of drugs provides effective control of many human microbial pathogens that have been cause of death of human and animals. Suitable antibiotics are not available in many fields of human medicine or in non-medical areas like plant diseases (fungi, bacteria, nematodes, viruses). An even more vexing problem is the emergence of resistant stains among the organisms that were sensitive to antibiotics before the drugs became widely used. Currently the only alternative for overcoming the resistance problem is the discovery of new and improved antibiotics, which can be possible by isolating/developing superior strains of fungi.

It is interesting to note that in the present study *Aspergillus flavus*, *A. niger* and *Fusarium solani* were isolated in high frequency in both rhizosphere and rhizoplane, indicating their high rhizosphere competence. It would suggest that strains of *A. flavus*, *A. niger* and non-pathogenic strains of *F. solani* could be utilized as biocontrol agents against root diseases of crop plants.

In the present study, some strains of *Aspergillus candidus*, *A. flavus*, *Paecilomyces lilacinus*, *Chaetomium* spp., *Fusarium solani*, *Stachybotrys atra*, *S. parvispora*, *Trichoderma* spp., and *Verticillium chlamydosporium* showed significant activity against both plant pathogenic fungi and human pathogenic bacteria and fungi. *A. candidus*, *Chaetomium* spp., *F. solani*, *Memnoniella echinata*, *P. lilacinus*, *S. atra*, *S. parvispora*, *V. chlamydosporium* could be exploited for the isolation of antimicrobial compounds for both human and plant diseases.

P. lilacinus, *Trichoderma* spp., and *V. chlamydosporium* are well-known biocontrol agents used for the control of root infecting fungi and plant parasitic nematodes. In the present study different strains of these fungi showed variations in antimicrobial activity. It would suggest that these more superior strains that were isolated from different ecological regions in our studies, may be utilized as biocontrol agents to control diseases of crop plants and thus increase productivity.

In our study, *M.echinata*, *S. atra*, *S. parvispora*, *Chaetomium flavum* showed promising antibacterial activity against both Gram+ve bacteria specially against highly pathogenic bacterium *Salmonella typhimurium* and fungi *Candida albicans*. Five compounds each from *M.echinata* and *C.flavum* and four from *S.parvispora* were isolated and purified and spectral data were recorded. So far, five saturated and one unsaturated hydrocarbons were characterized. Two compounds named ME-2 and ME-5 isolated from *M.echinata* showed significant antibacterial activity. Whereas two compounds named CE-2 and CE-3 isolated from *C.flavum* also showed significant antibacterial activity. This is the first report of antibacterial activity of pure compounds of *M.echinata* and *C.flavum*. Antimicrobial activity of *S. parvispora* is also reported for the first time. These compounds could be developed in antibacterial drugs after careful clinical trials.

Project No.	S-KU/Chem (321)
Project Title:	Characterization of plasma membrane glycoproteins of rabbit corneal epithelium.
Duration:	3 Years
Date of Initiation:	20. 06.1998
Date of Completion:	19. 06.2001
Location of Scheme:	University of Karachi, Karachi.
Principal Investigator:	Dr. Nikhat Siddiqui
Total Expenditure:	Rs. 606,939/-
Main Objectives:	<ul style="list-style-type: none">• To determine the influence of plasma membrane glycoproteins on epithelial cell adhesion and migration.• To isolate glycoproteins that participate in corneal epithelium wound healing process.• To study the contribution of the oligosaccharide moieties of glycoproteins in cell-cell and cell-matrix interactions.

Summary of work done:

The purpose of the present study was to identify galactose specific glycoproteins that are synthesized in higher amounts or down regulated during the migratory process of the corneal epithelium. Identification of proteins that might be associated with wound healing in the corneal epithelium could provide valuable information regarding cellular migration in this tissue.

Using organ culture techniques, the identification of various proteins in the rabbit non migrating and migrating corneal epithelia cells were carried out. Initial results obtained show migration specific protein components. On the basis of mobility on sodium dodecyl sulphate polyacrylamide gel electrophoresis (SDS-PAGE) (10%) under reducing and denaturing conditions, 12 glycoprotein components were identified. The migrating epithelium showed a significant increase in 98kD, 27kD, 40kD and 41kD protein band intensity when compared to non-migrating corneal epithelium. Several other minor differences were found in the protein patterns of the non-migrating and the migrating corneal epithelia. Cell surface radiolabeling showed increased synthesis of glycoproteins in the migrating as compared to non-migrating epithelium. The glycosylation was

increased by approximately 2-times during the migration process as indicated by ¹⁴C-glucosamine labeling and fluorography. Glycosylation was observed in the higher molecular weight region. Using ³H-mannose and ³H-galactose, it was determined that D-galactose played a significant role in the migration process. D-mannose did not show any significant result, however, D-Galactose was seen to increase in the migrating epithelium as compared to the non-migrating corneal epithelium and to facilitate wound healing. Galactose oxidase treatment in combination with DIG-labeling also indicated a 98kd galactose-linked glycoprotein on SDS-PAGE. Two acidic proteins of apparent molecular weight; 24kd and 23kd were seen to be down regulated in the migrating corneal epithelium.

This study has demonstrated that during corneal epithelial cell migration, synthesis of one membrane galactose-linked glycoprotein of 98kd with terminal galactose is elevated and the synthesis of the two-membrane protein is down regulated. These membrane proteins may play an important role in corneal epithelial cell wound healing by accelerating the reformation of cell adhesion complex and the subsequent epithelial cell-extra-cellular matrix adhesion.

Project No.	C-PINSTECH/Engg (41)
Project Title:	Determination of lateral and vertical penetration of canal water in Rechna Doab using environmental isotopes.
Duration:	2 Years
Date of initiation:	01.06.1998
Date of Completion:	31.05.2000
Location of Scheme:	PINSTECH, Islamabad.
Principal Investigator:	Dr. M. Ishaq Sajjad
Total Expenditure:	Rs. 3,21,436/-
Main Objectives:	<ul style="list-style-type: none"> • To identify different recharge sources in the area under investigations. • To estimate the relative contribution of different recharge to the ground water system. • To estimate the lateral and vertical penetration of canal water into the groundwater in the selected areas of Rechna Doab. • To establish the temporal variations of isotopes in groundwater region. • To combine the hydrological and hydrogeochemical and isotopes data into a model of the groundwater and to answer the mechanisms which effectively cause water logging and salinization in agricultural lands.

Summary of work done:

I it was planned to use the environmental isotopes to identify recharge sources, estimation of the relative contribution of different recharge determination of temporal variations of isotopes in the

groundwater regime and the assessment of lateral and vertical penetration of canal water into the groundwater.

Two sites were selected for the study; one at Sukheki and its surrounding area located in district Hafizabad and the other at Pansera and its surrounding area located in district Faisalabad. Ninety-six (96) sampling points (forty from Sukheki area and fifty-six from Pansera area) were selected for regular water sampling. Five samplings in Sukheki area and four in Pansera area were carried out periodically on quarterly basis. Physico-chemical parameters like Electrolytic Conductivity (EC) and temperature were measured in the field and Water samples were also analyzed for isotopes of hydrogen and oxygen in the laboratory.

Electrical resistivity survey was performed at eight locations in Sukheki area and at nine locations in the area of Pansera, to estimate the vertical penetration of canal water. The enriched isotopic values show rain recharge, depleted isotopic values are from canal system. The intermediate isotopic values show mixing of both sources of water. Spatial variations have been observed in this area. The canal water has lateral penetration in whole of the project area. The maximum depth of penetration of canal water came to be 88 meters in Sukheki area. Frequency histogram shows that major contribution towards groundwater comes from rainwater.

In Pansera area, the lateral penetration of canal water is more pronounced. In eastern part of the area, the isotopic data show mixing of rainwater and canal water. But major contribution towards groundwater recharge comes from canal system. The maximum depth of penetration of canal water came to be 200 meters near the canal and it reduces to 11 meters away from the canal. The EC is generally low near the canal and it increases as the distance from the canal increases.

Project No.	P-CEWRE/Engg (43)
Project Title:	Impact of irrigation management practices on nitrate leaching at farmer's field.
Duration:	3 Years
Date of initiation:	01.05.1997
Date of Completion:	31.07.2000 (3-months extension)
Location of Scheme:	University of Engg. & Technology, Lahore.
Principal Investigator:	Prof. Dr. M. Latif
Total Expenditure:	Rs. 3,15,089/-
Main Objectives:	<ul style="list-style-type: none">• To compare the effects of heavy and light-cum-frequent surface investigation on nitrate leaching.• To investigate the effect of method of water application (surge and conventional furrow irrigation) on leaching behavior of fertilizer.• To develop or adopt appropriate computer model for nitrate leaching.

Summary of work done:

This study attempted to investigate and create awareness amongst the researchers, planners, scientists and water users in polluting groundwater reservoir by fertilizer. A set of land, water and fertilizer management practices was studied under surge and continuous irrigations. Judicious use of irrigation water and fertilizer also have fringe benefits in terms of energy saving, controlling water table, reducing drainage effluent and increase in crop yields. This study was carried out in two phases.

Phase-I: Developing and calibration of Surge Automatic Valve/Gate and

Phase-II: Field Investigation of Nitrate Leaching Behavior in Crop Root zone.

Nitrate Leaching were studied under following level of treatments

- Method of water application (*Surge Vs. Conventional Irrigation*)
- Dose of fertilization (*Heavy Vs. Light*)
- Depth of irrigation water (*Heavy Vs. Light*).

Results of the study revealed that the surge gate is best suited for low inflows. Surge irrigation helps in retaining the NO_3 within the root zone. Furthermore, light irrigations and lower doses of fertilizer play a pivotal role in controlling the groundwater contamination. It was observed that after first irrigation, downward movement of nitrates depth. The nitrate concentration was maximum in 0-30 and 90-120 cm soil depths for light and heavy irrigations respectively. This suggests that heavy irrigation causes excessive movement of nitrates out of crop root zone particularly during early state of crop growth when roots are shallow. Similarly, higher doses of fertilizer caused greater movement of nitrates out of the crop root zone compared with smaller dose of fertilizer. Further the various types of fertilizer behave differently on the mobility of nitrates.

Two models were initially used in this study. Results of the LEACHN model were reasonably well, however, an overestimation trend was observed during calibration of the model with the observed data. ROSE model performed better in estimating the NO_3 leaching behavior within the root zone for both surge vs. continuous irrigation under various doses of fertilizers. This model was employed in this study due to its simplicity and ease of operation.

Project No.	P-CEME/Engg (73)
Project Title:	Design and fabrication of rock bed storage system for a solar air heated, hospital at Goma-Skardu, Pakistan.
Duration:	2 Years
Date of initiation:	15.06.1998
Date of Completion:	14.06.2000
Location of Scheme:	College of Electrical & Mechanical Engineering, Rawalpindi.
Principal Investigator:	Brig. Dr. Nasim A. Khan
Total Expenditure:	Rs. 3,39,484/-
Main Objectives:	<ul style="list-style-type: none">• To design and fabricate a solar thermal energy rockbed storage system for 25x7.6-meter hospital located at Goma, Skardu.

- To design and develop a complete ducting system to utilize the heat energy stored in the rockbed storage.
- To demonstrate utilization of solar energy to heat houses in remote locations.

Summary of work done:

The snow bound Northern Areas of Pakistan have acute shortage of energy resources during extreme cold weather for warming their houses. The local population resort to cutting of trees for warming their houses. Alternately kerosene oil heaters are used which produce excessive carbon monoxide, carbon dioxide and fumes.

The present project was undertaken to make use of solar energy for heating building in cold weather. The intensity of solar radiation in the area is as high as 1380 Watts/m² in October. A hospital at Goma, Skardu was solicited for the purpose. A solar air-heating system to warm the hospital day and night was successfully designed, and installed by providing heat energy to the building through a combination of solar roof air collectors and solar wall (Trombe Wall) for heat storage.

The system was tested for one year and performed satisfactorily for day heating and partial night heating. It is expected that the solar air heated hospital building and the storage system will act as a model for the local residents and builders.

Project No.	P-UAAR/Env(42)
Project Title:	To evaluate suitability of sewage sludge as organic manure for crop production in Potohar region.
Duration:	2 Years
Date of initiation:	01-04-1998
Date of Completion:	31-03-2000
Location of Scheme:	University of Arid Agriculture, Rawalpindi.
Principal Investigator:	Dr. Mushtaq Ahmed Khan
Total Expenditure:	Rs.1, 80,647/-
Main Objectives:	<ul style="list-style-type: none"> • To study the accumulation salts and heavy metals from sludge application of different soil types (sandy-silty and clay in Potohar Region). • To evaluate suitability of sewage sludge as organic manure for crop production in Pothohar Region.

Summary of work done:

Sewage sludge is the product of sewage treatment plants and is the solid waste (digested aerobically or anaerobically) removed from sewage during treatment. Sewage sludge can be used as organic amendment for improving soil fertility and crops yield but as it may contain excess of heavy metals and salts, its long-term land application for crop production may deteriorate soil quality and cause health hazards. In Islamabad, sewage sludge is being produced at CDA Sewage Treatment Plant and sold to

the farmers as an organic amendment without considering its pollution effects on soil and crop. It was therefore, important to evaluate suitability of this sewage sludge for crop production and advise the farmers accordingly.

From the overall results, it can be concluded that soil application of sewage sludge did not cause toxicity of heavy metals in the soils or plants, however, it tended to increase the metals in isolated cases. It did not affect soil pH or soil salinity. The use of sludge improved organic matter and available P, and to some extent micronutrients, in superior to farm yard manure but inferior to poultry manure and chemical fertilizers as far as improvement in yields was concerned. However, its use in combination with NP-fertilizers (half the recommended dose of each) resulted in crop yields equal to those by crops yields. Farmers are therefore, advised to use sewage sludge or farm yard manure in combination with fertilizers @ half the recommended doze of each. Since the sewage sludge has shown increasing trend in the heavy metals contents in sols in some cases. It is recommended that monitoring of soil heavy metals, by soil testing, be carried out in case sewage sludge is used continuously on a field for many years.

It was found from the survey of sewage irrigated farms in Rawalpindi division that sewage irrigation caused increases in the heavy metals in the soil, however, their levels were quite low as compared to the critical levels for their toxicity. Sewage irrigation also increased soil salinity/sodicity level in the soils. It was observed that sewage irrigation increased soil organic matter, available P, extractable K and micronutrients. It is therefore, concluded that sewage irrigation had both, positive and negative effects on soil. It is recommended that farmers, who are using sewage irrigation continuously for may years, must get their soils tested regularly to monitor the status of heavy metals and soil salinity/sodicity in their soils to check the soil pollution.

Project No.	P-AU/Envr (44)
Project Title:	Studies on metals eco-toxicity of the river Ravi.
Duration:	3 Years
Date of initiation:	02-05-1998
Date of Completion:	01-05-2001
Location of Scheme:	University of Agriculture, Faisalabad.
Principal Investigator:	Dr. Muhammad Javed
Total Expenditure:	Rs. 550,884/-
Main Objectives:	<ul style="list-style-type: none">• To monitor heavy metals eco-toxicity of the riverine system with partic reference to water, plankton, sediments and fish for the uptake and accumulation of heavy metals, viz., zinc, iron, magnesium, manganese, and nickel.• To identify the types, specific sources and release of metal bearing effluents at specific sites of the driver system flowing through Baloki Head works to Sidhnai Barrage.• To study the dependence of heavy metals toxicity of plankton, fish, sediments and water on the physico-chemical variables, viz.,

temperature, pH, dissolved oxygen and total hardness.

- To compare the toxicity levels of river system with the world's acceptable standards for sustainable conservation of aquatic resources for freshwater fisheries.

Summary of work done:

By integrating the chemical, toxicological and ecological data, the impact of heavy metals pollution in the river Ravi stretch from Shahdera Bridge to Sidhnai barrage was assessed. The role of both plankton and fish as indicators of freshwater contamination by metals was been studied. The present investigation reveals that metals eco-toxicity of river Ravi has crossed the safe limits for sustainable conservation of aquatic habitats as described by the Environmental Protection Agency (EPA) of USA.

The heavy metals toxicity of water, plankton and sediments at Farrukhabad, Bakar Mandi, Munshi Hospital, Hudiara, Taj Company nullas, Degh nulla I and II, Sammundri and Sukhrawa main drains were extremely high and there has been an increasing tendency towards accumulation of metals in water, fish, plankton and sediments in riverine ecosystem. Considerable deterioration in the quality of river water was recorded at discharge points of Farrukhabad, Bakar Mandi, Munshi Hospital, Hudiara, Taj Company and Degh nullas. The quality of river water improved gradually onwards after Bakar Mandi Nulla, except at Khurdpur (the point where Hudiara nulla enters river Ravi) where this river receives large quantities of wastes deteriorating its water quality. The gradual improvement in the quality of river water at Baloki headworks was due to merging of less polluted tributary i.e. Q.B. Link Canal, into the river. The river stretch from Baloki headworks to Sidhnai barrage receives bulk discharges of contaminated water from Degh nulla II, Sammundri and Sukhrawa main drains and ultimately deteriorating the quality of water at Sidhnai barrage.

All the three freshwater fish species, viz, *Catla catla*, *Labeo rohita* and *Cirrhina mrigala* (major carps) are on the verge of extinction in the river Ravi due to heavy loads of metals in water, plankton, and sediments. Three fish species showed significant variations for the accumulation of metals in their bodies. *Catla catla* showed significantly higher tendency to accumulate metals in its body than *Labeo rohita* and *Cirrhina mrigala*. The fish at Sidhnai barrage showed significantly higher metal contamination than that at Baloki headworks. Fish liver appeared to be an organ which had significantly higher tendency for the accumulation of iron, zinc and lead while nickel and manganese accumulations were the maximum in fish skin and gills respectively.

All the metal ions, except lead, in sediments and plankton have shown direct relationships with the intensity of water pollution. Thus, both these components of aquatic ecosystem could act as indicators of metal pollution in fresh waters. Regarding the stretch of river from Shahdera to Baloki headworks, the phytoplankton, viz., Aphanocapsa, Bacillaria, Closterium, Cyclotella, Cocconeise, Cosmarium, Denticulla, Dinobryon, Euglena, Pinnularia, Spirulina and Spirogyra showed considerable tolerance against heavy metals toxicity both in tributaries and river. Among the zooplankton, Keratella, Cyclops, Monnstyla and Filinia were the sensitive forms and showed their existence according to the severity of pollution at different sites. The river stretch, from Baloki headworks to Sidhnai barrage showed Myxophyceae, Bacillariopygyceae and Chlorophyceae as the important groups distributed with variable densities. Among Phytoplankton, Aphanocapsa, Bumilleria, Bacillaria, Cladophora, Cocconeis, Eudorina, Microcystis, Pandorina, Scendesmus, Volvox and Zygnema indicated direct relationships with the intensity of pollution. Among zooplankton, the genus, viz., Bosmina, Filinia, Keratella and Monnstyla showed considerable tolerance against metallic ion pollution. Daphnia appeared to be a sensitive form against metal pollution in water.

Eight (8) Research papers were published under this project. Moreover, one Ph.D and one M.Phil degrees were also awarded on the basis of research work done under this project.

Project No.	S-AKU/Med (160)
Project Title:	Analysis of morphological, immunohistochemical and genetic prognostic determinants in predicting disease free survival of breast carcinoma patients.
Duration:	2 Years and Six months
Date of initiation:	01-07-1998
Date of Completion:	15-12-2000
Location of Scheme:	The Aga Khan University, Karachi.
Principal Investigator:	Dr. Shahid Pervez
Total Expenditure:	Rs. 2,29,500/-
Main Objectives:	<ul style="list-style-type: none">• To collect baseline data by testing various prognostic markers independently and correlate them with patient long term management and clinical outcome.

Summary of work done:

Breast cancer is an increasingly important cause of illness and death among women worldwide. In Pakistan too, it is not only the commonest disease among women but it occurs in a younger age as compared to western population. This study was conducted on 315 consecutive human breast biopsy and mastectomy specimens with lymph node sampling and histologically proven ductal carcinoma breast. The objective was to assess the utility of novel establish prognostic markers that will reliably assess the outcome of disease in breast carcinoma. Established parameters and prognostic variables of breast cancer like age of the patient, menstrual status, tumor size, histological grade of tumor, axillary lymph node status, hormones receptor status were studied in parallel to novel prognostic markers like amplification of growth promoting genes, tumor proliferative index and cathepsin-D.

Analysis was done on a total of 315 patients. The mean age was found to be 49 years while median was 48 years. Axillary lymph node was seen in 170 patients. Mean tumor size was 4.16 cm. Histological grade-II tumors comprised 214 cases, followed by grade III (56 cases) and grade I (45 cases). Vascular lymphatic invasion was seen in 150 cases. Data were statistically analyzed and significant results were found. Cathepsin-D protein over expression was seen in 391 of the cases. Its over expression did not show any significant correlation with overall survival or disease free survival. In this study C-erb-2, EGER, P53 are independent prognostic markers in both univariate and multivariate analysis.

Five (5) research papers were published under this project.

Project No.	S-AKU/Med (161)
Project Title:	Low urinary citrate, a major risk factor for calcium stone in Pakistan is it diet induced?
Duration:	2 Years

Date of initiation:	01-05-1998
Date of Completion:	12-09-2000
Location of Scheme:	The Aga Khan University, Karachi.
Principal Investigator:	Dr. Jamsheer Talati
Total Expenditure:	Rs. 262,732/-
Main Objectives:	<ul style="list-style-type: none"> • To prevent recurrence in known stone formers. • To determine the mechanisms which are responsible for low citrate excretions. • To identify etiological factors that may be targeted for preventive Programme

Summary of work done:

Renal stone disease is very common in Pakistan which results in the destruction of kidneys in a very short span of time and renal failure of which it is a common cause (In Pakistan 10% of patients undergoing dialysis treatment have renal stone disease). New stones keep forming even after complete removal of the first stone. Urinary citrate was focused due to two reasons (a) citrate is known to slow crystal aggregation and (b) majority of our stone patients have low citrate excretion. Citrate supplementation should help prevent stone formation. As oral citrate excretion is determined by alkali absorbed from the gut, we studied if NaHCO₃ (an alkali source) could raise urinary citrate as efficiently as citrate therapy. Citrate increased urinary citrate levels in 29 of 35 (82-91) patients. NaHCO₃ increased the urinary citrate in 19 to 31 (61%) patients. The mean 24-hour urinary citrate levels increased from 279.2+146mg to 433.39+211.1 after citrate administration. Rinary citrate did not rise significantly after NaHCO₃ administration. The net alkali absorption increased with citrate from 12.3 + 27.0 to 56.2 + 36.3 and with bio-carbonate from 20.5 + 26.0 to 65.4 + 32.7. It can be concluded on the basis of these results that:

1. Though bicarbonate increased urinary citrate in 61% of patients, the rise was not significant. Citrate on the other hand increased urinary citrate in 82.9% of patients.
2. Net alkali raises with NaHCO₃ as much as with oral citrate does as shown by rise in net alkali absorption strengthening our conviction stated previously that citrate excretion is not related to net alkali absorption.

Project No.	QU/ MATH (21)
Project Title:	Ricci collineations of space times.
Duration:	3 Years
Date of Initiation:	15.07.1996
Date of Completion:	14.07.1999
Location of Scheme:	Quaid-i-Azam University, Islamabad.
Principal Investigator:	Dr. Muhammad Ziad
Total Expenditure:	Rs. 2,35,254/-

Main Objectives:

- To obtain the RCs for cylindrically symmetric space times and use them to obtain the conservation laws and look for obtaining classification of geometrics on its basis.
- To helps training manpower for high class research in the field of relativity an cosmology.

Summary of work done:

In accordance with early observations of Noether, the existence of certain geometric symmetry properties described by continuous group of motions or homotheties or Ricci collineations lead to conservation laws in the form of first integrals (i.e. constants of the motion) of a dynamical system. Indeed, the fundamental importance of groups of motions in space-time and their relation to the conservation laws of energy, linear momentum, and angular momentum for particles and fields is well known. Besides, it is very difficult to find exact solutions of Einsteins field equations (EFEs), as they consist of ten highly non-linear, second order partial differential equations for ten functions of four variables, with inhomogeneous terms, depending upon the distribution of matter-energy. An alternative approach is to specify the symmetry in the physical problem and require the geometry to accommodate it. Requiring a high level of symmetry would not be of much use, as it would restrict the problems that could be solved by this approach. The procedure adopted is to require a minimal symmetry group and find all space times, with their associated isometries, homotheties or Ricci collineations possessing that or higher symmetries. For this approach to be effective we need to extend the procedure to smaller symmetry groups and deal with more of them.

The original attempts to classify space times by isometries were incomplete. The first attempt at a complete classification was for spherically symmetric space times according to their isometries and metrics. Later extended to plane symmetric static, cylindrically symmetric static and hyperbolically symmetric static space times. The project under consideration is related to finding the classification of certain spacetimes according to their Ricci collineations. These space times include the spherically symmetric space times admitting $SO(3)$ as the non-maximal isometry group, the hyperbolically symmetric static space times and the cylindrically symmetric static space times. Besides, the general hyperbolically symmetric and the general plane symmetric space times are classified according to their isometries and metrics. The plane symmetric static and the cylindrically symmetric static manifolds are classified according to their homotheties.

Project No.	PSF/NSFC/Res(6)/Phys
Project Title:	Particle production and nuclear fragmentation in $o^{16}+s^{32}$ collision at 14.6,60 & 200gev energies.
Duration:	3 Years
Date of initiation:	01.04.1995
Date of Completion:	31.03.1998
Location of Scheme:	Gomal University, D.I. Khan
Principal Investigator:	Prof. Dr. Abdul Waheed Khan

Total Expenditure: Rs. 4,48,060/-

- Main Objectives:
- To investigate some properties of URHIC and explore a few special signals for QGP formation.
 - To explore particle production and target fragmentation at the considered energies to understand the reaction dynamics in DPM.
 - To study dependence of the proposed signals on centrality of the collisions of nuclear geometry to establish possibly new Physics.

Summary of work done:

The present theory of strong interactions Quantum Chromodynamics (QCD) explains virtually all features of deep inelastic processes of quasi-free partons on a rather satisfying level. But, the phenomena of confinement of coloured partons cannot yet be explained completely. It may, however, be understood by a phase transition of hadronic matter to a thermalized plasma of quark and gluons (QGP)⁽¹⁾. The collisions of heavy ions at relativistic energies offer the right kind of environment to explore a variety of aspects⁽²⁾ related to hot and dense nuclear matter to enhance our existing knowledge about the nuclear equation of state (EOS), as well as possibility of observing the signals of QGP. The nucleus-nucleus collision is thus an effective way to approach the reality of quark matter and its space-time evolution.

Under this project the interactions of ¹⁶O and ³²S ions with emulsion nuclei at 14.6A GeV, 60A GeV, and 200A GeV energies have been analyzed and the emission of heavy fragments including He fragments (black tracks) as well as the distributions of relativistic (shower tracks) and slower (grey tracks) particles in nuclear emulsion have been studied. The results have been compared with Dual Parton Model and Lund model calculations^(6,7). Based on the participant-spectator model and the mechanism of friction evaporation process between participant and spectator contact layer, as well as intranuclear cascading effect in participant and spectator. The angular distributions of target fragments have been analyzed to explain the distribution properties. Extension of the investigation has been made to 160A GeV Pb-emulsion interactions.

During the report period 3 research papers were published.

Project No.	S-KU/Phys (74)
Project Title:	Optical Studies of Liquid Crystals.
Duration:	3 Years
Date of initiation:	01.07.1991
Date of Completion:	31.01.1997 (re-initiated)
Location of Scheme:	University of Karachi, Karachi.
Principal Investigator:	Prof. Dr. Iqbal A. Khan
Total Expenditure:	Rs. 2,48,436/-
Main Objectives:	<ul style="list-style-type: none">• To conduct optical studies on liquid crystal with items domain spectroscopy: using fast digital correlator and optical

transmission studies on liquid crystal in the presence of electric/magnetic field.

Summary of work done:

Experimental studies in various liquid crystal (LC) materials have been completed during this report period. These materials are in fact, organic compounds and include (short chemical names) E-31 8S5, 9S5, E310 and MBBA. The LC compounds possess the physical properties of crystals as well as of ordinary liquids. Being in liquid state, these molecules can distort themselves easily by twisting or bending. This means they require very small amount of energy to undergo such distortions. This aspect makes them attractive to be used in a display divide. The LC display devices are therefore getting popular. During the research, optical studies were also carried out, the techniques used were of optical transmission, polarizing microscopy and of light scattering. Light scattering data was also analyzed extensively using computer, methods.

In the present study tilt angles have been measured extensively as a function of surface treatment, concentration of surface, temperature of LC material and structure of the liquid crystal compound. In the optical transmission work, indium-tin oxide (ITO) coated glass slides were used. ITO slides allow light to pass through them as well as allow electric field on LC. In this part of work, transmittance of laser light through the LC cell as well as relaxation times and threshold voltage to operate the display cell was studied. Further, this study was extended as a function of cell temperature and the frequency of the cell operating voltage. Light scattering experiment an electromagnet with linear field sweep were designed and fabricated in the laboratory to carry out magnetic field induced transition in LCs as one of the projects offered to M.Sc. students.

This work also led to suitable surface treatment needed. Results have been presented at various forums and also published locally as well as internationally. The project has led to the award of two M.Phil and eight M.Sc. degrees.

Project No.	P-BZU/Phys (95)
Project Title:	Optical & electrical properties of germanate glasses.
Duration:	2 Years
Date of initiation:	01.05.1997
Date of Completion:	31.04.2000
Location of Scheme:	Bahauddin Zakrya University, Multan.
Principal Investigator:	Prof. Dr. M. Younis Nadeem
Total Expenditure:	Rs. 4,83,090/-
Main Objectives:	<ul style="list-style-type: none">• Development of chemically durable germanate glass.• Study of the optical properties as a function of photon energy, evaluation of the optical band gap and other parameters such as the refractive index.• Study of optical properties of glass system; i) Understanding the conducting mechanism in the germanate glasses with

different modifying oxides, ii) Temperature dependence of the electrical conductivity, and iii) Variation of the optical gap with concentration.

- Student's training.

Summary of work done:

Various compositions were tried to fabricate fresh samples ranging from 50% GeO₂ to 90% GeO₂. But only three compositions could be successfully produced using the furnace available. These were 60, 65 and 70% GeO₂ with 40, 35 and 30% BaO respectively. The above measurements were repeated on the fresh samples. The optical gap measured for these samples (prepared afresh) varied between 3.20eV to 3.27eV. Hence the optical band gap does not depend on the fabrication method of the samples as long as the composition is the same. This result is very encouraging as the other optical data of this research can use for the thin film sample and vice-versa. The optical absorbance, reflectance and the transmittance of the germanate glasses produced were recorded using the Spectrophotometer.

The values for these quantities found were (3.20-3.27)eV, (0.46-0.56) eV, (94.34-101.60) g-atom/liter, (29.53-31.80.80)em respectively. The range in each value represents the effect of the %age composition of the sample. Electrical measurements were also carried out on the prepared samples to determine the conduction mechanics. When the same measurements were performed on glassy samples of the same material, the conduction mechanism was found to be Poole-Frankel. The values of the refractive index and the dielectric constant of the samples were also evaluated here. Electrical conductivity was found to decrease by increasing the former to modifier weight ratio. The temperature dependence on the conductivity was also analyzed and the activation energy involved in the conduction was found to be between .20 to .30 eV.

One paper was published during the report period.

Project No.	C-QU/Phys (104)
Project Title:	Laser Assisted Atomic Structure Studies.
Duration:	3 Years
Date of initiation:	01.06.1997
Date of Completion:	31.05.2000
Location of Scheme:	Quaid-i-Azam University, Islamabad.
Principal Investigator:	Prof. Dr. M. Aslam Baig
Total Expenditure:	Rs. 2, 31,849/-
Main Objectives:	<ul style="list-style-type: none">• To investigate the structure of atoms in the highly excited Rydberg states to be able to measure the energy levels of atoms and the ionization potentials accurately. Atoms to be investigated are alkali atoms (Lithium, Potassium and Sodium), alkaline earth's (Magnesium, Calcium and Strontium) some refractory elements (Copper, Silver and Lead) and other important elements such as uranium.

- To extend the investigations for the double excitation by exciting both the valence electrons in Calcium, Strontium, Barium and Ytterbium.
- To train manpower in the field of Atomic Physics and Laser Spectroscopy to keep abreast with the latest developments in the field of Laser Isotopic separation.

Summary of work done:

Under the project, the spectra of different elements, lithium, sodium, ytterbium and inert gases were investigated. All the experiments were carried out using two or three dye lasers pumped by a common Nd:YAG laser. The ions were detected either using a channeltron in an atomic beam apparatus of a thermionic diode. The spectra of inert gases were obtained using Laser Optogalvanic Technique. The results of all these experiments have been published in the international scientific journals.

Under this project two students have completed and received Ph.D. degrees and two students have submitted their Ph.D. theses. Their work is based on the optogalvanic spectra of Neon, Argon, Krypton and Xenon. Furthermore two students have also completed the M.Phil degrees.

iii) Scientific Publications Produced through PSF Supported Projects

An important achievement of the Foundation is the research publications resulting from the research conducted under PSF funded projects. Through the projects completed during report period, 61 research papers were published or presented in National and/or International Conferences/Symposia. A list of these papers is placed at Annexure-IV.

iv) Higher Degrees Earned through PSF Supported Projects

One of the major goals of the Foundation is the training of scientific manpower in the country. This in turn would result in strengthening of R&D infrastructure of various scientific organizations. In order to achieve this goal, the PSF has been developing scientific manpower, through its research projects. For this purpose, Research Associates are provided in the projects, they are required to register for Ph. D or M. Phil degrees. During the report period, 11 Ph.D., 10 M.Phil and numerous M.Sc. degrees were awarded to research workers under PSF funded projects in the fields of Agriculture, Biology, Chemistry, Physics and Mathematics. List of the scholars who obtained the degrees is given below.

S. No.	Project No.	Name of Researcher	Degree awarded
1.	P-AU/Agr (191)	Mr. Zubair	Ph.D
2.	P-AU/Agr (191)	Mr. Mansoor Ahmmad Bhutta.	Ph.D
3.	P-AU/Agr (191)	Mr. Faraoq Ahmad Khan	Ph.D
4.	S-KU/Agr (200)	Mr. Uroojul Hassan	Ph.D
5.	S-KU/Agr (217)	Mr. Muhammd Anis	Ph.D
6.	C-NARC/Agr (216)	Miss Shazia Batool	M.Phil.
7.	P-PU/Bio (228)	Miss Shazia Afrasayab	Ph.D
8.	B-BU/Chem (279)	Mr. Niaz Muhammad	M.Phil
9.	S-KU/Chem (321)	Ms. Asifa Ahmed	Ph.D

10.	C-QU/Math (21)	Mr. Khalid Saifullah	Ph.D
11.	C-QU/Math (21)	Miss Sadia Saleem	M. Phil.
12.	C-QU/Math (21)	Miss Aamna Mubarak	M. Phil.
13.	C-QU/Math (21)	Miss Shabana Kiran	M. Phil.
14.	C-QU/Math (21)	Miss Tooba Feroze	M. Phil.
15.	S-KU/Phys (74)	M. Mansoor Afzal	M.Phil
16.	S-KU/Phys (74)	Sarah Akhtar	M.Phil
17.	P-BZU/Phys (95)	M. Altaf	Ph.D
18.	C-QU/Phys (104)	M. Yaseen	Ph.D
19.	C-QU/Phys (104)	Raheel Ali	Ph.D
20.	C-QU/Phys (104)	M. Rafiq	M.Phil
21.	C-QU/Phys (104)	M. Riaz	M.Phil

3. SCIENCE AND TECHNOLOGY FOR ECONOMIC DEVELOPMENT (STED) PROGRAMME

The National Commission for Science & Technology (NCST) headed by the Chief Executive of Pakistan is the highest national body, which takes policy decisions and provides leadership and guidance for the development and functioning of a strong and well-integrated system of Science and Technology in the country. The Commission, in its meeting held on 2nd May, 2000 accorded approval in principle, to a number of programmes, including Human Resource Development, Up-gradation of R&D institutions and Science & Technology for Economic Development (STED). The Commission also obtained Government approval for a National Science & Technology Fund (NSTF) of Rs. 15.70 billion to be created for the year 2000-2001 for funding of various programmes

The NCST assigned the responsibility of implementation of STED Programme to Pakistan Science Foundation, on the basis of Foundation's expertise and capabilities. Thus a STED Cell was set up in the Foundation with the following objectives.

- Creating a technology-oriented environment by providing opportunities to scientists, entrepreneurs, technologists etc., both in public & private sector to enhance their innovative capabilities.
- Supporting the R&D projects for setting up of production plants and industrial units based on the result of research and development, thus stimulating technological advancement and economic self-reliance.
- Encouraging dialogue and communication between the private and public sector organizations for commercialization of processes/products developed under R&D projects.

For implementation of STED programme, the following activities were undertaken.

1. On June 24, 2000, pre-proposals were invited through the press from scientists, technologists, doctors and engineers working in public & private organizations in collaboration with entrepreneurs.
2. In response to the advertisement, a total of 820 pre-proposals were received in 15 different S&T fields, namely; Agriculture, Biotechnology, Chemical Technology, Communications, Electronics, Energy, Engineering, Environment, Food Technology, Information Technology,

Materials, Medical Technology, Pharmaceuticals, Small Industry and Textiles. These pre-proposals were subjected to initial review by subject experts, out of which 225 proposals having some commercial prospects were selected for inviting detailed projects. They were then asked to submit detail proposals on PC-1 form.

3. The detailed project proposals received by Foundation were evaluated by 15 Peer Review Committees convened by PSF during October to November 2000 and 74 projects were recommended for approval on the basis of criteria laid down in the advertisement, i.e., technical merit of the projects, institutional capability, competence of the Project Directors and nature of collaboration between public and private sector organizations etc.

4. The Project Directors of the 74 projects were asked for options to the following priorities.

Priority A: Those projects in which the industrial partner/entrepreneur is willing to invest at least 10% of the project cost at the time of commencement of the project and there is a commitment from Project Directors to repay the amount invested by the government within a period of 5 years after completion of project.

Priority B: Those projects, which have at least 10% investment from industrial partner but no commitment from the Project Directors to refund the money to the government.

Priority C: Projects in which there is no investment from an industrial partner but the Project Directors would refund the amount to the government within five years after completion of project.

Priority D: Those projects where there is no investment from the industrialist and where the funds are required as a grant.

5. The options exercised by the Project Directors were analyzed and projects with 40% & above rating were invited on PC-1 form, to further process them at DDWP level. Only 110 Project PC-1s were submitted to the Foundation.

6. Furthermore, 29 presentations on projects by the PDs and site visits for the Special Review Committee were organized during January to May 2001. Assistance was also extended to the Project Directors in the revision of their PC-1s. As a result, 8 revised PC-1s out of 15 recommended by the Special Review Committee were received and sent to MoST for further processing with DDWP.

The Project PC-1s (110) received in the Foundation were forwarded to MoST for review by the Projects Preliminary Review Committee (PPRC). Till June 30, 2001, 85 projects were reviewed by the PPRC, out of which funds were released for three projects only. The rest are under process with the MoST and Project Directors.

4. 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. 0.375 million were released to the following Scientific Societies and Journals during the year 2000-2001.

No.	Name of Society/Association/Journal	Amount of Grant (Rs.)
1.	Pakistan Academy of Sciences	50,000/-
2.	Pakistan Association of Scientists & Scientific Professions (PASSAP)	30,000/-
3.	Zoological Society of Pakistan	40,000/-
4.	Biological Society of Pakistan	20,000/-
5.	Chemical Society of Pakistan	30,000/-
6.	Pakistan Society of Nematologists	20,000/-
7.	Pakistan Society for Semiconductor Science & Technology	15,000/-
8.	Pakistan Thalassaemia Welfare Society	25,000/-
9.	Pakistan Phytopathological Society	15,000/-
10.	Society of Economic Geologists & Mineral Technologists	20,000/-
11.	Pakistan Physiological Society.	10,000/-
12.	Institute of Engineers, Pakistan	20,000/-
Sub Total:		295,000/-

Publications/Journals

1.	Mehran University Research Journal of Engineering. & Technology.	15,000/-
2.	Pakistan Veterinary Journal.	15,000/-
3.	Pakistan Oral & Dental Journal.	10,000/-
4.	Journal of Natural Science & Mathematics.	10,000/-
5.	Pakistan Journal of Arid Agriculture.	30,000/-
Sub Total:		80,000/-
Total:		3,75,000/-

5. FUNDING FOR CONFERENCES/SEMINARS/SYMPOSIA/WORKSHOPS

To enable scientists to share their knowledge and research experience with each other, the Foundation provides partial financial assistance to Scientific Societies/Universities and R&D Organizations for organizing Science Conferences, Seminars, Symposia and Workshops etc. This is a continuing activity of the Foundation and during the report year, grants amounting to Rs. 0.427 million were released to various Organizations for holding National/International Conferences, Seminars, Symposia and/or Workshop etc. (Annexure-V).

6. TRAVEL GRANTS

One of the functions of the Foundation is to provide travel grants from its annual budget to Pakistani scientists for their participation in international conferences, seminars, symposia etc. for presentation of their research findings at international forums. However, this activity of the Foundation has remained suspended during the last several years due to a ban imposed by the Government on utilization of GoP funds for travel abroad for participation in meetings, conferences, seminars etc.

In view of the above mentioned ban, a PC-1 titled, "Participation of Scientists and Technologist in International Conferences, Seminars and Workshops" costing Rs.39.00 million for five years was submitted to the Ministry of Science and Technology for obtaining development grant. The project was approved in April 2001 and funds, amounting to Rs.0.30, million were released by the Ministry for the project.

During the report period an amount of Rs.218, 860/- was released to the following scientists for presentation of their research work in International Conferences.

<u>S. No.</u>	<u>Name & Address of Applicant</u>	<u>Purpose</u>	<u>Amount</u>
1.	Prof. Dr. S.M. Saifullah, Chairman, Dept. of Botany, University of Karachi, Karachi.	International Symposium on Mangroves, at Tokyo, Japan, From 10-12 July 2001.	Rs.82, 610/-
2.	Dr. Syed Moosa Hassany, Chief Scientist, PINSTECH, Nilore, Islamabad.	XVIth International Symposium on Physio-chemical Method of the Mixtures Separation (ARS SEPARATION-2001) At Borowno near Pydoszez Poland, From 20-23 June 2001.	Rs.80, 800/-
3.	Dr. Shahid Mehboob Rana, Associate Professor, Post Graduate Department of Zoology, Government College, Faisalabad.	Aquaculture Europe 2001 Conference, at Trondheim, Norway, From 4-7 August 2001.	Rs.55, 450/-

7. INTERNATIONAL LIAISON

A five-member delegation of Chinese Scientists from National Natural Science Foundation of China visited Pakistan from 26th Feb. to 4th March 2001 under the S&T Protocol signed between the Governments of the Islamic Republic of Pakistan and the Peoples Republic of China. The main purpose of the visit was to strengthen S&T Cooperation between scientists of the two countries.

During their stay in Pakistan the Delegation visited following R&D institutions:

- National University of Science and Technology, Rawalpindi.
- Biomedical and Genetic Engineering Division, Dr. A.Q. Khan Research Labs, Islamabad.
- Centre of Excellence in Applied Molecular Biology (CAMB), Lahore.
- Institute of Biochemistry and Biotechnology, University of the Punjab, Lahore.

- University of Agriculture, Faisalabad.
- National Institute of Biotechnology and Genetic Engineering (NIBGE), Faisalabad.
- Nuclear Institute of Agriculture and Biology (NIAB), Faisalabad.
- HEJ Research Institute of Chemistry, University of Karachi, Karachi,
- PCSIR Labs Complex, Karachi.

Members of the Delegation were apprised of the research facilities available in these organizations. Scientists of the two sides held useful discussions and agreed to strengthen the already existing S&T Cooperation.

As a follow up of this visit, a delegation of scientists from Pakistan is due to visit China shortly. The proposed visit is expected to result in the identification and initiation of useful collaborative projects in the fields of common interest such as Agriculture, Soil Conservation, Chemistry, Applied Physics, etc.

II. SCIENCE POPULARIZATION

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 in improving and cultivating scientific minds. In order to achieve this objective, the Foundation has taken up a number of programs to popularize science in the community, particularly among the students. These activities/ programs are detailed as under.

1. SCIENCE CARAVAN (MOBILE SCIENCE EXHIBITION)

Science Caravan is a Mobile Science Exhibition that has been designed to increase public awareness about science and to motivate the younger generation of Pakistan towards the study of science. Through Mobile Science Exhibition, the people living in rural backward areas of the country are exposed to some of the most fascinating scientific and technical developments of the modern world. All narrations are in national language, and are accompanied by simple illustrations. At present five Science Caravan Units are operating; one each in Balochistan, Sindh, NWFP, Punjab and Federal Areas. Caravan Units continued their activities throughout the report period & organized science exhibitions in schools within their jurisdiction, the details are given below.

a. Balochistan Unit

S.No.	Place of Exhibition	No. of Schools attended	Period
1.	Distt. Loralai.	13	22 nd Oct, to 7 th Nov. 2000
2.	Distt. Sibi.	13	22 nd Jan, to 15 th Feb. 2001
3.	Distt. Nasirabad.	20	8 th to 19 th April, 2001
4.	Distt. Quetta.	13	30 th May, to 19 th June, 2001



Chinese Delegation with H.E. the Ambassador of the Peoples Republic of China, Secretary MoST and Chairman, PSF, at Lunch hosted by the Ambassador.



Group Photo of the Chinese Delegation with Chairman and Staff of PSF.



Prof. Wang Naiyan, Vice President, National Natural Science Foundation of China and leader of the delegation (Centre) with Director, NIAB (left) and Director, NIBGE (right).

b. Sindh Unit

1.	Taluka Sakrand.	38	21 st Aug, 2000 to 9 th Sep. 2000
2.	Distt. Nawabshah.	36	18 th Sep, to 14 th Oct. 2000
3.	Taluka & Distt. Nawabshah.	42	23 rd Oct, to 22 nd Nov. 2000
4.	Daur Distt. Nawabshah.	25	8 th Jan, to 20 th Jan. 210A01
5.	Thatta and Gharo.	74	16 th April, to 24 th May, 2001

c. NWFP Unit

1.	Saidu Sharif, Swat	13	5 th to 17 th Sept. 2000
2.	Distt. Bannu	16	16 th to 31 st Oct. 2000
3.	Distt. Karak	10	15 th to 26 th Nov. 2000
4.	D.I. Khan	20	8 th to 28 th Jan. 2001
5.	Tank	19	13 th to 22 nd Feb. 2001
6.	Ahmadabad Karak	11	24 th to 30 th March, 2001
7.	Distt. Haripur	19	16 th to 29 th April, 2001
8.	Mansehra	14	21 st May, to 3 rd June, 2001
9.	Distt. Upper Dir	11	19 th June, to 28 th June, 2001

d. Punjab Unit

1.	Distt. Faisalabad	16	15 th March, to 7 th April, 21001
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e. Federal Unit

1.	Charhan, Murree	21	7 th to 30 th Aug, 2000
2.	Sehr Bagla, Murree	29	25 th Sept, to 30 th Oct, 2000
3.	Hasal, Chakwal	33	8 th to 20 th Jan. 2001
4.	Tehsil Taxila	10	9 th to 26 th April, 2001

2. 11TH INTRA BOARD SCIENCE ESSAY COMPETITION

Foundation announced the 11th Intra Board Science Essay Competition in collaboration with the Boards of Intermediate and Secondary Education of the country. Eleven Boards have participated in this competition and furnished the results of 48 position holder essays in English, Urdu and Sindhi. An amount of R.34, 000/- was paid to the Boards for the award of prize money to the winners of the competition.

The Inter Board Science Essay Competition was organized by the Foundation & a Committee of Judges constituted by the Foundation for the purpose evaluated the position holder

essays sent by the Boards. The following students secured first, second and third positions. An amount of Rs.3, 000/- (one thousand each) was paid to the judges as honorarium.

a. English Essays

S.No.	Name of Students/Schools	Position
1.	Beenish Irfaan,, Mama Parsi Girls Secondary School, Saddar, Karachi.	1st
2.	Afsheen Mazhar, Punjab Girls Secondary School, Sector C-I, Block-2, Town Ship, Lahore	2 nd
3.	Zohra Kazmi, D.H.A. Model High School, Phase VII, DHA Karachi.	3 rd

b. Urdu Essays

1.	Umair Ahmed, Public School, Mirpurkhas.	1st
2.	Jamshid, G.H.S.S., Tetali Bluner Saidu Sharif, Swat.	2 nd
3.	Atiya Akbar, Govt. Girls High School, Ferozpur Road, Lahore.	3 rd

c. Sindhi Essays

1.	Mr. Akhtar Alam Laghari, Darul Uloom High School, Tando Muhammad Khan, Hyderabad.	1 st
2.	Mr. Dildar Ali Abro, Public School, Mirpurkhas, Hyderabad.	2 nd
3.	Mr. Yar Muhammad, Oxford High School, Shadman Town, North Karachi, Karachi.	3 rd

3. 12TH INTRA BOARD SCIENCE POSTERS CONTEST

The Foundation announced 12th Intra Board Science Posters Contest on the above-entitled theme in collaboration with the Board of Intermediate & Secondary Education of country. Nine (9) Boards of Intermediate & Secondary Education participated in the contest and furnished their results of position holder posters (1st, 2nd & 3rd). An amount of Rs.19, 000/- was paid to the boards as prize money to the winners of the competition.

4. PURCHASE OF EQUIPMENT FROM NATIONAL EDUCATIONAL EQUIPMENT CENTRE (NEEC), LAHORE

Two sets of Lab. Equipment were purchased at a cost of Rs.127, 332/-from NEEC Lahore for donation to schools of Balochistan & Sindh Provinces. The equipment will be handed over to

the schools after making necessary arrangements with the Directorates of Education of respective divisions.

5. DONATION OF COMPUTERS/EQUIPMENT

a) Fatima Jinnah Medical College, Lahore

An amount of Rs.154, 000/- was sanctioned to Fatima Jinnah Medical College, Lahore for the purchase of two computers with printers.

b) High Schools

Computers along with a printer (one set each) were donated to following four schools during the report period.

- Govt. High School, Darvaish, Distt. Haripur (NWFP)
- Govt. High School, Noukot, Distt. Mansehra (NWFP)
- Govt. High School, Sahiwal (Punjab)
- Govt. Comprehensive High School, Sahiwal (Punjab)

c) Donation of Equipment to NMST, Lahore

A Video Projector along with 67 Urdu dubbed scientific films in eight cassettes was donated to National Museum of Science & Technology, Lahore.

d) Donation of Lab Equipment to Schools

Laboratory equipment for four schools (2 schools of Balochistan and 2 schools of Sindh) was procured and is being prepared for dispatching to above schools.

6. INSTITUTIONAL SUPPORT TO CHILDREN LIBRARY COMPLEX, LAHORE.

An amount of Rs.700, 000/- was sanctioned and paid to the Children Library Complex, Lahore for establishment of Science Corner in their premises.

7. SCIENTIFIC LITERATURE TO HIGH SCHOOLS

a) Donation of Monthly Science Digest

- Total of 6000 copies of six issues of Monthly Science Digest (Sept., 2000–Feb., 2001) were distributed to 1000 schools across the country.
- Issues of April, May & June 2001, 1000 copies of each issue were distributed to 1000 schools.

b) Donation of Monthly Global Science

Some 7000 copies of Monthly Global Science (7-issues with 1000 copies each) for December 2000 to June 2001 were purchased and dispatched to 1000 schools registered with the Foundation.

8. POPULAR SCIENCE LECTURES BY DIFFERENT EMINENT SCIENTISTS

Dr. Richard Fuchs, Head of Programme, International Foundation for Science, Sweden gave a lecture on the funding procedure of IFS, Sweden. The lecture was arranged in the auditorium of the Foundation.

9. INTRA-BOARD SCIENCE OLYMPIAD

An amount of Rs.120, 000/- was released to the following Boards for organizing Intra-Board Science Olympiad (1st phase)

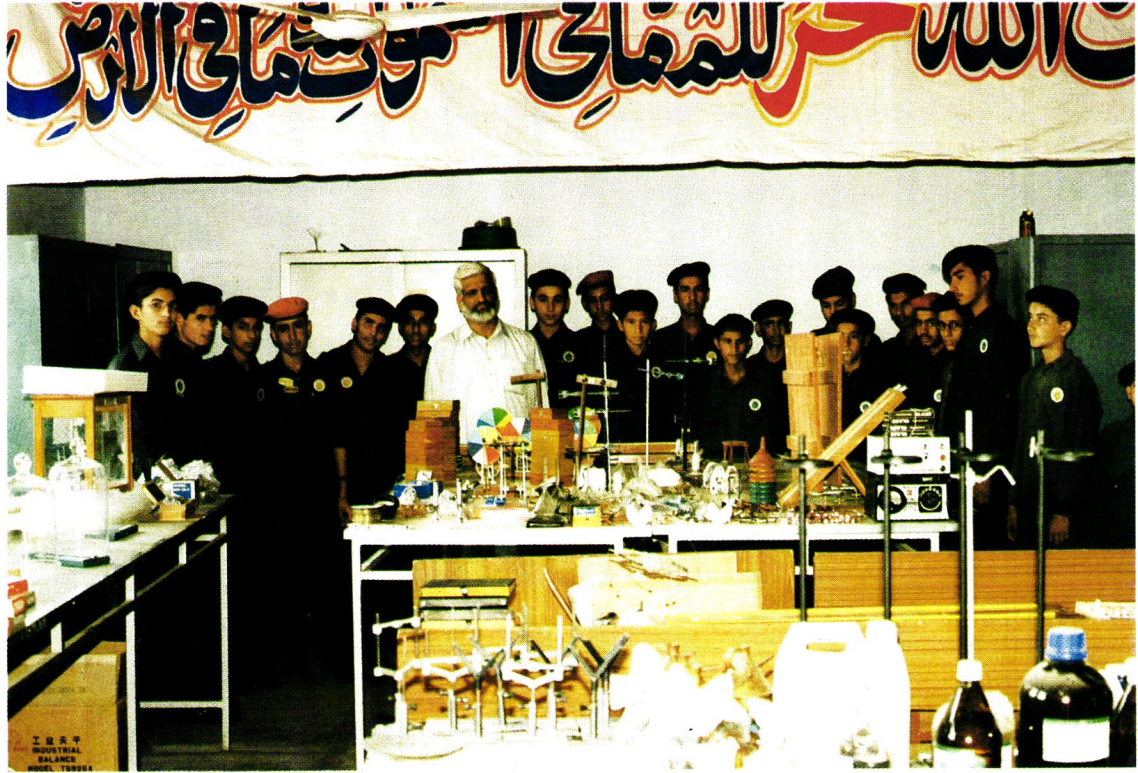
No.	Name of Board	Amount
1.	BISE, Faisalabad	Rs.10,000/-
2.	BISE, Gujranwala	Rs.10,000/-
3.	BISE, Saidu Sharif, Swat	Rs.10,000/-
4.	BISE, Abbottabad	Rs.10,000/-
5.	BISE, Hyderabad	Rs.10,000/-
6.	BISE, Multan	Rs.10,000/-
7.	BISE, Karachi	Rs.10,000/-
8.	BISE, Sargodha	Rs.10,000/-
9.	FBISE, Islamabad	Rs.10,000/-
10.	BISE, Bahawalpur	Rs.10,000/-
11.	BISE, Mirpur	Rs.10,000/-
12.	BISE, Karachi	Rs.10,000/-

An additional amount of Rs.1, 08,000/- was also released on account of prize money to the winner students of Intra-Board Science Olympiad.

III. PLANNING AND DEVELOPMENT WORK

In pursuance of recommendations of the National Commission for Science and Technology (NCST) in its meeting held on 2nd May, 2000, the Ministry of Science and Technology initiated a large number of projects for the economic development of the country. The Government for funding of NCST programmes earmarked a sizable amount.

All the S&T Organizations under the administrative control of the Ministry of Science and Technology were encouraged to submit project PC-1s in areas relevant to their respective domain of activities. Accordingly, Pakistan Science Foundation submitted 12 project PC-1s to the Ministry of Science and Technology for funding under the block allocation for NCST programmes.



Donation of Science Equipments and Computers to Schools by PSF.

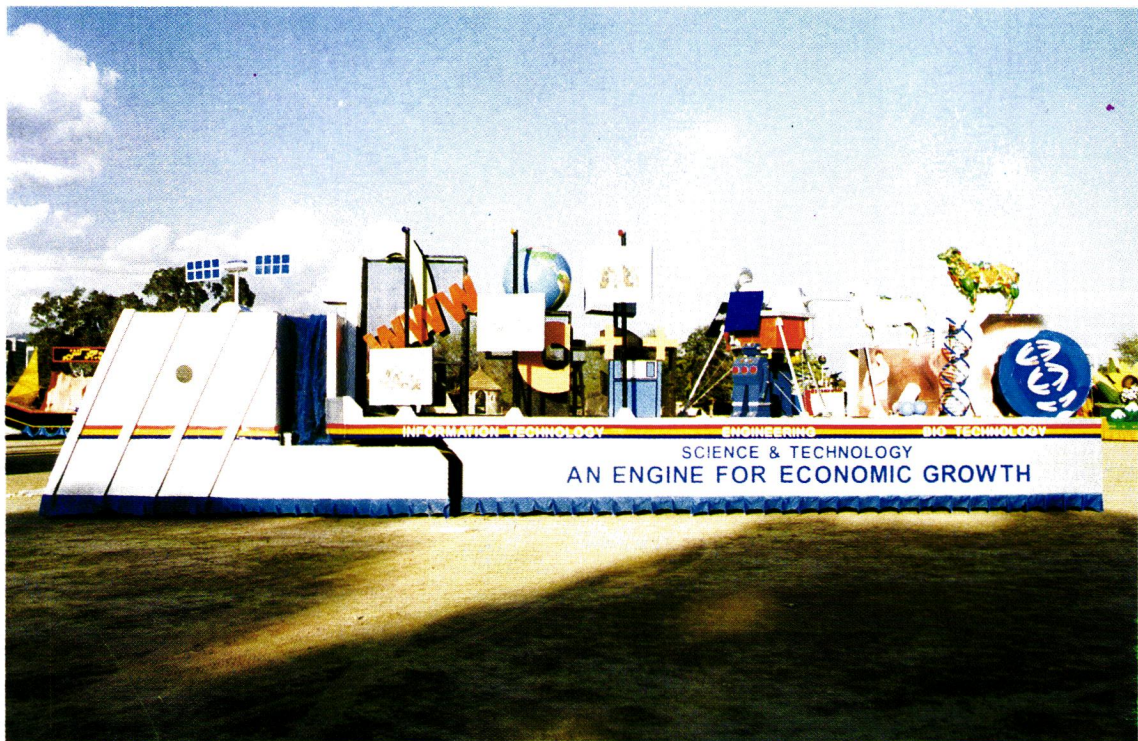




Science Exhibition at Govt. Girls High School, Phulerwan, Distt. Sargodha.



Science Exhibition at Govt. Boys High School ,Phulerwan, Distt. Sargodha.



A view of Science & Technology Float for the National Day Parade on 23rd March 2001.

After processing through various Committees in the Ministry, the following eight projects were approved by the DDWP of MoST at a total cost of Rs. 173.812 million.

<u>S.No.</u>	<u>Name of Project</u>	<u>Total Cost (Rs.)</u>
1.	Support to Scientific Societies in Pakistan.	39.00 million
2.	Participation of Scientists and Technologists in International Conferences, Seminars and Workshops.	17.00 million
3.	Funding of Scientific and Technological Research in Universities and other R&D Organizations.	39.00 million
4.	Printing of Scientific Monographs and Technical Books Written by Pakistani Scientists.	33.25 million
5.	Popularization of Science in Rural Areas	22.212 million
6.	Establishment of National Science and Technology Database/ Information Network at PASTIC.	39.70 million
7.	Bio-diversity of Pakistan – Databases and Global Networking.	11.150 million
8.	Establishment of Virtual Orientation Gallery at PMNH	8.50 million
Total approved cost.		173.812 million

Development funds amounting to 28.344 million were received by the Foundation against projects at S. No.1, 2, 6, 7 and 8.

Brief description and objectives of the approved projects are as under:

i) Support to Scientific Societies in Pakistan

There are many Scientific Societies and Learned Bodies, disciplinary as well as general, in the country that are actively engaged in the promotion of Science and Technology. They are rendering their services by holding conferences, seminars, workshops on various scientific topic and publication of scientific journals and periodicals in their respective fields. These Societies and Learned Bodies, however, do not have any regular source of funding/income for the support of their activities. Moreover, they work in isolation and do not have foreign exchange to develop linkages with similar bodies in the advanced countries to expose themselves to the latest S&T developments.

Pakistan Science Foundation does provide grants-in-aid to some of the Societies and Learned Bodies for their activities and for the publication of few scientific journals but the number of societies and journals supported and the amounts given to each society is negligibly small. Thus the PC-1 was meant to enhance financial support to the societies.

During the year, an amount of Rs. 43,56,000/- was released to different Scientific Societies as listed below.

S. No.	Name of the Society	Amount Released
1.	Pakistan Thalassaemia Welfare Society	Rs. 1,50,000/-
2.	Zoological Society of Pakistan	Rs. 6,50,000/-
3.	Pakistan Society of Nematologists	Rs. 2,26,000/-
4.	Soil Science Society of Pakistan	Rs. 5,00,000/-
5.	Pakistan Physical Society	Rs. 5,00,000/-
6.	Pakistan Society of Biochemistry & Molecular Biology	Rs. 8,00,000/-
7.	Pakistan Society for Semiconductor Science & Technology	Rs. 1,00,000/-
8.	Pakistan. Physiological Society	Rs. 3,00,000/-
9.	Islamic Society of Statistical Sciences	Rs. 1,10,000/-
10.	Pakistan. Nuclear Society	Rs. 1,50,000/-
11.	The Chemical Society of Pakistan	Rs. 5,00,000/-
12.	Pakistan Botanical Society	Rs. 1,00,000/-
13.	Pakistan Society of Microbiology	Rs. 2,40,000/-
14.	Council of Social Sciences Pakistan	Rs. 30,000/-
Total:		Rs. 43,56,000/-

ii) Participation of Scientists and Technologists in International Conferences etc.

One of the functions assigned to Pakistan Science Foundation under its charter is to provide financial support to scientists for presentation of their research papers in international conferences and seminars. Accordingly, the Foundation has been providing financial assistance to scientists for this purpose but the budget allocation under this head has been very meager (Rs. 0.20-0.25 million per year). Thus, so far only 168 scientists have been provided travel grants amounting to Rs.4.20 million since 1973. Therefore this project was initiated to support the activity and encourage participation of scientists in international conferences.

iii) Funding of S&T Research in Universities and other R&D Organizations

This project aims to strengthening of Scientific and Technological Research activities in the universities and other R&D organizations by providing more funds to the projects, which are goal oriented and aimed at solving industrial/economic problems of the country.

iv) Printing of Scientific Monographs and Technical Books Written by Pakistani Scientists.

The main objectives of the project are; a) to encourage Pakistani scientists to write good quality scientific monographs and technical books, b) to ensure availability of scientific books and reference material at cheaper rates to science students as well as scientific research workers, c) to encourage reading trend among students of science.

v) Popularization of Science in Rural Areas.

Pakistan Science Foundation has five Science Caravans but these Units are not sufficient to cover the whole spectrum of population. The present projects was, therefore, prepared with a view to construct and equip four more Science Caravans for holding science exhibitions in schools of rural areas. The objectives of the project are to:

- Stimulate interest of students in science through the display of attractive scientific models, charts and exhibits;

- Disseminate information on the achievement and accomplishments of science and portray the blessings and facilities provided by science and technology which are being enjoyed by us in our every day life;
- Stimulate the interests of students in the natural science phenomena by arranging scientific film shows on topics of interest to common man;
- To arrange planetarium shows to explain the astronomical concepts;
- To arouse interest of students for science and technology and to create in them a thirst for acquiring more knowledge;
- To inculcate in the minds of students the idea of solving every day problems by application of science and technology, such as use of mechanized agriculture practices, pest management and control, problems related to hygiene and sanitation, scientific management of human and animal diseases etc.

vi) Establishment of National Science and Technology Database/ Information Network at PASTIC

The main aim of this project is to develop an effective information network for science, engineering and technology, having adequate links with international information centers for providing the services to R&D workers and other interested agencies, speedy access to current knowledge in different S&T fields. Such services are concerned with the acquisition, analysis and dissemination of all information wherever available from national and international sources of interest to scientist and technologist. The service has to be use oriented and should have the means to anticipate and ascertain the particular interest of researchers so as to supply the relevant information to them expeditiously.

vii) Biodiversity of Pakistan – Databases and Global Networking

The objectives of this project include automation and networking of the PMNH for quick access and retrieval of Biodiversity records and to make available information on plants, animals, rocks, minerals and fossils of Pakistan on the Internet. COMSATS (CIIT) has been appointed as consultants of the project. Computer labs and server-room have been set up and networking of the PMNH building is nearing completion. A large number of natural history specimens and field data from all parts of Pakistan have already been collected. After development of necessary software, data entry will be initiated next year.

viii) Establishment of Virtual Orientation Gallery at PMNH

The objectives of this project are to computerize all the natural history exhibits of Pakistan Museum of Natural History and make them accessible on the computer terminals of the Museum. The browser will be able to navigate through the exhibit halls and galleries, zoom on any individual plant animal or rock specimen on display and get its details. Furthermore, there will be additional information on the natural history of Pakistan in particular and the world in general. Computer hardware, digital camera and accessories were purchased during the report period.

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.

Pakistan Museum of Natural History remained engaged in the collection, curation and preservation of natural history specimens and research on flora, fauna and geology of Pakistan. The scientists of the three Divisions of PMNH viz., Botanical Sciences, Earth Sciences and Zoological Sciences Divisions carried out 18 field tours to various localities of Sindh, Punjab, NWFP, Northern Areas and AJK. About 20000 natural history specimens, comprising of plants, animals, rocks, minerals and fossils were collected. The collected material was curated and preserved in the reference collection of PMNH. Besides samples, numerous photographs showing details of the area of study were also taken. Research was conducted on various aspects of the natural history of the country, which resulted in the production of many research articles. During this period, 10 research articles were published in national and international journals.

PMNH continued international collaboration on research with various Universities/ Research Organizations of USA, France, Japan, Canada and Switzerland. Expert help was provided to agencies like IUCN, WWF, UNESCO, etc. Several university students were guided in their research work.

The preparation of new display dioramas and other exhibits of PMNH Display Halls was continued. The work was carried out by Design section, with technical assistance from the scientists of the three Divisions of PMNH.

Details of Division-wise activities of PMNH are given below.

1. BOTANICAL SCIENCES DIVISION (BSD)

a) Reference Collection

During the report period, six field trips were undertaken by the scientists of PMNH to various localities of Northern Area of Pakistan, Azad Jammu & Kashmir, North West Frontier Province and Punjab to collect higher and lower plant specimens along with ecological and ethnobotanical data. A total of 3500 plant specimens comprising of flowering plants, algae and fungi were collected and added to the reference collection of the Museum.

b) Laboratory Work

About 2500 higher and 3000 lower plant specimens were preserved and mounted. Some 25 water samples were analyzed for its physico-chemical properties. Moreover, microphotographs of about 1000 algal samples were produced. Similarly, 1500 higher and 1400 lower plants were identified and several tree trunks were inoculated with Oyster mushroom spawn for cultivating the mushroom.

c) Extension Work and Service to other Organizations

- Many student groups from various institutions were provided guided tours to the laboratories and reference halls of the Division.
- Collaborative research project of Natural History Museum with China, Japan, International Development Research, Canada, Global Strategy for Plant Conservation, and World Wildlife Fund (WWF).
- Provided a list of Medicinal Plants of Pakistan to the Ministry of Science & Technology, Government of Pakistan.
- Guided 8 M. Phil. students from Quaid-i-Azam University, Islamabad and University of Azad Jammu & Kashmir, Muzaffarabad for carrying out their research work.

d) Publications

Bhatti, G.R., Qureshi, R & S.M. Shah, (1998) "Ethnobotany of *Calotropis procera* with special reference to the people of Nara Desert". Scientific Sindh, 5: 13-22.

Ahmad, S. (1999). "Family Scrophulariaceae in Islamabad, Pakistan". J. Sci. Tech. 23: 53-57.

Awan, M.R., N.A. Raja & M. Idris. (2001), "Cluster analysis of vegetation of Swat District". Pak. J. Sci. Ind. Res. 4(1): 42-51.

Leghari, M.K. and Leghari, M.Y. (2000). "Ecological study of Algal Flora of Neelum River, Azad Kashmir". J. Drain. Water Manag. 4(1,2): 45-49.

Masud-ul-Hasan, M.K. Leghari, M. Sher & K. Sultana (2000). "Taxonomic studies of Desmids I: genus *Closterium* from Lahore". Sindh Univ. Res. Journ. 32(1): 1-8.

2. ZOOLOGICAL SCIENCES DIVISION (ZSD)

a) Reference Collection

During the period under report the zoologists of the PMNH undertook 5 field trips to different localities of Northern Pakistan, Azad Jammu & Kashmir, North West Frontier Province and Punjab. A total of 15600 zoological specimens were collected which comprise of 12060 invertebrates and 3577 vertebrates. These specimens were preserved in the PMNH reference collection. Some 1500 photographs of habitats and insects were also made.

b) Laboratory Work

The ZSD curated and catalogued 7800 zoological specimens, including 2000 insects. Identified about 4000 invertebrate and 2800 vertebrate specimens. It mounted 610 insects, stuffed 32 birds and 3 large mammals. Processed skin of 4 mammals and 35 birds. The skeleton of whale was articulated.

c) Extension Work and Service to other Organizations

- Provided help to IUCN Environmental Rehabilitation in NWFP & Punjab (ERNP) for the preparation of management plan of Ayubia National Park.
- Provided a revised plan to UNESCO to designate Palas Valley, NWFP as a Biosphere Reserve. Also gave technical assistance to UNDP on development of Fisheries in Azad Jammu & Kashmir.

- Supervised a British student in his research on butterflies. Conducted M. Phil examinations of 2 students of Quaid-i-Azam University, Islamabad.
- Guided tours to the Division were provided to various student/teacher groups of different Colleges and Universities.
- Provided technical assistance for Taxidermy at the Zoo of Aiwan-i-Sadar.

d) Publications

Hasan, S.A. and Ahmad, I. (1999). "A new species of *Plautra* Stal (Heteroptera: Pentatomoidae: Pentatominae: Antestini) from the Malaysia and Indonesia with reference to key to genus from Indo-Malayan subregion and their relationship." *Proc. Pak. Congr. Zool.* **19**: 58-67.

Khatoon, S. (1999). "Scorpions of Pakistan (Arachnida: Scorpionida)". *Proc. Pak. Congr. Zool.* **19**: 207-225.

Rafique, M. (2000). "Fish diversity and distribution in Indus river and its drainage system." *Pak. J. Zool.* **32(4)**: 321-332.

Rafique, M. (2000). "Comparative karyomorphology of three fish species belonging to the genus *Barilius* (Cyprinidae) from Pakistan." *Pak. J. Zool.* **32(4)**: 337-342.

3. EARTH SCIENCES DIVISION (ESD)

a) Reference Collection

The Geologists of PMNH carried out 7 field tours to various localities of Kot Diji, Sukkur, Rohri, Khairpur, Nara Desert, Dera Ghazi Khan, Khewra, Choa Saidan Shah, Chitral, Malakand, Zinda Pir and Kohistan. Numerous geological samples such as rocks, minerals and fossils were collected. Some areas were excavated for locating geological/fossil samples. The collected material was added to the reference collection of PMNH.

b) Laboratory Work

Geological material was examined to find out and separate samples of rocks, minerals and fossils and to identify and catalogue them. About 370 megascopic rock samples were identified. Numerous sediment samples were collected and washed to separate micro and mega vertebrate and invertebrate fossils. Some 200 thin sections of rocks/minerals were prepared and studied and petrographic studies of two samples were carried out. X-ray diffraction studies of 27 clay minerals were conducted. Some 160 samples of rocks, minerals and cherty cores were identified.

c) Extension Work and Service to other Organizations

- A large number of student groups from various schools and colleges were guided through the labs and reference material of the Division.
- Identified many rock, mineral and fossil samples brought by various visitors, including students, researchers, professionals, etc.
- Collaborated with University of Wisconsin, University of Arizona, Northern Ohio University, Harvard University, USA, University of Montpellier, France, Swiss Institute of Technology, ETH, Switzerland and National Science Museum, Tokyo on geological research.

d) Publications

Zeilinger, G., Burg, J.P, Chaudhry, M.N., Dawood, H., Hussain, S.S. (2000). Fault system and paleo-stress tensors in the Indus Suture Zone, NW Pakistan. *J Asian Earth Sci.* **18**: 547-559.

In addition, four abstracts in the Abstract Book of the 4th National Geolog. Soc. Pak, 2001 were published.

4. PUBLIC SERVICES DIVISION (PSD)

a) Museum Display & Maintenance

Detailed work on panels, background-painting, fore-ground-layout, model-making, write-ups, identification keys, calligraphy, etc. on various dioramas/exhibits like Children Discovery Room, Ocean Diorama, Salt Range Diorama, Prehistoric Wildlife, Gemstones, Biodiversity, etc. were carried out. Moreover 72 photographs of mountains and collected stones/rocks from the Salt Range for the Salt Range diorama were prepared. Initiated work on the project on Virtual Orientation Gallery. Prepared more than 1000 photographs of the new PMNH building. Carried out installation of spotlights in the display area. Audio-visual room and photo studio were maintained.

b) Educational Activities

- More than 5000 students from various schools and colleges were provided guided tour to the Museum.
- Several student groups were shown films on Natural History in the audio-visual hall of the PMNH.

c) Extension Work and Services to other Organizations

- Prepared more than 1000 photographs of birds, butterflies, insects and plants for Pakistan Television Corporation.
- Produced 300 photographs of Medicinal Plants for WWF book on Medicinal Plants.
- Prepared layout plan and cost estimates for construction of Science Corner at Children Library Complex, Lahore.
- Designed a shield for Pakistan Academy of Sciences.

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 subsidiary of Pakistan Science Foundation.

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

The National Centre is housed in its own building situated in the Quaid-i-Azam University Campus, Islamabad. It has four Sub-Centres at Karachi, Lahore, Peshawar and Quetta.

AIMS & OBJECTIVES

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

TECHNICAL SERVICES AND ACTIVITIES

During the year 2000-2001, the activities undertaken by PASTIC are briefly described below.

1. DOCUMENT PROCUREMENT AND SUPPLY SERVICE

Under the Document Procurement and Supply Service, queries were received from all R&D organizations for supply of reprints of research articles/conference papers and reports that are procured either from local sources or from abroad. A total of 2128 S&T documents were procured and supplied against 2605 requests received from scientists and researchers.

2. BIBLIOGRAPHY SERVICE

References from International databases on CD-ROM are supplied to users according to their research topics on request. Against 589 orders received, 28454 references on various S&T topics were collected and supplied to 589 researchers.

3. CURRENT CONTENT SERVICE

Under the Current Contents Service, table of contents from 77 S&T Journals on Chemistry, Biology, Physics, Computation, Earth Sciences, Mathematics and Medicine were provided to 380 Scientists.

4. ABSTRACTING AND INDEXING SERVICE

PASTIC publishes a quarterly journal "Pakistan Science Abstracts (PSA) which contains abstracts of research articles published in recent S&T journals of Pakistan.

During the report period, following volumes were finalized and composed.

- i) PSA (1997) Vol. 37 No. 1-4 was published and distributed among Institutions/Individuals on exchange/subscription and gratis bases.
- ii) PSA (1998) Vol. 38 No. 1-4 consisting of 412 abstracts, 1934 keywords and 1107 author entries was compiled and sent for printing.
- iii) About 210 abstracts were scanned from 32 journals for PSA 1999, classified according to UDC schedule. Moreover 25 abstracts of research articles were written out and 1266 keywords were prepared.
- iv) About 30 new Pakistani journals were identified for revised edition of Directory of S&T Periodicals of Pakistan.
- v) A write up was prepared for Ministry of Science & Technology's website to be launched soon, and proof reading of 17 organization's write up was also done.
- vi) One-day workshop on "New Vision and New Strategies for Revamping and Strengthening PASTIC and its Activities" was organized.
- vii) A development project entitled "Establishment of National Science and Technology Database/Information Network of PASTIC" costing Rs.39.70 million was approved by the Government of Pakistan.
- viii) Proposal for the screening of S&T libraries of Pakistan was prepared for the preparation of Union Catalogue on CD-ROM and 350 Libraries were identified for the purpose.
- ix) Chief Editor, PASTIC visited 22 Libraries in Lahore, 11 in Karachi, 15 in Quetta and 15 in Peshawar and collected/received serial holding record of 26 libraries. Moreover 66 libraries were requested to send serial holding data of their organizations/institutions.

5. UNION CATALOGUE

During the report period, updating of Union Catalogue has been continued and data from 34 libraries was received. Moreover, data from 62 libraries was updated while proof reading of data of 59 libraries was proof read.

6. PASTIC NATIONAL SCIENCE REFERENCE LIBRARY

About 624 issues of various S&T periodicals, 72 documents and 154 books were received in the libraries of PASTIC National Center Islamabad and Karachi Sub-Center. Whereas 677 references were supplied to researchers/scientists.

The subscription of following databases on CD-ROM was renewed.

- i) Life Sciences, ii) POLTOX, iii) PROQUEST, iv) Medline and v) Physical, Chemical & Earth Science Abstracts.

7. REPROGRAPHIC SERVICE

The Reprographic Section of PASTIC has facilities ranging from photocopying to offset printing. During the report period, about 8,67,870 impressions, 4,444 pages and 1,71,243 copies were produced by the Reprography Unit against 92 jobs received from 16 organizations.

8. COMPUTERIZATION ACTIVITIES

During the report period, Computer Section of the PASTIC undertook following activities.

- About 8152 pages laser printed, 17 color printouts and 2315 D.M pages were composed for Quaid-i-Azam University, PSF, TIPS, MoST, COMSATS, PMNH, and PCST.
- Work on the establishment of Computer Lab. carried out for one of PASTIC development project entitled "Establishment of National Science and Technology Database/Information Network at PASTIC".
- A book entitled "Words from a Scientist" written by the Chairman, PSF was published.
- Software/Hardware services were provided to other S&T organizations.

9. INTERNATIONAL LIAISON

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

- a) **INFOTERRA:** INFOTERRA is the United Nation Environment Programme's Global Information Network based at Nairobi comprising of National Focal Points in about 200 member states. INFOTERRA provides information by searching the database on Environmental Information Sources it has developed with the assistance of the NFPs. All Information services such as articles service, bibliographic service, reference and referral services are supplied free of charge through INFOTERRA. During the report period, the following activities were undertaken.

- i. Provided information on “Insecticide degrading bacteria, effect of chromium on fish, effect of lead on birds reproduction, solid waste & its effect on environment, air & noise pollution & its effect on environment, ambient air pollution, bacterial water pollution caused by industrial wastes, ion exchange of AG & V, SPM in air pollution, ozone determination in water, Neurotoxic effects of pesticides on human beings, effect of different fertilizers on yield & environmental health, effect of soil on leeching of herbicides, environmental sciences, analysis of toxic metals in cigarettes, industrial wastes, NDVI & drought prediction, agro climatic zoning of agricultural practices, offensive odor, Bioclimatic architecture and heating system in residential area, ventilation in bioclimatic architecture, Bioclimatic architecture of hotels, SPM sources, SPM techniques, Occupational health, effects of Industrialization, UV water disinfections, ozone survey of biomonitoring, drinking water quality, CBG, petrol, catalyst, organic Waste, microbiological analysis of drinking water, isolation of bacteria from drinking water and chemical profiling of underground water, global warming, The role of *Panthera Pardus* on the rural economic of National Park, isolation & identification of bacteria from air and water, fish toxicology and metals in cosmetics and BT Toxin “to 56 clients.
- ii. Prepared a Country Environmental Profile and National Environment outlook statement of Pakistan, which is loaded to the UNEPNET Global Environment Portal, developed by NFP of INFOTERRA.

b) CEHANET: The World Health Organization’s Centre for Environmental Health Activities Information network gathers information about published material on environmental health with the help of NFPs, which are 22 in number. Information is then provided through the bibliographic database on environmental health documents, which can be obtained from the member states. During the report period following activities were undertaken.

- i About 30 records were added to Environmental Health Documents Database.
- ii As much as, 1003 Environmental Health Documents, 59 Environmental Institutions and 303 Environmental Professionals lists were prepared for record.

c) ASTINFO: It is a UNESCO supported network for the exchange of experience and information in Science and technology in Asia and the Pacific. It aims to build and strengthen the information infrastructure in the member states. Under this network, PASTIC is responsible for distributing the UNESCO developed software package CDS/ISIS and for providing training on this package.

During this period following activities were undertaken.

- i. WINISIS Package was provided to University of the Punjab, Lahore, School of Information Technology, Geological Survey of Pakistan, Quetta, Planning and Development Division, Islamabad, M.M.U.P Library, Pakistan Science Foundation, Council of Islamic Ideology and European Commission Delegation.
 - ii. ASTINFO newsletters were distributed to S&T organizations in Pakistan.
- d) SAARC Documentation Centre:** SDC was established in 1994 for facilitating exchange of information amongst the SAARC Member States. The following information activities were undertaken during the period under report.

- i. Proceedings entitled “ Four Days Workshop on Information and Communication Technology” consisting of 253 pages was compiled and published.
- ii. About 58 Pakistani journals on Agriculture were identified for inclusion in the revised edition of “Directory of Agricultural Periodicals of SAARC Countries” to be compiled by SAIC, Dhaka, Bangladesh.
- iii. Nominations regarding Master Level Course on “Information Sciences” were processed.

e) Miscellaneous

- i. Articles for a book entitled “50 Years of Natural History of Pakistan” were composed.
- ii. Web site of Ministry of Science & Technology is to be launched by MoST for which write ups received from 17 organization were modified according to the web page format.
- iii. Information provided on Experts Biodata and information on PASTIC to MoST in connection with TCDC Information referral services the wide initiative.
- iv. Prepared two write ups on training courses to be organized by PASTIC under the project entitled “Establishment of National Science & Technology Database/Information Network at PASTIC.
- v. About 250 letters were sent to different organization for inviting nominations for participation in the workshop organized by PASTIC on “Information Handling for Promotion of E-Business” 2 week workshop for Middle Management Women from 23-July to 4 August, 2001 in Islamabad, under one of its project entitled “Establishment of National Science and Technology Database/Information Network at PASTIC.
- vi. Brochure composed for the workshop.

10. TECHNOLOGICAL INFORMATION PROMOTION SYSTEM (TIPS)

Technological Information Promotion System based at PASTIC has been regularly publishing weekly and Fortnightly bulletins in Pakistan which provides up-to-the-minute and detailed information on technology and trade opportunities. It covers fourteen 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) Bio-Technology (ix) Textiles (x) Fisheries (xi) Building Materials (xii) Chemicals (xiii) Mining (xiv) Packaging.

Tips has provided 586 Technological abstracts from 42 countries to its subscribers in Pakistan. Similarly, information from fifty-five Pakistani companies about their products and services was disseminated to 50 TIPS member countries.

TIPS in collaboration with PSF organized “Computer & Office Equipment Exhibition” at Rawalpindi 16-17, September 2000. “White Meat Journal” Vol. 4, No. 2&3, and Vol. 5, No. 1, were published.

Information was also collected from Lahore and Faisalabad for next issue of “White Meat Journal”.

CHAPTER-2

ORGANIZATION AND ADMINISTRATION

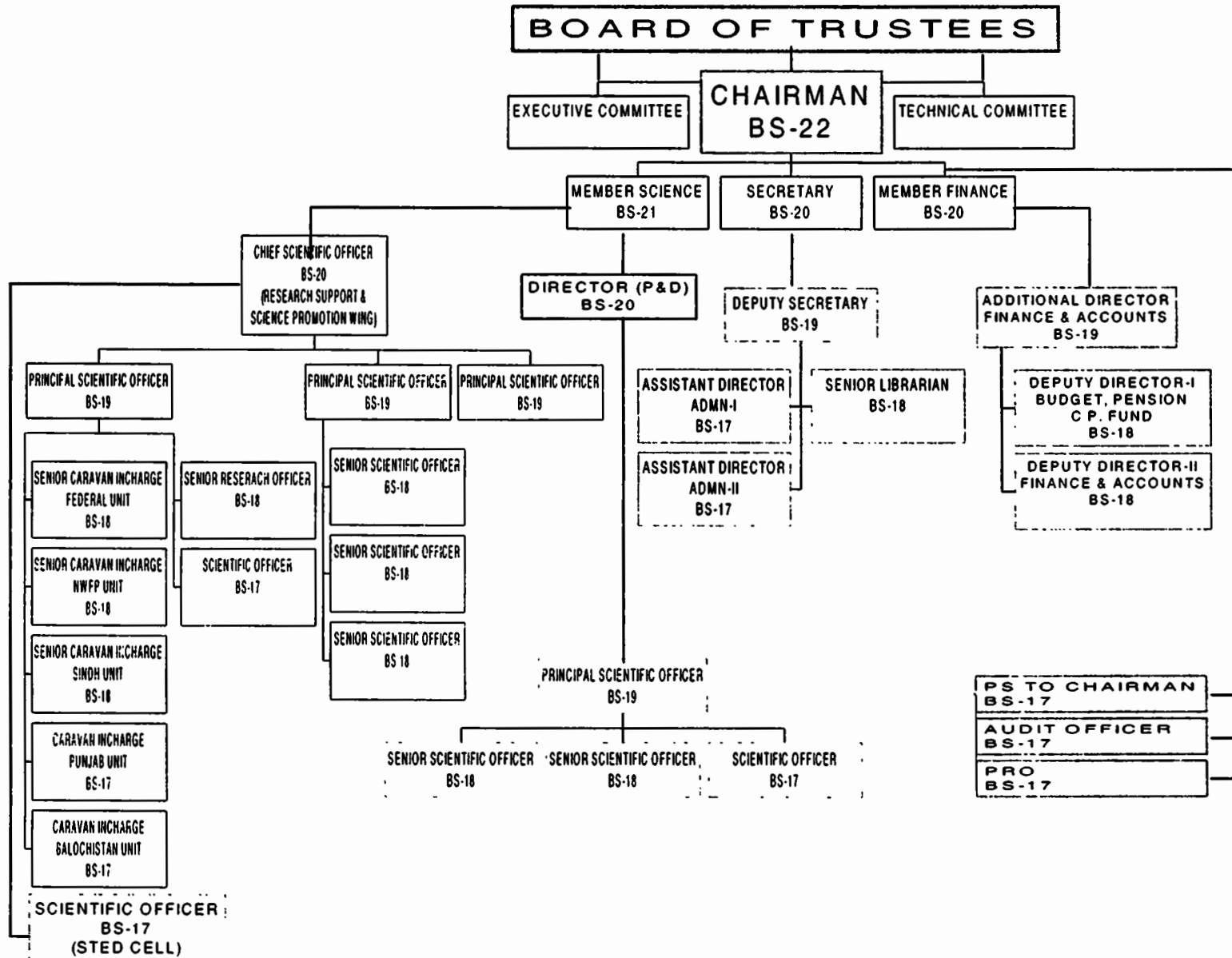
The organizational structures of the Pakistan Science Foundation, Pakistan Museum of Natural History and Pakistan Scientific & Technological Information Centre are given on the forthcoming pages. The sanctioned strength of staff in the Foundation, PMNH & PASTIC during the period was as under:

PAKISTAN SCIENCE FOUNDATION (PSF)

S.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	5
7.	Senior Scientific Officer	4
8.	Senior Research Officer	1
9.	Deputy Director (F&A)	1
10.	Deputy Secretary	1
11.	Senior Accounts Officer	1
12.	Public Relations Officer	1
13.	Accounts Officer	1
14.	Assistant Director (Admn.)	1
15.	Research Officer	1
16.	PS to Chairman	1
17.	Librarian	1
18.	Scientific Officer	2
19.	Internal Audit Officer	1
20.	Senior Caravan Incharge	3
21.	Caravan Incharge	2
22.	Graphic Artist	2
23.	Administrative Officer	1
24.	Translating Officer	1
25.	PA to Chairman	1
26.	Mechanic for Instruments	1
27.	Cashier-cum-Accountant	1
28.	Accountant	1
29.	Supporting Staff	131
	Total:	171

PAKISTAN SCIENCE FOUNDATION

ORGANIZATIONAL CHART

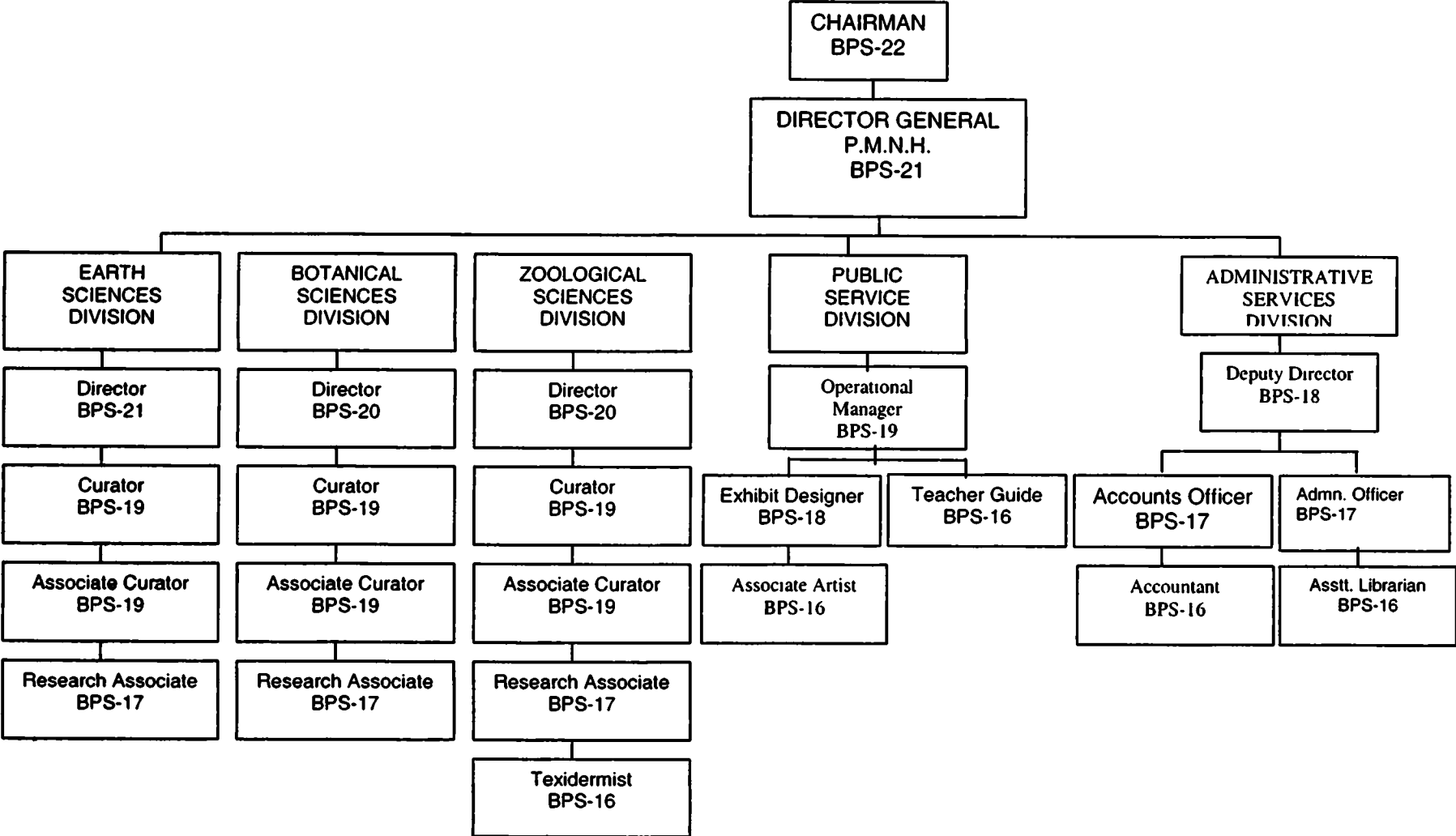


PAKISTAN MUSEUM OF NATURAL HISTORY (PMNH)

S.No.	Designation	Number
1.	Director General	1
2.	Director (Earth Sciences Division)	1
3.	Director (Zoological Sciences Division)	1
4.	Director (Botanical Sciences Division)	1
5.	Curator	6
6.	Operational Manager	1
7.	Associate Curator	10
8.	Exhibit Designer	1
9.	Deputy Director (Admn.)	1
10.	Accounts Officer	1
11.	Research Associates	19
12.	Asstt. Librarian	1
13.	Taxidermists	2
14.	Associate Artist	2
15.	Teacher Guide	1
16.	Admn. Officer	1
17.	Accountant	1
18.	Supporting Staff	85
	Total:	136

PAKISTAN MUSEUM OF NATURAL HISTORY

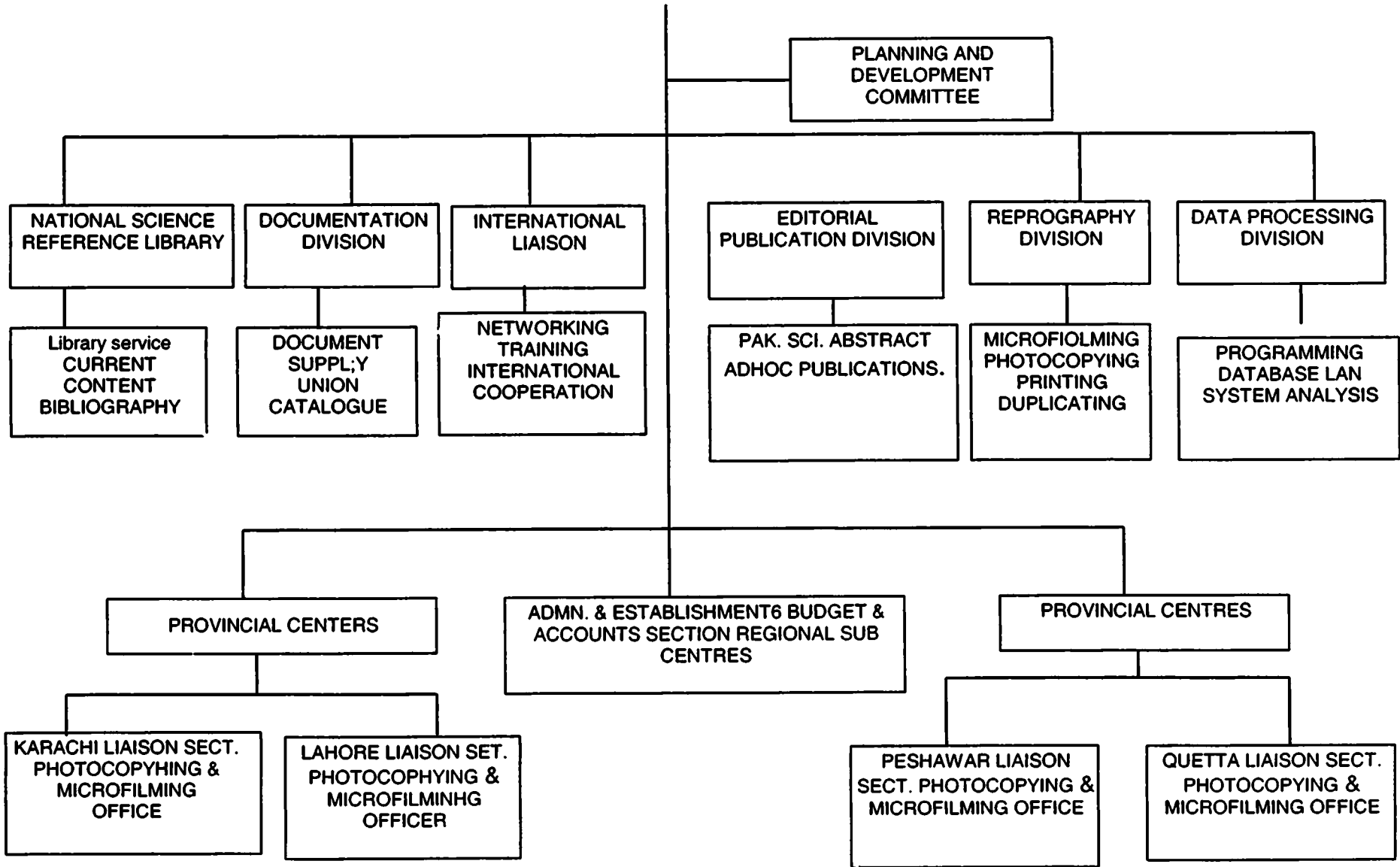
ADMINISTRATIVE ORGANIZATIONAL CHART



**PAKISTAN SCIENTIFIC AND TECHNOLOGICAL INFORMATION
CENTRE (PASTIC)**

S.No.	Designation	Number
1.	Director General	1
2.	Deputy Director (Doc)	1
3.	Deputy Director A&E	1
4.	Chief Liaison Officer	2
5.	Sr. Translating Officer	1
6.	Manager Reprographic Unit	1
7.	Sr. System Analyst	1
8.	Sr. Documentation Officer	1
9.	Chief Editor	1
10.	Sr. Information Officer	1
11.	Sr. Bibliographic Officer	1
12.	Sr. Librarian	1
13.	Sr. Accounts Officer	1
14.	Scientific Information Officer	3
15.	Bibliographic Officer	1
16.	System Analyst	2
17.	Manager Technology Information	1
18.	Photographic Officer	1
19.	Printing Officer	1
20.	Graphic Artist	1
21.	Patent Officer	1
22.	Translating Officer	1
23.	Administrative Officer	2
24.	Liaison Officer/Officer Incharge	2
25.	Accountant	1
26.	PA to Director General	1
27.	Superintendent (R.U)	1
28.	Asstt: Scientific Information Officer	5
29.	Asstt: Doc. Officer	3
30.	Asstt: Programmer	4
31.	Asstt: Manager (R.U)	1
32.	Supporting Staff	108
Total:		154

ORGANIZATIONAL STRUCTURE OF PAKISTAN SCIENTIFIC & TECHNOLOGICAL INFORMATION CENTRE



CHAPTER-3

PAKISTAN SCIENCE FOUNDATION FINANCIAL STATEMENTS JUNE 30, 2001.

AUDITORS' REPORT TO THE BOARD OF TRUSTEES

We have audited the accompanying balance sheet of the PAKISTAN SCIENCE FOUNDATION as at June 30, 2001 and the related receipt and payment account together with notes forming part thereof for the year then ended. These financial statements are the responsibility of 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 the 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 test basis, supporting the amounts and disclosures in financial statements. An audit also includes assessing the accounting principles used and significant estimates made by the 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, 2001 and of the results of its activities for the year then ended.

S.M. Masood & Co.
S.M.MASOOD & CO.,
Chartered Accountants



ISLAMABAD

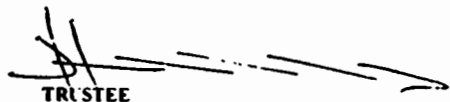
DATED: 26 Nov. 2001

**PAKISTAN SCIENCE FOUNDATION
BALANCE SHEET
AS AT JUNE 30,2001**

	Note	2001 Rupees	2000 Rupees		Note	2001 Rupees	2000 Rupees
GRANT AND LIABILITIES				PROPERTY AND ASSETS			
GENERAL FUND	3	24,296,026	25,215,251	TANGIBLE FIXED ASSETS	6	22,243,829	23,250,022
RESEARCH SUPPORT GRANT	4	45,124,982	47,956,517	RESEARCH PROJECTS IN PROGRESS		45,124,982	47,956,517
				LONG TERM DEPOSITS	7	1,617,195	1,617,195
CURRENT LIABILITIES				CURRENT ASSETS			
Accrued and other liabilities	5	688,004	682,034	Advances and prepayments	8	611,621	462,897
				Cash and bank	9	511,385	567,171
						1,123,006	1,030,068
		<u>70,109,012</u>	<u>73,853,802</u>			<u>70,109,012</u>	<u>73,853,802</u>

AUDITORS' REPORT TO THE BOARD OF TRUSTEE IS ANNEXED.

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


TRUSTEE


CHAIRMAN

**PAKISTAN SCIENCE FOUNDATION
RECEIPTS AND EXPENDITURE ACCOUNT
FOR THE YEAR ENDED JUNE 30, 2001**

	NOTE	2001 Rupees	2000 Rupees
RECEIPTS			
Grant from Federal Government		27,370,000	30,733,000
 EXPENDITURE			
Scientific functions	10	10,082,748	14,394,983
Administrative expenses	11	18,206,477	18,331,782
		28,289,225	32,726,765
TRANSFERRED TO GENERAL FUND		(919,225)	(1,993,765)

AUDITORS' REPORT TO THE BOARD OF TRUSTEE IS ANNEXED.

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


TRUSTEE


CHAIRMAN

**PAKISTAN SCIENCE FOUNDATION
NOTES TO THE ACCOUNTS
FOR THE YEAR ENDED JUNE 30, 2001**

1. BACKGROUND AND OBJECTIVES

Pakistan Science Foundation is a statutory organization established under Pakistan Science Foundation Act, 1973 on the 2nd day of February 1973. The main objects of the its establishment are 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 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's depreciation is charged on the assets acquired during the year and no depreciation is charged on the disposals.

	Note	2001 Rupees	2000 Rupees
3 GENERAL FUND			
Balance as on July 01,		25,215,251	27,209,016
Deficit transferred from Receipts and Expenditure account		(919,225)	(1,993,765)
		<u>24,296,026</u>	<u>25,215,251</u>
4. RESEARCH SUPPORT GRANT			
Balance as at July 01		47,956,517	43,263,597
Add: Disbursements during the year	4.1	<u>6,167,066</u>	<u>9,951,996</u>
		54,123,583	53,215,593
Less: Projects completed during the year	4.2	<u>(8,998,601)</u>	<u>(5,259,076)</u>
		<u>45,124,982</u>	<u>47,956,517</u>

Comin

	2001	2000
	Rupees	Rupees
4.1 DISBURSEMENTS DURING THE YEAR		
Bio tech Sciences	560,503	-
Mathematics and Computer Sciences	1,000	-
Physical Sciences	616,974	584,039
Chemical Sciences	1,140,535	1,705,944
Biological Sciences	685,123	2,368,527
Earth Sciences	409,988	174,450
Environmental Sciences	126,767	1,004,837
Engineering Sciences	229,841	147,165
Agricultural Sciences	2,036,653	2,385,923
Medical Sciences	69,134	1,150,644
Institutional support	113,332	276,581
Board/Committee meetings	177,216	153,886
	<u>6,167,066</u>	<u>9,951,996</u>
4.2 PROJECTS COMPLETED DURING THE YEAR		
Physical sciences	2,116,030	887,076
Environmental Sciences	746,630	-
Chemical sciences	1,040,882	940,942
Biological sciences	1,586,100	1,613,843
Agricultural sciences	3,016,727	1,537,209
Medical sciences	492,232	280,006
	<u>8,998,601</u>	<u>5,259,076</u>
5. ACCRUED AND OTHER LIABILITIES		
Accrued expenses	192,124	152,562
Security deposits	40,495	40,495
Other liabilities	455,385	488,977
	<u>688,004</u>	<u>682,034</u>

6 TANGIBLE FIXED ASSETS

PARTICULARS	C O S T			RATE	D E P R E C I A T I O N			WRITTEN DOWN VALUE AS AT JUNE 30,2001
	AS AT	ADDITIONS	AS AT		AS AT	CHARGE FOR THE PERIOD	AS AT	
	JULY 01,2000		JUNE 30,2001		JULY 01,2000	JUNE 30,2001		
Lease hold land	3,713,418	-	3,713,418	-	-	-	-	3,713,418
Building	19,484,540	-	19,484,540	5%	4,407,775	753,838	5,161,613	14,322,927
Motor vehicles	3,706,809	-	3,706,809	20%	3,097,063	121,949	3,219,012	487,797
Office equipment	3,135,361	-	3,135,361	15%	2,016,534	167,824	2,184,358	951,003
Science equipment	1,786,275	218,000	2,004,275	15%	1,251,217	112,959	1,364,176	640,099
Furniture and fixture	1,957,216	3,200	1,960,416	6%	818,277	68,528	886,805	1,073,611
Air conditioners	194,974	-	194,974	20%	183,502	2,294	185,796	9,178
Library books and films	1,455,004	-	1,455,004	5%	409,213	-	409,213	1,045,791
Bicycle	680	-	680	20%	674	-	674	6
2001 (Rupees)	35,434,277	221,200	35,655,477		12,184,255	1,227,393	13,411,648	22,243,829
2000 (Rupees)	35,434,277	-	35,434,277		10,816,676	1,367,578	12,184,255	23,250,022

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	2001 Rupees	2000 Rupees
7. LONG TERM DEPOSITS		
Electricity (WAPDA)	1,472,195	1,472,195
Gas (SNGPL)	145,000	145,000
	<u>1,617,195</u>	<u>1,617,195</u>
8. ADVANCES AND PREPAYMENTS		
TO STAFF		
- for vehicle / motorcycle	142,135	204,637
- for house rent	451,831	244,453
	593,966	449,090
Prepaid insurance	17,655	13,807
	<u>611,621</u>	<u>462,897</u>
9. CASH AND BANK		
Cash at bank	495,880	529,472
UNESCO Coupons	15,505	12,630
Cash in hand	-	25,069
	<u>511,385</u>	<u>567,171</u>
10. SCIENTIFIC FUNCTIONS		
Research and support grant	6,167,067	9,951,996
Scientific societies and professional bodies	345,000	500,000
Scientific conferences, meetings and seminars	395,000	427,400
Operation of science caravan	1,280,859	980,524
International liaison	-	2,140
Science promotion activities	1,394,822	1,496,128
Science centre, herbaria clubs etc.	500,000	-
Science fair	-	1,000,000
Special scientific survey and collection of statistics	-	6,795
Scientists pool / senior scientist emeritus	-	30,000
	<u>10,082,748</u>	<u>14,394,983</u>

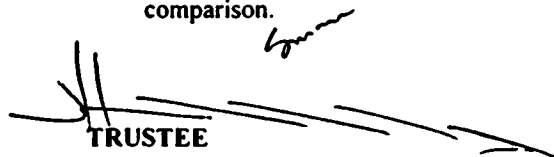
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11. ADMINISTRATIVE EXPENSES	2001 Rupees	2000 Rupees
Salaries and other benefits	11,133,309	10,752,833
Travelling	139,522	213,029
House rent facility	2,060,202	2,658,409
Ground rent to CDA	17,944	17,944
Electricity, gas and water	568,880	434,358
Postage, telephone and telegram	961,746	926,051
Printing and stationery	175,266	195,837
Vehicle running and maintenance	1,319,451	1,325,615
Newspaper and advertisement	304,295	170,426
Liveries and uniforms	13,708	-
Entertainment	56,751	85,139
Repair and maintenance of office equipment	109,297	78,233
Audit fee	12,500	12,500
Depreciation	1,227,393	1,367,578
Maintenance of office building	68,723	40,555
Staff welfare fund	30,000	30,000
Miscellaneous	7,490	23,275
	<u>18,206,477</u>	<u>18,331,782</u>

12. FIGURES

- have been rounded off to the nearest Rupee.

- of the previous year have been regrouped and rearranged wherever deemed necessary for comparison.


TRUSTEE


CHAIRMAN

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.

LIST OF NEW PROJECTS APPROVED BY THE FOUNDATION DURING 2000-2001

<u>S.No</u>	<u>Title and Number of Project</u>	<u>Name of PI and the Organization Supported</u>	<u>Project Cost</u>
a) Agricultural Sciences:			
1.	Study of Orobanche sp. and its Control in Balochistan. B-ARIG/Agr (238)	Mr. Waseem-ul-Hassan, Research Officer, Agriculture Research Institute, Sariab Road, Quetta.	Rs.6,19,619/-
2.	Studies on the Establishment & Improvement of Clovers <i>Trifolium</i> spp for Nitrogen Availability and Soil Management under Agroclimatic Condition of Azad Kashmir. AJK-UCR/Agr (275)	Dr. M. Kaleem Abbasi, Assistant Professor, University College of Agriculture, Rawlakot.	Rs.49,71,536/-
3.	Investigation of Plant Parasitic Nematodes and <i>Pseudomonas</i> associated with date palm in Balochistan and their Management by Organic Amendments. S-PARC/Agr (277)	Dr. Aly Khan, Senior Scientific Officer, CDRI, Pakistan Agricultural Research Council, University of Karachi, Karachi.	Rs.3,19,168/-
4.	Use of Rhizobia in the Biological Control of Root Knot Diseases of Crop Plant. S-KU/Agr (269)	Dr. M. Javed Zaki, Assistant Professor, University of Karachi, Karachi.	Rs.4,19,915/-
5.	Evaluation of Morphological and Physiological Plant Traits Adopting and Forage under Stress. F-AU/Agr (268)	Dr. M. Akmal, Associate Professor, NWFP, Agriculture University, Peshawar.	Rs.6,83,147/-
6.	Evaluation and Assessment of Germination Stand Establishment and Yield of Soyabean and Mungbean before and after Seed Storage using Osmo Conditioning Techniques. F-AU/Agr (282)	Dr. Shad Khan, Associate Professor, NWFP Agriculture University, Peshawar.	Rs.4,58,622/-
b) Biotechnological and Genetic Engineering			
7.	Hyper Expression of Lysine and Transfer of Cellulose Genes in <i>Bravibacterium Fflavum</i> for Recycling of Aagroindustrial Wastes. P-AU/Env (31)	Mr. Amer Jamil, Central Hi Tech Lab Oratory, University of Agriculture, Faisalabad.	Rs. 7,54,879/-
8.	Gene Transfer Technology for the Induction of Herbicide Resistance in Wheat. P-NIBGE/Agr (34)	Dr. Hamid Rashid, Senior Scientific Officer, Agriculture Biotechnology Institute, NARC, Islamabad.	Rs. 7,00,255/-
9.	Optimization of Cultural Conditions on the Biosynthesis of Xylanase by Locally Isolated <i>Aspergillus Nniger</i> .P-GC/Bio (37)	Prof. Dr. Ikram-ul-Haq, Biotechnology Research Labs, Government College, Lahore.	Rs. 6,18,946/-
10.	Characterization of Virulent Races of Blight and Wilt Pathogens using Biological and DNA Molecular Marker Techniques and Evaluation of Chickpea Germplasm for Resistance Against these Diseases. P-NIAB/Agr (38)	Dr. Farahat Fatima Jamil, Chief Scientific Officer, Nuclear Institute for Agriculture and Biology (NIAB), Faisalabad	Rs. 7,79,366/-

c) Biological Sciences

- | | | | |
|-----|--|---|----------------|
| 11. | Effect of Anxiety and Tolerance Development Induced by Anxiolytics on Reproductive Functions in the Rat. S-AKU/Bio (281) | Dr. Arif Siddiqui, Associate Professor, The Agha Khan University, Karachi | Rs. 7,89,480/- |
| 12. | Studies on Co-culture System of Buffalo Embryos. P-AU/Bio (300) | Dr. Zafar Iqbal Qureshi, Associate Professor, University of Agriculture, Faisalabad | Rs. 2,73,839/- |
| 13. | Aerobiological Studies of Karachi and Adjacent Areas in Relation to Allergy S-KU/Bio (314) | Prof. Dr. M. Qaisar, University of Karachi, Karachi | Rs. 4,51,432/- |
| 14. | Ecological Studies of the Reptilian Fauna of Cholistan Desert. C-PMNH/Bio (315) | Dr. Khalid Javed Baig, Associate Curator, Pakistan Museum of Natural History, Islamabad. | Rs. 5,80,533/- |
| 15. | Introduction of Salinity Tolerance in Plants through the use of Halotolerance Conferring Genes from Bacteria and Fungi: A Transgenic Approach. P-NIBGE/Bio (317) | Dr. Zahid Mukhtar, Senior Scientific Officer, National Institute of Biotechnology and Genetic Engineering (NIBGE) Faisalabad. | Rs. 541,640/- |
| 16. | Use of Isozyme Markers in Chickper Breeding. P-NIAB/Bio (324) | Miss. Hina Syed, Scientific Officer, Nuclear Institute for Agriculture & Biology (NIAB), Faisalabad. | Rs. 4,37,576/- |
| 17. | Mushrooms and Toad Stools of Margalla Hills and Adjacent Area, Islamabad. C-PMNH/Bio (327) | Dr. Kishwar Sultana Nazir, Curator Pakistan Museum of Natural History, Islamabad. | Rs. 1,16,688/- |

d) Chemical Sciences

- | | | | |
|-----|---|--|---------------|
| 18. | Synthesis and Characterization of Some Liquid Crystalline Molecules. C-QU/Chem(370) | Dr. Mrs Naeema Khan, Associate Professor, Quaid-i-Azam University, Islamabad. | Rs.6,16,945/- |
| 19. | Development of Polymer Electrolyte Membrane Vased Fuel Cell Sensor of Alcohols. P-IUB/Chem(368) | Dr. Muhammad Shahid Ghouri, Assistant Professor, Islamia University, Bahawalpur. | Rs.5,94,048/- |
| 20. | Synthesis of Biologically Active Chiral Iridoids Via Pauson Khand Reaction. S-KU/Chem(372) | Dr. Khalid Mahmood Khan, Assistant Professor, University of Karachi, Karachi. | Rs.5,15,418/- |
| 21. | Enantioselective Synthesis of Carbohydrate Building Blocks and Bio ctive Natural Products. C-QU/Chem(373) | Dr. Farzana Latif Ansari, Associate Professor, Quaid-i-Azam University, Islamabad. | Rs.9,84,459/- |

e) Earth Sciences

- | | | | |
|-----|---|---|----------------|
| 22. | Petrology and Economic Geology of Pegmatites of Granitic Complexes of Swat, Malakand and Hazara.C-PMNH/Earth (59) | Mr. Hamid Dawood, Assistant Curator, Pakistan Museum of Natural History, Islamabad. | Rs. 5,68,415/- |
| 23. | Detection of Saline Intrusions in the Right Bank Coastal Sediments. S-SU/Earth (65) | Prof. Dr. Saeed Ahmed Soomro, University of Sindh, Jamshoro. | Rs. 8,02,505/- |
| 24. | Geological Studies of Carbonatite Complexes of Northern Pakistan and their | Mr. Aziz Ahmed Qureshi, Principal Geologists Radiation, PINSTECH, P.O. | Rs. 2,86,824/- |

	Economic Evaluation in Terms of Rare Metals Rare Earth Elements, Phosphate and Uranium. C-PINSTECH/Earth (67)	Nilore, Islamabad.	
25.	Geochronological, Tectonic Uplift and Petrogenetic Studies of Alkaline Complexes from the Peshawar Plain Alkaline Igneous Province (PAIP), NW Pakistan with the help of Petrographic and Fission-track Dating Techniques. C-PINSTECH/Earth (69)	Mr. Nimat Ullah Khattak, Senior Geologist, PINSTECH, P.O. Nilore, Islamabad.	Rs. 2,88,231/-
26.	Biostratigraphic and Tectonic Analysis of Paleogene Rocks of Neotethys Ocean in Azad Jammu and Kashmir and Hazara Areas of the Himalayas of Pakistan. AJK/Earth (70)	Dr. Mirza Shahid Baig, Professor, University of Azad Jammu & Kashmir, Muzaffarabad.	Rs. 7,36,715/-
f) Medical Sciences.			
27.	Role of Vitamins B6, B12, and Folate Glutathione and Cytokines in the Development of Coronary Artery Disease in Pakistani Population. S-AKU/Med (185)	Dr. Muhammad Pervaz Iqbal, Professor, The Aga Khan University, Karachi.	Rs.4,86,111/-
g) Physical Sciences.			
28.	Generation and Characterization of Hydrogen Methane and Oxygen-Argon Cold Plasma. P-GC/Phys (119)		Rs.6,24,515/-
29.	Laser Optogalvinic Spectra of Atoms. C-QU/Phys (120)		Rs.6,60,113/-
	Total:		Rs.16,207,040/-

**DETAILS OF MONITORING AND EVALUATION OF ON-GOING PSF PROJECTS
DURING 2000-2001****a) Semi-Annual Reports**

S.No	Project No.	Project Title	Reports
1.	P-AU/Agr (236)	Identification of Resistant Sources Against Major Potato Viruses and their Vectors and their Diagnosis Based in Serological Tests.	1 st semi-annual
2.	B-ARIQ/Agr (247)	Determination of Insecticidal Resistance in Codling Moth and Spotted Spider Mites Serious Pests at Apple in Balochistan.	1 st semi-annual
3.	C-NARC/Agr (266)	Identification Characterization and Distribution of Phytoplasmal Diseases of Potato in Pakistan.	1 st semi-annual
4.	C-NARC/Agr (270)	Characterization and Monitoring of Banana Bunchy Top Virus (BBTV).	1 st semi-annual
5.	S-PCCC/Agr (183/1)	Breeding for Glandless Cotton.	2 nd semi-annual
6.	P-AU/Agr (223)	Development of Commercial Diet for Rearing of Lacewing, <i>Chrysoperla carnea</i> -A Biological Control Agent.	2 nd semi-annual
7.	P-UAAR/Agr (230)	Studies on the Control of Codling, Moth, <i>Cydia pomonella</i> (Tortricidae, Lepdideptern) in Murree Hills of Punjab.	2 nd semi-annual
8.	F-AU/Agr (232)	Assessment of Soil Losses, Runoff Estimates and Changes in Some Physico-chemical Properties of Soil Under Different Cropping System.	2 nd semi-annual
9.	F-AU/Agr (258)	Identification and Field Evaluation of Bio-control Agents of the Family Bracomidae (Hymenepitem) Against Important Crop Pests of Pakistan.	2 nd semi-annual
10.	S-AU/Agr (169)	Population Ecology of Whitefly and Fruitfully on Cucurbits in Sindh.	3 rd semi-annual
11.	P-AU/Bio (286)	Taxonomy, Ecology of Spider Communities of Citrus Orchards and the Role of Spiders as Predators.	2 nd semi annual
12.	C-PMNH/Bio (295)	Studies on Taxonomy and Traditional Uses of Economically Important Plants of Chitral.	2 nd semi annual
13.	P-PU/Bio (304)	Micropropagation of Jojoba (<i>Simmondsia chinensis</i>), an Oil yielding Plant of High Commercial Value.	1 st semi annual
14.	C-PMNH/Bio (311)	Eco-taxonomic Studies of Algal Flora of Pakistan (Punjab & Islamabad).	1 st semi annual
15.	S-KU/Bio (319)	Distribution and Abundance of Juvenile Fish Stock in Korangi Creek.	1 st semi annual
16.	C-NARC/Bio (321)	Pathobiology, Molecular Characterization and Control of Avian Influenza Viruses.	1 st semi annual

17.	C-QU/Bio (323)	Identification of Loci in Pakistani Kindreds with Ectodermal Dysplasia.	1 st semi annual
18.	P-CEME/Ind (21)	Process Development for the Manufacture of Bacillus Thuringiensis Bioinsecticides.	1 st semi annual
19.	P-AU/Med (24)	Technologies Development for the Production of Gonadotropins from Animal Sources.	1 st semi annual
20.	P-NIBGE/Agr (27)	Isolation, Identification and Molecular Characterization of Economically Important Potato Virus (PLRV) of Pakistan and Development of Transgenic Potato.	1 st semi annual
21.	S-SU/Chem(294)	Spectrophotometric & High Performance Liquid Chromatographic Determination of Copper, Nickel, Iron, Cobalt, Vanadium, Cadmium, Lead & Mercury Using new Semi-carbazones as Complexing Reagents.	2 nd semi annual
22.	S-KU/Chem(321)	Characterization of Plasma Membrane Glycoproteins of Rabbit Corneal Epithelium	3 rd semi annual
23.	C-QU/Chem(303)	Studies of Biologically Active Organic Compounds Containing Silicon & Germanium.	2 nd semi annual
24.	S-KU/Chem(363)	Purification Characterization and Applied Studies of Protein Antibiotics from Indigenous Staphylococci.	1 st semi annual
25.	P-AU/Chem(353)	Pilot Production of Barium and Strontium Pigments from Indigenous Barite and Celestite Minerals.	1 st semi annual
26.	F-PU/Earth (66)	Structural and Stratigraphic Analysis of Himalayan Fold-Thrust-Belt in Kohat, Karak and Bannu Transect, North Pakistan.	2 nd semi annual
27.	C-PINSTECH/Engg(38)	Stress Corrosion Cracking & Pitting of Low Alloy Steel (LAS) Corrosion in Sour Environment.	3 rd semi annual
28.	C-PINSTECH/Engg(70)	Stress Analysis of Piping System Subjected to Dynamic Loading.	2 nd semi annual
29.	P-UAAR/Env(45)	Floristic Study of Arid Zone (Desert Nara) Region Sindh Pakistan.	3 rd semi annual
30.	S-KU/Env(51)	Population Dynamics and Dispersal Pattern of Fiddler Crabs in the Mangroves Areas of Karachi Coast.	1 st semi annual
31.	C-QU/Env(58)	Studies on the Degradation of Chlorinated Phenolic Compounds by Pseudomonas Species.	1 st semi annual
32.	P-AU/Env(44)	Studies on Metals Eco-toxicity of the River Ravi.	3 rd semi annual
33.	S-AKU/Med(177)	A Study of Host and Virus Related Factors that Determine Response to Interferon Therapy in Pakistan Patients with Chronic Hepatitis 'C' Virus Infection.	1 st semi annual
34.	S-SIUT/Med(180)	Haem Degradation Products in the Faces of Newborn Infants.	1 st semi annual
35.	C-QU/Phys(108)	Study of X-ray/Neutrons/Ion Beam Emitted from Math Type Plasma Focus.	1 st semi annual

36.	P-PU/Phys(114)	Pomeron (Odderon) in Soft and Hard Process	1 st semi annual
37.	P-PU/Phys(117)	Investigation in CP Violation	1 st semi annual

b) First Annual Reports

1.	P-AU/Agr (223)	Development of Commercial Diet for Rearing of Lacewing, Chrysoperla Carnea- A Biological Control Agent.
2.	P-UAAR/Agr (230)	Studies on the Control of Codding, Moth, Cydia Pomonella (Tortricidae, Lepdideptern) in Murree Hills of Punjab.
3.	F-AU/Agr (232)	Assessment of Soil Lossess, Runoff Estimates and Changes in Some Physico-chemical Properties of Soil Under Different Cropping System.
4.	P-UAAR/Agr(234)	Dynamics of Microbial Biomass C, N and Pin Rainfed Soils in Relation to Wheat and Maize Production.
5.	P-AU/Bio (286)	Taxonomy, Ecology of Spider Communities of Citrus Orchards and the Role of Spiders as Predators.
6.	C-PMNH/Bio (295)	Studies on Taxonomy and Traditional Uses of Economically Important Plants of Chitral.
7.	C-PINSTECH/Chem(341)	Exploitation of Cheaper Materials for the Removal of Toxic and Harmful Substances from Industrial Effluents.
8.	B-BU/Chem((322)	To Study the Effect of Siderophores on Biologically Active Trace Metals.
9.	B-BU/Chem((346)	Leishmania and Leishmaniasis in Pakistan.
10.	S-KU/Chem(342)	Influence of Long Chain Brannging and High Molecular Weight Components on Elongational and Shear Properties of Polyolefins.
11.	S-KU/Chem(348)	Extrapyramidical and Monoaminergic Effects of Neurolepticse Modulation by I-tryptophan and L-valine.
12.	F-PU/Earth (50)	Crustal Evaluation of the Kohistan Island Arc: Study of Structure, Lithiostratigraphy and Volcanism in Arc-related Basins.
13.	F-PU/Earth (51)	Geological Bibliography of the Himalayan Karakaram Hindukush Region of Pakistan.
14.	F-PU/Earth (66)	Structural and Stragraphic Analysis of Himalayan Fold-Thrust-Belt in Kohat, Karak and Bannu Transect, North Pakistan.
15.	F-PU/Earth (68)	Updating and Compilation of the Stratigraphy of Pakistan.
16.	S-KU/Env(51)	Population Dynamics and Dispersal Pattern of Fiddler Crabs in the Mangroves Areas of Karachi Coast.
17.	C-QU/Env(58)	Studies on the Degradation of Chlorinated Phenolic Compounds by Pseudomonas Species.
18.	C-QU/Phys(108)	Study of X-ray/Neutrons/Ion Beam Emitted from Mather type Plasma Focus.
19.	C-QU/Phys(111)	Numerical Study of Pinch Dynamic/Stability and Study of Nonlinear Wave Propag: in Magnetized Plasmas.
20.	C-QU/Phys(115)	Quantum State Measurements

c) Second Annual Reports

1. S-AU/Agr (169) Population Ecology of Whitefly and Fruitfully on Cucurbite in Sindh.
2. S-PCCC/Agr (183/1) Breeching for Glandless Cotton.
3. F-AU/Agr (232) Assessment of Soil Lossess, Runoff Estimates and Changes in Some Physico-chemical Properties of Soil under Different Cropping System.
4. P-AU/Bio (246) Development of Subunit Recombinant Vaccine (S) and Sensitive Diagnostic Tests for Controlling Infections bursal (Gumboro) Disease of Poultry.
5. S-KU/Bio (277) Assessment of Biological Activity in the Marine Cyanobacterial Species from Coastal and Near-shore Environments.
6. S-KU/Chem(321) Characterization of Plasma Membrane Glycoprotiens of Rabbit Corneal Epithelium
7. F-PU/Earth (50) Crustal Evaluation of the Kohistan Island Arc: Study of Structure, Lithiostratigraphy and Volcanism in Arc-related Basins.
8. P-AU/Engg(52) Comparison of Modem Irrigation System with Primitive Flooding Irrigation.
9. C-PINSTECH/Engg(70) Stress Analysis of Piping System Subjected to Dynamic Loading.
10. P-UAAR/Env(45) Floristic Study of Arid Zone (Desert Nara Region) Sindh, Pakistan.

**LIST OF PUBLICATIONS PRODUCED THROUGH PSF SUPPORTED PROJECTS
COMPLETED DURING 2000-2001**

1. Shahina, F, & M.A. Maqbool (1996), Isolation of entomopathogenic nematodes (Heterorhabditidae and Steinernematidae) from Pakistan. Pak. J. Nematol. 14:15-136.
2. Shahina, F.M. Anis, S. Zainab & M.A. Maqbool (1998), Entomopathogenic nematodes in soil sample collected from Sindh, Pakistan, Pak. J. Nematol. 16; 41 - 50.
3. Shahina, F.M. Anis, M.A. Maqbool & M.H. Soomro (1999). Mortality response of some insects by entomopathogenic nematode *Steinernema* BS266. Pak J. Nematol, 17 : 125 - 128.
4. Shahina, F. M. Anis, M.A. Maqbool, P. Reid & J. net Rowe (2000). Two new species of the genus *Steinernema* Travasasos, 1927 (Nematode Steinernematidae) from Pakistan. International Journal of Nematology (Submitted).
5. Anis, F.M. Shahina & M.A. Maqbool (2000). Redescription of *Heterorhabditis indica* Poinar et al. 1992 (Rhabditida: Heterorhabditidae) from Pakistan Pak.J. Nematol, (in press).
6. Anis, M.F. Shahin & M.A. Maqbool (2000). A modified technique for mounting of entomopathogenic nematodes, Pak. J. Nematol. (in press).
7. Shabeer Ahmad and Hakim Khan. 2000. Effect of fungicide synergy on downy mildew control in onion. J. Biological Sciences. 3: 1042-1043.
8. Shabeer Ahmad and Hakim Khan. 2000. Influence of host management on downy mildew control in onions (Accepted for Publications in Pak.J. Biological Sciences).
9. Batool, S., Ahmad, I., Malik, S.A., and Mirza, J. I. (1999). Distribution of mating types of *Phytophthora infestans* in Pakistan during 1997-99. Second National Conference of Plant Pathology, 27-29 September, 1999, University of Agriculture, Faisalabad, Pakistan Phytopathological Society (Abstract No.73). pp.22.
10. Batool, S., Ahmad, I., Malik, S.A., and Mirza, J. I. (1999). Metalaxyl resistance in Pakistani population of *Phytophthora infestans* during 1997-99. Second National Conference of Plant Pathology, 27-29 September 1999, University of Agriculture, Faisalabad, Pakistan Phytopathological Society (Abstract No.74). pp.22. Batool, S., Ahmad, I., Malik, S.A., and Mirza, J. I. (1999). Distribution of mating types of *Phytophthora infestans* in Pakistan during 1997-99. Proceedings of Second National Conference of Plant Pathology, 27-29 September, 1999, University of Agriculture, Faisalabad, pp 267-272.
11. Batool, S., Ahmad, I., Malik, S.A., and Mirza, J. I. (1999). Metalaxyl resistance in Pakistani population of *Phytophthora infestans* during 1997-99. Proceedings Second National Conference of Plant Pathology, 27-29 September, 1999, University of Agriculture, Faisalabad, pp. 273-280.
12. Mirza, J.I. and Ahmad, I. (1999), Mating Types of *Phytophthora infestans* in Pakistan. Pakistan Journal of Phytopathology 10(2): 6-10.
13. Batool, S. (1999), Metalaxyl sensitivity of *Phytophthora infestans*, the cause of late blight of potato, M. Phil Thesis, Department of Biological Sciences, Quaid-e-Azam University, Islamabad, Pakistan.
14. Afrasayab, S. and Hasnain, S. 1999. Moderately halophilic rhizobacteria from native plants of salt range. Proc. Pak. Congr. of Zool. 9:79-93.
15. Afrasayab, S. and Hasnain, S. 2000. Synergistic growth stimulatory effects of mixed culture bacterial inoculations on the early growth of *Triticum aestivum* under NaCl stress. Pak. J. Biol. Sci. 6: 1016-1023
16. Afrasayab, S. and Hasnain, S. 2000. Early growth responses of *Triticum aestivum* var Inqlab 91 under NaCl stress after inoculation with mixed culture rhizoplant and phylloplane salt tolerant bacteria. Sci. Int. 12(1):79-86.

17. Iftikhar, S., Ahmad, I. 2000. Prevalence of *Spongopora subterranea* in soils of potato production areas of Gilgit and Hunza valleys of Pakistan. *J. Biol. Sci.* 3(5): 848-849.
18. Iftikhar, S., Ahmad, I. and Rattu, A.R. 1997. Detection of *Spongopora subterranea* in soils of Northern areas of Pakistan. International Conference on Integrated Plant Disease Management for Sustainable Agriculture, Indian Phytopathological Society (Golden Jubilee) 10-15 Nov. New Delhi, India pp 142 (Abs).
19. Merz, U., Ahmad, I. and Iftikhar, S. 1999. Evidence of the presence of *Spongopora subterranea* in the Northern Areas of Pakistan and its importance for national potato production. 1st Forum for International Agriculture, ETH Zurich, Switzerland March 30.
20. Rattu, A.R., Iftikhar, S. and Ahmad, I. 1997. Prevalence of *Spongopora subterranea*, in potato growing areas of Swat and Kaghan valleys. *S. J. Agr.* 15(1): 47-49.
21. Haq, I., Sohail Z. Qadeer, M.A. 1998. Citric acid fermentation of Starch-hydrolysate by a mutant strain of *Aspergillus niger*. *Biologia*, 44(1&2): 6-16
22. Haq, I., Ghaffoor, G., Khurshid, S. Qadeer, M.A. 1998. The influence of metal complexing agents on citric acid production by *Aspergillus niger*. *Biologia*. 44(1&2):25-32.
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24. Haq, I., Ali, S., Qadeer M.A. Iqbal, J. 2000. Biosynthesis of citric acid by locally isolated *Aspergillus niger*, using sucrose salt media. *Pak. J. Biol. Sci.* (accepted).
25. Haq, I., Ali, S., Qadeer M.A. Iqbal, J. 2000. Citric acid fermentation by mutant strain of *Aspergillus niger* GCMC-7 in stirred fermentor. *Biologia* (accepted).
26. Haq, I., Ali, S. Qadeer, M.A. 2000. Fed-batch culture study during citric acid fermentation by *Aspergillus niger* GCMC-7 in stirred fermentor. *Biologia* (accepted).
27. Javed, M. and G. Mahmood, 2001. Metal toxicity of water in a stretch of river Ravi from Shahdera to Baloki head works. *Pak. J. Agri. Sci.*, 38 (1-2).
28. Javed. M. and G. Mahmood, 2000. Metals bio-accumulation in body organs and Tissues of Fish from the river Ravi. *Pak.J. Fisheries*, 1(1): 1-6.
29. Javed. M. and G. Mahmood, 2001. Concentration, distribution and comparison of selected heavy metals in bed sediments and Fish organs from the river Ravi. *Nat. Farm. Environ.* 1: (4).
30. Javed. M. and G. Mahmood 2000. Studies on the metal toxicity of Plankton in the river Ravi. *Pak. J. Biol. Sci.* 3(12): 2165-2168.
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32. Javed, M. and S. Hayat, 1999. Heavy metal toxicity of river Ravi aquatic ecosystem *Pak. J. Agri. Sci.*, 36 (3-4) : 81-90.
33. Javed, M. and S. Hayat, 1998. Fish as a bio-indicator of freshwater contamination by metals. *Pak. J. Agri. Sci.*, 35 (1-4): 11-15.
34. Mahmood, G. M. Javed and M. Hassan, 2000. Assessment of the river Ravi for the Physico-chemistry and heavy metals toxicity of water. *Pak. J. Biol. Sci.*, 3(11): 1962-1964.
35. Ziad, M., Feroze, T. Qadir, A. The classification of plane symmetric spacetimes by isometries. *J. Math. Phys.* (accepted).
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48. Iqbal A. Khan (1995). Temperature Profile of Thin Glass Samples using Magnetically induced Birefringence. *Proc. 5th Nat. Symp. Front Phys. Islamabad*, pp130-133.
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52. Ahmed N, Ahmed A and Siddiqui AA (1999). Plasma membrane glycoprotein components in re-epithelialization of organ cultured corneas. Submitted for publication in *Journal of Biochemistry, Molecular Biology and Biophysics*.
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54. Choudhary M, Aziz , Mazhar M, Salma U, Ali S, X. Qinglan, Molly K.C (2001) Synthesis and Characterization of Diorganotin compounds containing silicon and germanium and crystal structure

of precursor carboxy ethyltrichlorogermaniu. Synthesis and reactivity in inorganic and metal-organic chemistry, No. 2, New York, USA (Accepted).

55. Choudhary M, Aziz , Mazhar M, Ali Saqib, Ashraf Saima, and Malik Abdul (2001). Synthesis, Characterization and Biological Activity of Triorganotin Carboxylates Containing Germanium Tur.J. Chem. (Accepted).
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57. Qureshi, S.A., V. Sultana, S.Ehteshamul-Haque and V.U. Ahmed. 2000. Antifungal activity of fungi associated with rhizosphere and rhisoplane of wild and cultivated plants. *Acta Mycologica*, (Submitted).
58. Qureshi, S.A., V. Sultana, S. Ehteshamul-Haque and M.Athar.2000. Antibacterial activity of some rhizospheric fungi, *Phytologia*, (Submitted).
59. Riaz, R., S. Hameed, V.Sultana, J.Ara and S.Ehteshamul-Haque.2000. Antimicrobial activity of Fusarium solani strains. *Acta Mycologia*, (Submitted)
60. Qureshi, S.A., V. Sultana, S.Ehteshamul-Haque, J.Ara and V.U. Ahmed. 2000. Antibacterial activity of *Memnoniella echinata*. *Pharm. Biol.*, (Submitted)
61. Qureshi, S.A., V. Sultana, J. Ara and S.Ehteshamul-Haque. 2000. Role of UV and acridine orange mutation to induce/enhance antimicrobial activity in fungi. *Acta Mycologica*, (Submitted)

**GRANTS SANCTIONED FOR CONFERENCES, SEMINARS AND SYMPOSIA
DURING 2000-2001**

S. No.	Event	Society/Department	Amount of Grant
1.	International Conference on Technology & development in the New Millennium.	Department of Applied Physics, University of Karachi, Karachi.	Rs.30,000/-
2.	40 th Annual Convention & 1 st International Conference.	The Institution of Engineers, Islamabad, Pakistan.	Rs.25,000/-
3.	Workshop for Training of Young Scientists.	Department of Biochemistry, Postgraduate Medical Institute, Lahore.	Rs.20,000/-
4.	Workshop on Computational Mathematics.	Department of Mathematics, University of Peshawar, Peshawar.	Rs.15,000/-
5.	First International Chemistry Conference.	Department of Chemistry, University of Peshawar, Peshawar.	Rs.30,000/-
6.	Workshop on Poverty Alleviation Through Sustainable Agricultural Development.	Agriculture University Teachers Association, Agriculture University, Peshawar.	Rs.20,000/-
7.	Annual science competitions 2000. Holding of science quiz, science models competition and essay competition.	National Museum of Science & Technology, Lahore.	Rs.32,400/-
8.	8 th Symposium on "Frontiers in Physics".	Pakistan Physical Society, Department of Physics, Quaid-i-Azam University, Islamabad.	Rs.20,000/-
9.	6 th National Conf. On Biochemistry & Molecular Biology.	Department of Chemistry, Shah Abdul Latif University, Khairpur-Sindh.	Rs.25,000/-
10.	7 th National Conference of Plant Scientists.	Pakistan Botanical Society, Department of Botany, Govt. College, Lahore.	Rs.15,000/-
11.	Seminar on "Shortage of Water Resources in Pakistan".	Pakistan Association of Scientists & Scientific Professions (PASSP), Karachi.	Rs.15,000/-
12.	All Pakistan Mathematical Conference 2000.	University of Sindh, Jamshoro.	Rs.25,000/-

13.	2 nd Symposium on "Utilization of Untapped Aquatic Resources".	Pakistan Fisheries Society, Lahore.	Rs.15,000/-
14.	21 st Pakistan Congress of Zoology.	The Zoological Society of Pakistan, Department of Zoology, University of the Punjab, Lahore.	Rs.10,000/-
15.	21 st Pakistan Congress of Zoology.	University of Agriculture, Faisalabad.	Rs.30,000/-
16.	4 th Pakistan Geological Congress	Pakistan Museum of Natural History, Islamabad.	Rs.25,000/-
17.	4 th Pakistan Geological Congress.	National Geological Society of Pakistan, Institute of Geology, University of the Punjab Lahore.	Rs.20,000/-
18.	8 th Statistics Seminar-2001.	Department of Statistics, University of Karachi, Karachi.	Rs.15,000/-
19.	7 th Pakistan Physiological Society Conference.	King Edward Medical College, Lahore.	Rs.20,000/-
20.	National Seminar on "Potentials and Prospects of Mountain Agriculture: Issues and Challenges for the 21 st Century.	University College of Agriculture, Rawalakot, Azad Kashmir.	Rs.20,000/-
		Total	Rs.4,27,400/-