# ANNUAL REPORT


# 1988-89

## PAKISTAN SCIENCE FOUNDATION

# Pakistan Science Foundation

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**PAKISTAN SCIENCE FOUNDATION**
Almarkaz F 7/2
Islamabad

# LETTER OF TRANSMITAL

Islamabad

Dear Mr. Secretary

I have the honour to enclose herewith the Annual Report of the Pakistan Science Foundation for the Fiscal year 1988-89, alongwith its audited accounts, as adopted by the Board of Trustees for submission to the National Assembly as required by the Pakistan Science Foundation Act III of 1973.

With regards.

Yours sincerely,

Sd/-
(Dr. M.D. Shami)
Chairman
PAKISTAN SCIENCE
FOUNDATION

Secretary,
Ministry of Science and Technology,
Government of Pakistan,
ISLAMABAD.

# PAKISTAN SCIENCE FOUNDATION

## CHAIRMAN
## Dr. M.D. Shami, M.Sc.(Chemical Technology)
## Ph.D (Inorganic-Analytical Chemistry) Washington State Uni versity (U.S.A)

## EXECUTIVE COMMITTEE

| | |
|---|---|
| Dr. M.D. Shami | Chairman |
| Dr. Bashir Ahmed Sheikh | Member (Science) |
| Ch. Zia-ul-Qayyum | Director/Member (Finance) |

## BOARD OF TRUSTEES

Three whole-time Members appointed by the President:

| | | |
|---|---|---|
| 1. | Dr.M.D. Shami | Chairman |
| 2 | Dr Bashir Ahmed Sheikh | Member (Science) |
| 3 | Ch. Zia-ul-Qayyum | Director/Member (Finance) |

Sixteen part-time Members appointed as follows:

4 Chairman, Pakistan Council for Science & Technology, Islamabad

5 Dr Naeem Ahmed Khan, Chairman, Pakistan Council of Scientific & Industrial Research, Islamabad.

6. Lt Gen M.A.Z Mohydin, Chairman, Pakistan Medical Research Council, Shaikh Zayed Hospital, Lahore

7. Dr. S. Ahmed Hasnain, Director General, National Institute of Electronics, Islamabad.

8. Dr. A Q. Alvi, Chairman, Council for Works & Housing Research, Karachi.

9 Mr. M Masihuddin, Secretary, Ministry of Science & Technology, Islamabad.

10 Dr M Raziuddin Siddiqui, Fellow, Pakistan Academy of Sciences, Islamabad.

11 Dr. A Q. Ansari, Vice Chancellor, University of Sind, Jamshoro

12 Dr. Ishfaq Ahmed, Member (Technical), Pakistan Atomic Energy Commission, Islamabad.

13. Dr. M H. Qazi, Chairman, Department of Biology, Quaid-i-Azam University. Islamabad.

14 Prof Dr R A.K Tahirkheli, Director, Centre of Excellence in Geology, University of Peshawar, Peshawar

15. Prof. Dr. Jameel Ahmed Khan, Vice Chancellor, NED University of Engineering and Technology Karachi

16 Lt. Gen Syed Azhar Ahmad, Executive Director, National Institute of Health, Islamabad

17 Dr. Amir Muhammad, Chairman. Pakistan Agriculture Research Council, Islamabad.

18 Prof Dr. H A Kazmi, Whole-Time Member. University Grants Commission, Islamabad

19 Mr Abdul Raziq Khan, Secretary. Department of Irrigation and Power, Government of Baluchistan, Quetta

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# LIST OF ABBREVIATIONS

**Province**

| | |
|---|---|
| B | Baluchistan |
| C | Centre |
| F | Frontier |
| P | Punjab |
| S | Sind |

**Sponsoring Institutions**

| | |
|---|---|
| AC | Agricultural College |
| AU | Agricultural University |
| EU | Engineering University |
| QU | Quaid-i-Azam University |
| KU | Karachi University |
| HG | Government College, Haripur |
| PU | Peshawar University/Punjab University |
| SU | Sind University |
| KMC | Khyber Medical College |
| NHL | National Health Laboratories |
| CSIR | Council of Scientific and Industrial research |
| JPMC | Jinnah Post-graduate Medical Centre |
| NIAB | Nuclear Institute for Agriculture and Biology |

**Disciplines**

| | |
|---|---|
| AGR | Agricultural Science |
| BIO | Biological Sciences |
| ENG | Engineering Sciences |
| MED | Medical Sciences |
| PHY | Physical Sciences |
| CHEM | Chemical Sciences |
| MATH | Mathematics and Computer Sciences |
| EARTH | Earth Sciences |
| OCEAN | Oceanography |
| ENVR | Environmental Sciences |

# INTRODUCTION

The Pakistan Science Foundation was established on June 30th, 1973 under the Pakistan Science Foundation Act No.III of 1973 (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:-

a) i) establishment of comprehensive scientific and technological information and dissemination centres;

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 centres, 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) organisation of periodical science conferences, symposia and seminars,

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

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

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

b) The Foundation shall also:-

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

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

iii) establish liaison with similar bodies in other countries.

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

# CHAPTER - 1

## ACTIVITIES & PROGRAMMES

The Activities and Programmes undertaken by the Foundation for the performance of its statutory functions can be broadly divided into four catagories:-

i) establish comprehensive scientific & technological Information & Dissemination centres.

ii) Promote & Finance Scientific Research in the country and the Utilization of the research results.

iii) Promote and Popularize Science in Society.

iv) International Liaison.

The first activity is carried out through Pakistan Scientific and Technological Information Centre, a subsidary organisation of PSF. The other functions i.e. research support, Science popularization etc. are performed by the Science Section of the Foundation, which is divided into two sub sections as under:-

(A) Research Support Section performing the following activities.

a. Grant of Research Projects to individual researchers.

b. Institutional Support.

2. Research Evaluation.

3. Scientific Societies/Learned Bodies.

4. Exchange of visits.

5. Awards and Fellowships.

6. Survey and Statistics.

7. Scientists Pool.

8. International Liasion.

9. Other Activities.

(B) Science Popularization Section, which carries out the following activities:-

1. Funding for Conferences, Symposia, Seminars, Workshops.

2. Organisation of Science exhibitions/fairs.

3. Popular Science lectures.

4. Arranging Film/Planetarium & Slide shows.

5. Distribution of Scientific Books & Magazines.

6. Science Promotion through Press & Publications.

7. Science Posters.

8 Promotion of Science in rural areas through Mobile Science Exhibition (Science Caravans).

9. Establishment of Science Centres, clubs, etc..

A second subsidary organisation of Pakistan Science Foundation is the Pakistan Museum of Natural History established in 1979 to serve the national needs in the vitally important areas of research, conservation & education involving Pakistan's heritage of natural resources. The Museum is a national repository for permanent storage of plants, animals, rocks, minerals & fossils of the country.

The progress of the work carried out by the Science Sections of the Foundation, PASTIC & PMNH during the year 1988-89 is summarized in the following pages

# PAKISTAN SCIENCE FOUNDATION

## RESEARCH SUPPORT SECTION

The progress of the work done by the Research Support Section during the year 1988-89 under various statutory functions entrusted to it, is summarised below:-

1. **RESEARCH SUPPORT:**
   The Promotion of Basic and Fundamental Research in Universities and other Institutions on Scientific Problems Relevant to the Socio- economic Development of the Country.

The Foundation carries out its statutory responsibility for the support of scientific research through a number of programmes, which include:-

a) Grants for research projects submitted by individuals or groups of scientists in the universities and research institutions across the nation.

b) Institutional Support -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.

A) **GRANTS FOR RESEARCH PROJECTS SUBMITTED BY INDIVIDUAL RESEARCH WORKERS OR GROUPS OF SCIENTIFIC WORKERS.**

Research Support is the Foundation's principal programme for the promotion of basic and fundamental research, having relevance to the socio-economic needs of the country.

a) New Projects: During the period under report 26 projects costing Rs. 13.72 million were received by the Foundation, whereas 60 projects proposals which had been at various stages of their processing, were carried over from the previous year Thus, in all, 86 proposals remained under active consideration of the Foundation during the period 1988-89. These proposals were examined by experts in the relevant fields in the light of their scientific merit and relevance to national needs according to the criteria laid down by the Foundation. The criteria for research are (a) competence of the scientific personnel to carry out the research, (b) Institutional capability i.e., availability of requisite equipment, library facilities and support from scientific colleagues; (c) scientific merit of the proposed research; and (d) likelihood of completion of the project within the stipulated time Each proposal, after the initial review report, is placed before the Technical and other Committees of the Foundation.

During the report period 15 projects were sanctioned at an estimated cost of Rs. 3.148 million as listed below:

# TABLE - I
# SUBJECT WISE LIST OF SANCTIONED RESEARCH PROJECTS
# (1973-89)

| DISCIPLINE | 1973-85 | | 1985-86 | | 1986-87 | | 1987-88 | | 1988-89 | | 1973-89 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No.of Scheme | Amount sanctioned | No of scheme | Amount sanctioned | No of scheme | Amount sanctioned | No of scheme | Amount sanctioned | No.of Scheme | Amount sanctioned | No of scheme | Amount sanctioned |
| Agricultural Sciences | 31 | 6 011 | - | - | 2 | 0.492 | 4 | 1.299 | - | - | 37 | 7.832 |
| Biological Sciences | 66 | 9 785 | 4 | 0 869 | 3 | 1 457 | 6 | 1 338 | 2 | 0 458 | 83 | 13 607 |
| Chemical Sciences | 81 | 10 583 | 5 | 1.365 | 10 | 3 341 | 3 | 1.444 | 5 | 1.145 | 100 | 17 846 |
| Earth Sciences | 16 | 2 068 | - | - | 4 | 1 411 | 1 | 0 030 | - | - | 21 | 3.520 |
| Engineering Sciences | 8 | 1.247 | - | - | 1 | 0.377 | 2 | 0.491 | - | - | 11 | 2 115 |
| Environmental Sciences | 16 | 1 937 | 1 | 0.547 | - | - | - | - | - | - | 17 | 2.484 |
| Mathematical Sciences | 5 | 0.250 | - | - | - | - | 1 | 0.043 | 1 | 0.369 | 7 | 0.662 |
| Medical Sciences | 49 | 6.758 | 1 | 1.444 | 2 | 0.129 | 1 | 0.048 | 1 | 0.040 | 57 | 8.419 |
| Oceanography | 4 | 1.276 | - | - | - | - | - | - | - | - | 4 | 1.276 |
| Physical Sciences | 23 | 4.624 | 2 | 0.985 | - | - | 4 | 1.675 | 6 | 1.435 | 35 | 8.720 |
| Total | 302 | 44.509 | 16 | 5.200 | 24 | 7.207 | 24 | 6.388 | 15 | 3.147 | 381 | 66.460 |

| Title of Schemes | Name of P.I. & Organisation Supported | Amount Sanctioned |
|---|---|---|
| **Biological Sciences:** | | |
| Ecological Studies on the Vegetation of Swat. PMNH/Bio(148) | Dr. Muhammad Rashed Awan, Pakistan Museum of Natural History, Islamabad. | Rs.97,000 |
| Ecological Studies Mush-rooms & Toad-Stools of Kaghan Valley PMNH/Bio (150) | Mrs. Kishwar Nazir, Pakistan Museum of Natural History, Islamabad. | Rs.61,500 |
| **Chemical Sciences:** | | |
| Characterization and Improved Production of Xylanolytic Enzymes of Thermophilic Micro organisms. P-PU/Chem (183) | Dr. M. Waheed Akhtar, Prof. of Chemistry, University of the Punjab, Lahore. | Rs.3,89,681 |
| Production of Mycelial Protein from Cellulosic Biomass as Substrate for Poultry Feed. S-SU/Chem (184) | Mohammad Umar Dohot, Deptt. of Biochemistry, Institute of Chemistry, University of Sind, Jamshoro. | Rs.193,402 |
| Kinetic Study of the React-ion of Hexacyano-ferrate (II) with Haloamine in Aqueous Medium. B-BU/Chem (187) | Dr Abbas Haider Khan, Department of Chemistry, University of Baluchistan, Quetta. | Rs.89,515 |
| Multiple Forms of Dihydrofolate Reductase. S-AKU/Chem (191) | Dr. M.Pervaiz Iqbal, Deptt. of Biochemistry, Aga Khan University, Karachi. | Rs.2,89,670 |
| Calculation of Potential Energy Surfaces for Ion Pairs Derived from the Alkali and Alkaline Earth Metals Reduction of Some Sub-stituted Ethylenes. C-QU/Chem (193) | Dr. Mehboob Muhammad, Department of Chemistry, Quaid-i-Azam University, Islamabad. | Rs.1,82,457 |
| **Mathematics:** | | |
| The Pseudo-Newtonian Formalism. C-QU/Maths (16) | Prof. Asghar Qadir, Department of Mathematics, Quaid-i-Azam University, Islamabad. | Rs.3,68,800 |

**Medical Sciences:**

| | | |
|---|---|---|
| Use of LeuM$_1$ Monoclonal Antibody for the Diagnosis of Hodgkin's Disease. S-JMPC/Med (129) | Dr.Capt Ghulam Mustafa Memon, Fellow in Pathology, JPMC, Karachi. | Rs.40,400 |

**Physical Sciences:**

| | | |
|---|---|---|
| Laboratory Preparation and Study of Properties of Binary & Ternary Semiconducting Compounds P-PU/Phys (52) | Dr. Shakoor A. Mughal, University of the Punjab, Lahore. | Rs.1,71,700 |
| Preparation and Study of the High Tc Super-conductors. C-QU/Phys (58) | Dr. S. Khurshid Hasanain, Department of Physics, Quaid-i-Azam University, Islamabad. | Rs.4,13,600 |
| The Chou-Yang Model for High Energy Scattering and its Comparison with QCD for Large Momontum Transfer. P-PU/Phys (60) | Dr. Muhammad Saleem, Centre for High Energy Physics (CHEP), University of the Punjab, Lahore. | Rs.2,31,500 |
| Nonlinear Optical Effect in Atoms in a Cavity C-QU/Phys (62) | Dr M S.K Razmi, Department of Physics, Quaid-i-Azam University, Islamabad. | Rs.2,13,100 |
| Theortical/Experimental/ Computational Study of Some Aspects of Plasma/Fusion Physics. C-Qu/Phys (64) | Dr. G.Murtaza, Department of Physics, Quaid-i-Azam University, Islamabad. | Rs.2,38,700 |
| A Study of Coherence Properties of Radiation in Lasers and Quantum Optics. C-Qu/Phys (67) | Dr. M Suhail Zubairy, Department of Physics, Quaid-i-Azam University, Islamabad. | Rs.1,67,000 |

The Ist installments of these projects amounting to Rs.1,218 million were released after signing of their contract agreements with the Sponsoring Institutions. Annex I indicates the Research grants so far sanctioned by the Foundation.

Brief Summaries of the projects sanctioned during the year 1988-89 are as under:-

## BIOLOGICAL SCIENCES

**PMNH/Bio (148)**

Title:- **Ecological Studies on the Vegetation of Swat.**

Swat is an undeveloped district of Pakistan where population mainly depends on sheep and goat farming. The vegetation in the area is being cut down for fodder and fuel by local inhabitants at an alarming rate Rapid population explosion and fast rate of civilization has converted many natural vegetated areas and forests into cultivated fields and small industries which poses a serious threat not only to the original vegetation but also to the wild life of the area.

The project envisages ecological studies of plants for the analysis of vegetation sociologically in three regions of Swat namely Lower Swat, Kohistan Area, and Bunar. Studies will include· (i) identification of plant communities and their analytical and synthetic characterists, (ii) collections of climatic data to correlate different plant communities with the climatic conditions of the area, and (iii) investigation on the impact of grazing and erosion on the vegetation and threatended species.

The studies would provide necessary data to identify the factors involved in disturbing the vegetation of Swat. The results may help planning management practices for preserving the natural vegetation in this area

**PMNH/Bio (150)**

Title:- **Ecological Studies on Mushrooms and Toad-Stools of Kaghan.**

Mushrooms have traditionally been considered as a food of high quality with a pleasant flavour, appealing texture, and high nutritional value, although some are deadly poisonous and can cause diseases and even death of the consumer Research is being carried out on world-wide basis for identifying the edible species of mushrooms and their mass scale cultivation

The project is aimed at studying the mushroom/toad-stool flora of the Kaghan Valley Mushrooms will be identified in the field by examining the morphological characters, performing some chemical tests and studying their associations to their specific host plant Soil analysis, identification, and indexation of the collected material will be completed in the laboratory The collected and preserved material will be added to the mycological herbarium of the Pakistan Museum of Natural History, Islamabad. The results of these investigations will provide keys to the identification of major groups, genera and species of the Mushrooms of Kaghan Valley, alongwith their relevant ecological characters and nutritive/medicinal values.

The work will serve as a reference material for the mycologists, research workers, mushrooms collections as well as for the cultivation of mushrooms at an industrial scale.

## 2. CHEMICAL SCIENCES

**P-PU/Chem (183)**

Title:- **Characterization and Improved Production of Xylanolytic Enzymes of Thermophilic Micro-organisms.**

Lignocellulose, as a constituent of plant biomass, is the most abundent organic compound produced in our planet. it constitutes a large proportion of agricultural, industrial, municipal and forest wastes, the disposal of which is a growing problem. In Pakistan alone, output of Agricultural lignocellulosic wastes like wheat straw, rice baggass etc. is estimated to be over 40 million per year.

The project envisages to (i) isolate Thermophilic organisms showing high xylanolytic activity by screening a wide variety of samples collected from different habitates; (ii) purify and characterise the enzymes of the most active organisms; (iii) enhance the production of these enzymes by optimising culture conditions and recompliment DNA techniques; and (iv) study the mechanism of the action of these enzymes in the breakdown of hemicellulose.

These investigations in conjunction with studies already undertaken by the investigators on cellulytic enzymes, are expected to lead to the development of a system for an efficient utilization of lignocellulosic materials

**S-SU/Chem (184)**

Title:- **Production of Mycelial Protein from Cellulosic Biomass as Substrate for Poultry Feed.**

In Pakistan, like other developing countries, the disposal of agricultural waste materials such as rice husk, wheat straw, sugarcane is a big problem. These waste materials can be utilized in the development of mycelial/fungal protein, through fermentation Many industrial countries of the world have build up their economy and improved their food quality with the help of single cell protein. No work has, however, been carried out in Pakistan on the exploitation of these waste materials for the production of single cell protein on large scale.

The present study is aimed at the conversion of cellulosic biomass into mycelial protein by growing locally isolated mould cultivars such as Trichoderma & Pencillium Species. The selected mould cultivars, free from toxin production will be cultivated in stirred fermenters. The fermented material will be evaluated for the poultry feed. The fermented mesh will be analysed for nitrogen (both proteinous and non-proteinous) fiber & ash.

The results achieved will help in the exploitation of agricultural wastes.

**B-BU/Chem (187)**

Title:- **Kinetic Study of the Reaction of Hexacyanoferrate (II) with Haloamine in Aqueous Medium.**

There has been a great activity in the field of reactions which involve the oxidation/reduction mechanism. Kinetic and stereochemical techniques provide the most powerful methods of investigating the detailed reaction mechanisms. However, little is known about the oxidation reduction reactions and the aqueous chemistry of haloamines.

The project is aimed at developing the chemistry of some transition metal and non-metal redox reactions by way of determining their reaction mechanisms. For this purpose, the reaction mechanism between metal cations like hexacyanoferrate and non-metallic anions like haloamines $NH_2CL$ and NH CL, will be studied. Free redicals like C1, NH2 and free $NH_2$ are expected to be formed during these redox reactions which will be identified and studied in detail so as to enlighten different pats of reaction mechanisms.

The studies involving the formation and decomposition of $NH_2$ or $NHCl_2$ are very important for understanding the process of oxidation of ammonia with chlorine compounds. This behaviour is also significant in water chlorination processes

**S-AKU/Chem (191)**

Title:- **Multiple Forms of Dihydrofolate Reductase.**

Methotrixate (MTX) is being used for many years for the treatment of malignant/non-malignant disorders in human body It acts by inactivating the enzyme Dihydrofolate Reductase (DHFR) which plays a vital role in the biosynthesis of DNA/RNA Despite the extensive use of MTX, its clinical resistance is a problem not yet adequately explained or solved. Extensive work is being carried out on a world- wide basis to search for a low affinity form of DHFR which would help understanding the biochemical basis of clinical resistance to MTX.

The project is aimed at. (1) identifying and characterizing multiple forms of Dihydrofolate Reductase in human leukemia cells which may have different affinities for antifolate drugs; (2) defining (by enzyme-lined immunosorbent assay and radioenzymatic assay) the heterogeneity of dihydrofolate reductase, especially as regards the existence of apparently inactive forms of enzyme, and the distribution of these forms of enzyme in normal as well as in cancer tissues, in various leukemia cells, and in other biological fluids from patients with a variety of diseases including cancer and leukemia.

The identification of a low affinity form of DHFR enzyme, especially in tumerous cells, would help in correctly assessing the optimal therapeutic doses of MTX in a particular type of cancer so that tumer cells could be killed with minimal cytotoxic effects of the drug towards normal cells. The findings of this project could also identify a new pathway of folate metabolism and explain another form of reistance to Methotrexate. It could also provide a molecular basis for explaining some obscure causes of megaloblastic anemia.

C-QU/Chem (193)

Title:- **Calculation of Potential Energy Surfaces for Ion Pairs Derived from the Alkali and Alkaline Earth - Metals Reduction of some Substituted Ethylenes.**

Aquisition of knowledge about the structure of ion pairs is a pre- requisite for understanding the process of anionic polymerization. This can be achieved through constructing potential energy surfaces.

The project envisages extensive calculations of potential energy surfaces on ion pairs derived from the alkali and alkaline earth-metals reduction of substituted ethylene compounds on which a wealth of experimental data with regards to polymerization process is available.

The study will include ion pairs derived from both anion radicals and dianions. Three models (Peacock, Gordon and Kim, and Simonetta) will be considered and starting from semi-empirical m.o calculation, ab initio calculation will be utilized for constructing potential energy surfaces.

The results thus obtained will help in understanding the influence of the alkali metals and solvents on the disproportionation equilibria and hence on polymerization process involving substituted ethylenes.

**MEDICAL SCIENCES**

S-JPMC/Med (129)

Title:- **Use of Leu $M_1$ Monoclonal Antibody for the Diagnosis of Hodgkin's Disease.**

Hodgkin's disease, if diagnosed at early stage and treated effectively, has a good servival rate and prolonged life expectancy as compared to Non Hodgkin's Lymphoma. In the diagnosis of disease, detection of Reed Sternberg cells alongwith other components of Lymphytes and Sclerosis is of utmost importance as it helps in differentiating Hodgkin's disease from various other forms of Non Hodgkin's Lymphoma and reactive Lymphodentitis.

The project is aimed at demonstrating the Reed Sternberg cells by using Leu $M_1$ monoclonal antibody (the most potent among recently developed monoclonal antibodies) by applying Immunoperoxidase technique

If the above technique proves to be an effective and reliable diagnositic test, it will not only help in prolonging the life expectancy of the patients but may also be utilized as routine test in hospitals and laboratories.

**MATHEMATICS:** **C-QU/Maths (16)**

Title:- **The Pseudo-Newtonian Formalism.**

Special Relativity, depending as it does on cause and effect, is essentially dependent on the Newtionian force concept. As such it may be expected that re-expressing Relativity in terms of forces will provide fresh insights into its implications. The formalism for this was properly developed later and called the Pseudo-Newtonian (N) Formalism.

The project is aimed at extending the Pseudo-Newtonian Formalism to seek its application in solving certain problems of Relativity, Astrophysics and Cosmology. The validity and relevance of this extension will be tested. For its application to field theories, the space-time symmetries and the quantization of fields in the pseudo- Newtonian manifold will be studied.

Its implications are most dramatic for providing a relativistic explanation of pulsar drift and of the inclination of planetary orbits. It is intended to further develop the models suggested earlier for both of these explanations and refine the predictions of those models as well as to provide fresh predictions which could be tested.

The proposed studies would help developing such neglected fields in Pakistan like Geometry and Numerical methods and training manpower in highly sophisticated scientific skills. These skills, specially the expertise developed in the use of computers can be useful to many areas of Pure and Applied Sciences.

**PHYSICAL SCIENCES:**

**P-PU/Phys(52)**

Title:- **Laboratory Preparation and Study of Properties of Binary and Ternary Semiconducting Compounds.**

The importance of solid state electronic devices was strongly felt from the very beginning and tremendous development of these devices has taken place during the last three decades. These devices use Silicon and Germanium, or other compound materials as the semiconducting compounds. The devices are made out of these elements and compounds by different chemical processes or fabrication techniques.

The objective of present project is to develop Binary and Ternary semiconducting materials which can be used in the preparation of devices like solar cells. Initially, the emphasis will be on binary semiconducting materials like CdS, InP, GaP, and ternary materials like Zn,Si, $As_2$ etc.. The preparation of these materials will involve use of standard techniques of synthesis with slight modifications depending on the nature, solidus phase region, and reactivity of elements.

The products shall be used in the applied field of solar energy for the preparation of solar cells. The materials thus prepared can be used by the Physics Departments & Centre for Solid State Physics for further research work

**C-QU/Phys (58)**

Title:- **Preparation and Study of High Temperature Superconductors.**

Recent discovery of superconductivity in Ba doped $La_2 CuO_4$ and related copper perovskites is universally acknowledged as a discovery of a far reaching technological implications. From the rapid progress in this field it is hoped that soon materials will be developed which will be superconducting at room and higher temperature which would ultimately lead to great saving of electric power during transmission and developing faster and less noisy electronics and high power magnets.

The project envisages (a) Preparation of high temperature superconductors in the $R_1X_2T_3O_y$ series and their characterization, (b) Determination of critical temperature of superconducting transition, filamentary nature of superconductivity and thermodynamic features of the transition by measuring the electrical resistivity, critical currents and thermodynamic powers in the materials, details of the superconducting mechanisms, and the role of magnetic interactions in enhancing Tc (c) Thermoelectric power measurements and (d) Theoretical interpretation of data in the light of existing models and development of new models to explain the observed phenomenon.

The results obtained may help in seeking answers to some important questions in the field of superconductivity

**P-PU/Phys(60)**

Title:- **The Chou-Yang Model for High Energy Scattering and its Comparison with QCD for Large Momentum Transfer.**

The behavior of elementary particles, which serve as building blocks of matter, has been a problem of special interest and continued probe for physicists The construction of high energy machines have given an extra dimension to this field of study During the last few years large amount of literature has become available on this subject. However there does not exist any comprehensive theory of elementary particles Even the piecemeal explanations of the experimental data are not entirely satisfactory

Under the present project, it is intended to explain the most recent high energy experimental data for elastic scattering by using the Chou-Yang model which proposes a preliminary version of the Eikonal model for proton-proton elastic scattering. As mathematical tools are not available to obtain a Quantum Chromodynamics (QCD) based comprehensive solution of elastic scattering, attempts will be made for construction of heuristic models which can explain the experimental data for elastic processes.

It is expected that the investigations will be a useful addition to the knowledge regarding the nature and behavior of the elementary particles.

Title:- **Nonlinear Optical Effects in Atoms in a Cavity.**

Study of quantum electrodynamic effects in atoms contained in a cavity represents an exciting field of Laser Physics research. Some of the predicted effects include: inhibition of spontaneous emission from a single atom interacting with a suitably chosen single mode of the cavity; doublet structive of the spontaneous emission spectra due to vacuumfield Rabi oscillations and collapses; and revivals in the atomic excitation as a function of time. Another class of effects can be investigated by considering a system of atoms enclosed in a cavity interacting with a single mode of the quantized radiation field in the vacuum state with the whole system subjected to an external field.

The project is aimed at studying following aspects of non-linear optical effect.

i) Second harmonic generation and optical parametric oscillation in a quantum mechanical system enclosed in a cavity.

ii) Parametric interactions of waves, degenerate and non-degenerate four-wave mixing, third harmonic generation, Raman emission and other two quantum processes in a non-linear material inside a cavity. The third-order susceptibility of the system interacting with the vacuum of the quantized radiation field will be computed and information on vacuum-field Rabi oscillations obtained.

iii) The multiphoton Jaynes-Cummings model inside a lossy eavity. The dressed atomic states will be constructed by the Hamiltonian

iv) The generation of the squeezed states of the electromagnetic field in a cavity with finite Q using the multiphoton Jaynes-Cummings Hamiltonian.

This study will contribute towards the theoratical knowledge in the field of laser physics and will also help in the training of manpower

**C-QU/Phys (64)**

Title:- **Theoretical/Experimental/Computational Study of some Aspects of Plasma/Fusion Physics.**

There is a world wide growing appreciation of the application of plasma physics, particularly towards achieving nuclear fusion More and more countries are investing their men and material in the field. Even some of the developing countries of the Third World have also initiated research programme in this field.

This project envisages the (i) study of D-D fusion neutron generation in Plasma focus Devices and Pinch Machine; (ii) Compute simulation of Plasma focus, Theta Pinch, and Laser Fusion; (iii) Theoretical investigation of non-linear wave propagation in magnetized plasma, and (iv) Study of the transport processes and suprathermal electrons in ICF.

The study would help in establishing a working group in the fields of Experimental and Theoretical/Computational Plasma Physics.

**C-QU/Phys (67)**

Title:- **A Study of Coherence Properties of Radiation in Lasers and Quantum Optics.**

The Work proposed under the present project is an extension of the work being done by the investigator under PSF supported project No.C-QU/Phys (49) entitled "Coherence Properties of Radiation in Non-Linear Optics and Lasers in which studies were carried out on the 2nd and higher order coherence properties of radiation generated by coherent and partially coherent sources.

Under the present project it has been proposed to extent the work to study the linear amplifiers as well as the non-linear schemes for quenching of spontaneous emission of noise. Coherent beams with reference to their application in shift, rotation and scale invarient pattern recognition schemes will also be studied These systems have a wide range of application in single photon interference experiments, high precision measurements, communication etc..

## B) INSTITUTIONAL SUPPORT:

The Pakistan Science Foundation assists the Universities in the provision of equipment, literature etc., for research workers, who for one reason or another are unable to obtain these from their own institutions. During the current financial year funds amounting to Rs. 0.55 million were sanctioned for the purchase of equipment and literature as part of the research grants to various institution. After completion of project, the equipment is given to the same institution for the continuation of research in the fields for which these facilities were developed.

## 2. RESEARCH EVALUATION:

The Technical/Fiscal Reports received during the report period were evaluated as per procedure laid down by the Foundation for reviewing the progress of PSF supported research projects. The details of these reports are as under:

### i) Semi-Annual Reports.

Fourty one (41) six monthly reports, received after the initiation of each project or after the submission of the annual reports, were serutinized by the Research Support Section to assess the interim progress of these projects and to release their next due instalments. The particulars of these reports are as under:

| Project No. | Project Title | Reports |
|---|---|---|
| P-UET/Agr (89) | Studies on Adopted Reclamation Practices in Pindi-Bhattian. | 2nd Semi-Annual |
| S-KU/Agr (91) | Studies on Resistance in Egg Plant (Solanum melogena) and Influence of Salinity on Infectivity and Development of M. Javanica. | Ist Semi-Annual |
| P-BZU/Agr (93) | Improvement of Salt Tolerence in some Important Pulse Crops. | Ist Semi-Annual |
| P-PU/Bio (136) | Pest status, Food Preferences and control of Termites of Pakistan. | 3rd Semi-Annual |
| P-PU/Bio (141) | Studies on Siwalik Artiodactyla (Soudea, Anthrocotheroidea, Cervoideae) | 2nd Semi-Annual |

| | | |
|---|---|---|
| P-TICR/Bio (145) | Collection and Record of Reptilian Fauna of Tableland Potwar, Punjab, Pakistan. | 3rd Semi-Annual |
| S-KU/Bio (151) | Colonal Propogation of Carica papaya and Extraction of Papain from it. | Ist Semi-Annual |
| P-AU/Bio (152) | Quantitative survey of Population Trends of Heliothis armigera and its Natural Enemies on various Plants in Hyderabad Distt. | Ist Semi-Annual |
| P-BZU/Bio (154) | Ecological Guidelines for Exploitation of Natural Resources in Thal and Cholistan sand Dunes. | Ist Semi-Annual |
| P-GC/Bio (156) | Taxonomy and Biology of Entomostraca of Northern Punjab. | 3rd Semi-Annual |
| S-SU/Bio (159) | Ecological studies on some Desert Plants in District Khairpur, Sind. | Ist Semi-annual |
| B-BU/Bio (160) | Parasitic Survey of Wild Birds in Baluchistan Province. | Ist Semi-Annual |
| S-KU/Bio (166) | Screening and Isolation of Metal resistant Bacteria to be used for Environmental Pollution. | Ist Semi-Annual |
| S-KU/Bio (167) | A guide to the Malacostraca of the Northern Arabian Sea. | Ist Semi-Annual |
| F-PU/Chem (153) | A thermodynamic Study of the Superamolecular order in Aqueous Solutions of Polyvinyl Alcohol. | 2nd Semi-Annual |
| C-QU/Chem (159) | Synthesis and Development of Hydrogels for Sustained Release of Drugs. | 2nd Semi-Annual |
| B-BU/Chem (162) | Chemistry and Biochemistry of Glycoprotein Sulfotransferases and Sulfate Acceptors. | 2nd Semi-Annual |

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|---|---|---|
| S-KU/Chem (163) | Aminoacid Sequence Study on Heamoglobin and Venoms from Snakes found in Pakistan. | 2nd Semi-Annual |
| S-KU/Chem (164) | Mechanism of Iron Release from Biological Iron Transport Compounds | 2nd Semi-Annual |
| S-KU/Chem (165) | Isolation and Structural Studies on the Chemical constituents of Ervatamia coronaria. | 3rd Semi-Annual |
| C-QU/Chem (167) | Kinetics and Adsorption of Catalytic Processes | Ist Semi-Annual |
| S-KU/Chem (170) | Studies on the Chemical Constituents of Capparidaceous Plants of Pakistan. | 3rd Semi-Annual |
| P-CSIR/Chem (171) | Biosynthesis of Antibiotic Bacttracin Bacillus lichenformis as supplement in poultry feed. | 2nd Semi-Annual |
| S-SU/Chem (172) | Application of High Performance Liquid Chromatography for Multielemental Analysis at Trace Levels Using Ketoamine Schiff Bases | 2nd Semi-Annual |
| S-KU/Chem (173) | Preservation of Food by Edible Plant Extracts | 2nd Semi-Annual |
| C-QU/Chem (177) | Studies on the Chemical Constituents of some Labiateae Plants of Pakistan. | 2nd Semi-Annual |
| B-BU/Chem (178) | Immobilization of Enzymes and their Application in Flow Injection Analysis for the Determination of Substances of Diagnostic Importance | 2nd Semi-Annual |
| S-KU/Chem (185) | Synthesis and Biological Studies on Pedrin | Ist Semi-Annual |
| S-KU/Chem (186) | Pharmacological Studies on the Constituents of Medicinal Plants of Cardiovascular Importance. | Ist Semi-Annual |

| | | |
|---|---|---|
| C-PMNH/Earth (30) | Minerology and Geochemistry of the Cambrain Formation in Salt Range. | 2nd Semi-Annual |
| P-PU/Earth (32) | Stratigraphic Analysis of Mesozoic Paleogene Rocks of Hazara, Azad Kashmir and Adjacent Areas of Rawalpindi Distt. and Variation in Kohat Potwar Province of Indus Basin. | 2nd Semi-Annual |
| AJK/Earth 933) | Petrology and Geochemistry of Punjal Volconics in Poonch Muzaffarabad and Kaghan Valley. | Ist Semi-Annual |
| P-PU/Earth (37) | Petrotectionic Elements and Tectonic Framework of North west Himalya. | 2nd Semi-Annual |
| P-UET/Engg (26) | Gasification of Rice Husk for Power Generation. | Ist Semi-Annual |
| B-BZU/Math (15) | Study of Properties of BC-K and BC-I Algebra and their Catagorial Aspects | 2nd Semi-Annual |
| S-KU/Med (108) | Studies on Protein Changes in Senile Cataract. | 2nd Semi-Annual |
| C-QU/Phys (49) | Coherence Properties of Radiation in Non linear Opties and Lasers. | 3rd Semi-Annual |
| C-QU/Phys (50) | Computer Simulation of Lasers Fusion: Some Aspects of Plasma Physics. | 3rd Semi-Annual |
| S-KU/Phys (51) | Electronic Spectra of Molecules. | Ist Semi-Annual |
| C-QU/Phys (54) | Atomic Photospectroscopy at High Resolution. | Ist Semi-Annual |
| C-QU/Phys (57) | Quark Aspects in Nuclear Physics. | Ist Semi-Annual |

ii) **Annual Reports:**

As many as twenty (20) First Annual and eight (8) Second Annual Reports in Respect of on going projects were received by the Foundation, during the report period.

**IST ANNUAL REPORTS:**

| Project No: | Title of the Project |
|---|---|
| P-UET/Agr (89) | Studies on Adopted Reclamation Practices in Pindi Bhattian. |
| S-KU/Agr (91) | Studies on resistance in Egg Plant (Solanum melogena and Potato (Solanum tuberosum) and Influence of Salinity on Infectivity and Development of M. Javanica. |
| P-PU/Bio (153) | Studies on the Stability of Hybrid Plasmids Carrying Segments of Bacillus Subtilis in E. coli. |
| P-GC/Bio (156) | Taxonomy and Biology of Entomostraca, Northern Punjab. |
| B-BU/Chem (162) | Chemistry and Bio-chemistry of Glycoprotein Sulfotransferases and Sulfate Acceptors. |
| S-KU/Chem (163) | Amino acid Sequence Study on Hemoglobin and Venoms from Snakes Found in Pakistan. |
| C-QU/Chem (167) | Kinetics and Adsorption of Catalytic Processes. |
| S-SU/Chem (172) | Application of High Performance Liquid Chromotography for Multi- elemental analysis at Trace levels using ketoamine Schiff Bases. |
| S-KU/Chem (173) | Preservation of Food by Edible Plant Extracts. |
| B-BU/Chem (178) | Immobilization of Enzymes and their Applications in "Flow Injection Analysis" for the Determination of Substrates of Diagnostic Importance. |
| B-BU/Chem (179) | Studies on the Metabolism of Folates and Tetrahydrobiopterin in the Mammalian System. |
| S-KU/Chem (182) | Investigation of Pharmacologically Active Sub-stances from Marine Flora and Fauna. |
| S-KU/Chem (185) | Synthetic and Biological Studies on Pedrin. |

| | |
|---|---|
| S-KU/Chem (186) | Pharmacological Studies of the Constituents of Medicinal Plants of Cardiovascular Importance. |
| C-PMNH/Farth (30) | Mineralogy and Geochemistry of the Cambrain Formations in Salt Range. |
| AJK/Earth (32) | Stratigraphic Analysis of Mesozoic and Paleogene rocks of Hazara, Azad Kashmir and Adjacent areas of Rawalpindi District and Islamabad and Variations in Kohat Potwar Province of Indus Basin. |
| P-PU/Earth (37) | Petrotectonic Elements and Tectonic Framework of North-West Himalaya. |
| S-JPMC/Med (98) | Byssinosis in Cotton Industries of Sind. |
| S-KU/Phys (51) | Electronic Spectra of Molecules. |
| C-QU/Phys (57) | Quark Aspects of Nuclear Physics. |

**SECOND ANNUAL REPORTS:**

| **Project No:** | **Title of the Project** |
|---|---|
| P-PU/Bio (136) | Pest Status, Food Preferences and Control of Termites of Pakistan. |
| S-KU/Chem (163) | Amino Acid Sequence Study on Hemoglobin and Venoms from Snakes Found in Pakistan. |
| S-KU/Chem (164) | Mechanism of Iron Release from Biological Iron Transport Compounds. |
| P-CSIR/Chem (171) | Biosynthesis of Antibiotic Bacitracin by Bacillus licheniformis as Supplement in Poultry Feed. |
| S-KU/Chem (173) | Preservation of Food by Edible Plant Extracts. |
| C-QU/Phys (49) | Coherence Properties of Radiation in Nonlinear Opties and Lasers. |
| C-QU/Phys (50) | Computer Simulation of Laser Fusion: Some Aspects of Plasma Physics. |
| C-QU/Phys (54) | Atomic Photo Absorption Spectroscopy. |

After preliminary scrutiny by the Research Support Section, the reports were sent for detailed evaluation to the subject experts in the relevant fields. The progress reports alongwith the evaluation reports were then submitted to respective Technical Committees for consideration and acceptance. The remarks of the Technical Committee, if any, were conveyed to the Principal Investigators of the projects.

iii) Grants Released for Ongoing Research Projects:

Research grants totalling to Rs. 3.310 million were released on account of various instalments in respect of the ongoing projects mentioned in subpara (i) & (ii) above.

iv) Final Reports:

Twenty (20) Final Reports in respect of the completed research projects received during the year, were sent to the subject experts for review and evaluation. On receipt back from the experts, these were submitted to the relevant Technical Committees for consideration and adoption.

| **Project No:** | **Title of the project** |
|---|---|
| S-PCCC/Agr (77/1) | Development of Commercial Hybrid Cotton. |
| P-PU/Agr (85) | Study on the Epidemiology on Solmonella of Human and Animal Origin in Punjab |
| P-PU/Agr (86) | Studies on Phenology, Germination Ecology and control of Some Important Weeds of Wheat |
| S-KU/Bio (116/1) | Chemotoxonomic Studies in Leguminosae (from Pakistan) with reference to Phenolics. |
| P-PU/Bio (141) | Studies on the Siwalik Artiodactyla (Suoidea, Anthracotheroidea and Cervoidea) |
| B-BU/Bio (143) | Study of Genetic Potenital of Local Breeds of Sheep/Goat of Quetta. |
| C-QU/Bio (144) | Effect of Phytohormones Application in the Amelioration of Water and Salt Stress in Legumes. |
| P-PU/Bio (149) | Hormonal Influences on Skeletal Muscle Grafts. |
| C-QU/Chem (73 & 73/1) | Kinetics, Electro Chemical and Optical Investigation of Bipyridilium Herbicides and Related Compounds. |

| | |
|---|---|
| S-KU/Chem (96/1) | Synthetic and Isolation Studies towards Vinblastine and Vincristine and Their Novel Derivatives. |
| C-QU/Chem (122) | Silicones from Locally available Silicate Minerals. |
| S-SU/Chem (133) | Preparation and Development of new Sensitive Chromogenic Reagents for the Analysis of Metal Ions. |
| S-KU/Chem (170) | Studies on the chemical Constituents of Capparidaceous Plants of Pakistan. |
| C-QU/Chem (175) | Estimation of Heavy Trace Metals in Various Local Fish Species and relevant Marine/Fresh Waters. |
| P-CSIR/Eng (20) | Development of Fluidized Bed Cool Combustion System based on Low Grade Coal for the Supply of Clean Heat for Industrial Use. |
| P-MHL/Med (57) | Epidemiological Studies on Orbital Tumours. |
| S-JPMC/Med (85) | Biochemical Studies on Trauma. |
| S-DMC/Med (103) | Early Detection of Carcinoma Cervix Using Colpomicroscope and Comparing with other Methods. |
| P-PMI/Med (104) | Maternal Serum Alpha-Fetoprotein Levels in Second Trimester of Pregnancy and its correlation with Prenatal Diagnosis of Impending Fetal Death and Open Neural Tube Defects. |
| C-QU/Phys (44) | Deep Level Transient Spectroscopy |

**v) Compilation of Project Data:**

The data about research support programme has been updated and completed in respect of on-going and completed projects.

**vi) Compilation of Project Data:**

The Foundation, subject to the availability of funds, may support proposals for utilization of the results of scientific and technological research, including pilot plant studies, to provide the technical and economic feasibility of processes found to be promising on Laboratory scale. However, during the

report period no such proposal was received. Hence no grant was sanctioned/released under this head.

**vii) Summaries of Final Research Reports:**

Brief summeries of the final research reports received during the report period as mentioned in subpara (iv) above are as under:-

| | |
|---|---|
| **Project No.** | S-PCCC/Agr (77/1) |
| **Project Title:** | Development of Commercial Hybrid Cotton. |
| **Project Particulars:** | |
| - Duration | Three Years |
| - Date of Commencement | 15.5.1986 |
| - Date of Completion | 14.5.1989 |
| - Location of Scheme | Cotton Research Institute, Sakrand, District Nawabshah. |
| - Principal Investigator | Mohiuddin Ahmad. |
| - Total Expenditure | Rs. 2,00.200/- |
| Main Objectives. | To achieve a break through in yield as well as quality of cotton in Pakistan. |

## Summary of the Work Done:

The project is an extension of previous study on the production of $F_1$ Hybrids of G. barbadense and G. hirsutum cultivars manifest high degree of heterocis in yield in comparison to others; b) the main contributor towards yield in interspecific $F_1$ hybrid (G. hirsutum X G. barbadense) is boll number per plant whereas boll weight shows negative heterosis, and c) the ginning out-turn in general, is low in $F_1$ hybrids.

In the extension period, investigations were aimed at applying the phenomenon of heterosis into general practise. The results are as under:

- The parents belonging to both G. hirsutum and G. barbadense species have been identified which in $F_1$ cross combination menifest very high degree of heterosis in yield and out yield the standard commercial variety by a margin of as high as 200%.

- Local cytoplasmic male sterile lines of selected G. hirsutum cultivars have been developed which instead of exotic lines may be used with advantage of adaptability to the local agro-climatic conditions.

The development of fertility restorers having both fertility restorers gene Rf and fertility enhancer factor 'E' has made hybrid seed production easier and economical as hybrid seed may directly be produced by crossing these fertility restorers onto cytoplasmic male sterile lines rendering despensible the three way cross needed for the production of hybrid seed.

From the above results it is evident that so far the best combination of parents which manifest high degree of heterosis in $F_1$ generation have been isolated and best fertility restorers for inducing fertility in cytoplasmic male sterile line have been identified. Furthermore, the technology developed under this project and basic material needed for production of hybrid seed are now available for commercial exploitation.

The project work has resulted in the publication on 2 papers in reputable international journals.

| | |
|---|---|
| **Project No:** | **P-PU/Agr (85)** |
| **Project Title:** | Study on the Epidemiology on Salmonella of Human and Animal Origin in Punjab. |
| **Project Particulars:** | |
| - Duration | Three Years |
| - Date of Commencement | 1.6 1985 |
| - Date of Completion | 31.5.1988 |
| - Location of scheme | College of Veterinary Sciences, Lahore. |
| - Principal Investigator | Dr. M. Ajmal |
| - Total Expenditure | Rs. 2,83,320/- |
| Main Objectives: | To study the status of different species of Salmonella and their Serotypes producing typhoid and other enteric fevers septicamias, food poisoning, abortion, and other maladies in man and animal in Punjab. |

## Summary of the Work Done:

Salmenolla, having more than 2000 serotypes, constitutes an extremely large group of gram negative bacilli bacteria. Majority of these are ubiquitous in nature and potentially pathogenic to both man and animals. Severity of the disease caused by Salmonellae depends upon the prevailing environmental conditions, level of contamination, and break down in the resistance of the host.

The project was undertaken to study the epidemiology of prevalance in relation to different species of animals and carrier status of different serotypes of Salmonellae. A total of 26,912 samples were processed for the isolation and serotyping of Salmonella. Those include: 22,385 samples from

buffaloes, cattle, sheep and goats, camels, poultry, horses, dogs, cats, human beings and pigeons; 1450 samples from different edible food materials and; 3077 samples from other sources that are suspected to be contaminated by these bacteria.

Results have shown that S typhimurium was the most prevalant serotype in faeces of all the animal species as well as man. Incidence of its occurance during the years 1985-88 showed an increasing pattern of Salmonellosis ranging from 1.2% - 4.6% and 0.88% - 6.0% in cattle and buffaloes faecal samples respectively. The other serotypes having high incidence like; S. butantan, S. anatum, S. heidelberg, S gallinarium, and S pullorum were mostly isolated from poultry. Mesenteric Lymph nodes of buffaloes, cattle, sheep and goats, and poultry meat were also positive for Salmonellae. Of the 1450 samples of edible food material including vegetables, fruit, and pulses, 0.34% showed the presence of Salmonellae namely S. typhimurium and S. paratyphi of the 3077 samples from different sources (litter, commercial feed, fish meal, and meat) 100 were positive for Salmonellae with relatively high incidence of S. typhimurium, S butantan and S galtinarium than others. The meat samples analysed have indicated that there is a great chance of contamination through butchers using the same knife for all carcasses without proper cleaning and disinfection Thus, proper hygienic measures need be adopted at slaughter houses, butcher shops and in the kitchens so as to check the increasing rate of Salmonellosis in animals and man.

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|---|---|
| **Project No:** | P-PU/Agr (86) |
| **Project Title.** | Studies on Phenology, Germination Ecology and Control of some Important Weeds of Wheat. |
| **Project Particulars:** | |
| - Duration | Three Years 5-Months |
| - Date of Commencement | 1.1 1985 |
| - Date of Completion | 31.5.1988 |
| - Location of scheme | University of the Punjab, Lahore. |
| - Principal Investigator | Dr. S.R.A. Shamsi. |
| - Total Expenditure | Rs. 2,59,800/- |
| Main Objectives: | To study the phenology, seed germination and early seedling growth in relation to various environmental factors of some important weeds of wheat of irrigated and barani areas. |

## Summary of the Work Done:

In agricultural lands, weeds cause reductions in crops yield by competing with them for light, nutrients, water, and space. They incur enormous losses and reduce the productivity of wheat which is the most important food crop of Pakistan. The magnitude of loss caused to wheat by various weeds necessitates intensive research on weeds both of basic and applied nature.

A survey of barani and irrigated wheat fields was carried out and nine weeds viz. P. minor, G. arvensis, M. parviflora, M denticulata, L. aphaca, S. didyma, A. arvenis, C. albuns and F. indica in irrigated fields of Lahore and six weeds viz. A. tenuifolius C. arvensis, F. indica V. sativa, A. arvensis and I. polycerata in barani fields of Maldeo Dina, Distt. Jehlum were found to be the commonest weeds. Detailed studies were conducted on various phenological aspects of these weeds (such as: germination span of vegetative growth, flowering fruit formation, seed dispersal, and seed dormancy) in relation to the prevailing climatic conditions were conducted and following results were achieved.

- Initiation of germination and span of germination period is highly variable in different weeds Declining day and night temperatures during post-monsoon period from October to December stimulate germination of these weeds. In general, weeds of irrigated wheat fields show maximum germination during December and the barani ones during November (except A. arvensis and T. polycerata). Since germination and growth period of these weeds coincide with that of wheat, they show close association and severe competition with wheat for the full season. Their seeds are dispersed in wheat fields even before the start of wheat harvesting period in late April/early May. So these weeds perannate in wheat fields during hot summar as seeds and appear again in the fields as winter annuals successively year after year.

- Germination and early seedling growth in all the weeds was optimum at 40 to 60% WHC (soil Water Holding Capacity). M denticulata was most and L. aphaca least sensitive to extremes of soil moisture stress, weeds in descending order are: L. aphaca, P. minor, C. arvensis, M. parviflora, A. tenuifolius, M. denticulata.

- As far as their germination is concerned all the weeds under study are moderately salt tolerant and can be arranged in the following descending order with respect to their salt tolerence L. aphaca, A. tenuifolius, M. parviflora, P. minor, C. arvensis, M. denticulata. As regards seedling growth, M denticulata, M parviflora and A. tenuifolius are fairly salt tolerant in contrast to P. minor, L. aphaca and C arvensis which are highly salt sensitive In general, all these weeds prefer moderately moist, salt-free soils for their germination and seedling growth, consequently their ecological distribution is restricted to thoroughly ploughed, well aerated irrigated wheat fields.

- Seeds stored for six months showed 80-90% of their respective optimum percentage germination as compared to their fresh counterparts. Only in M. parviflora, fresh weeds showed 67% germination Viability of seeds of most of the weeds start declining after 2 years storage. Apparently, all these weeds are capable of infesting wheat crop in the very first available wheat sowing season in November after dispersal of their seeds in April in the same year. They also retain this infestation potential for 2-3 years

- P minor, M denticulata, M. parviflora and mixed weeds were greatly controlled by Dicuran MA but Arelon totally eliminated all those except mixed weeds. Arelon also

caused relatively greater mortality of L. aphaca than Dicuran MA. C. arvensis was virtually eliminated by Dicuran MA, and resisted to Arelon with only 13% mortality. Application of these herbicides significantly improved wheat growth and grain yield as compared to the weed check. In most of the weedy treatments (especially for M. parviflora, L. aphaca and mixed weeds) response to Arelon was significantly better than to Dicuran MA.

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|---|---|
| **Project No:** | S-KU/Bio (116/1) |
| **Project Title:** | Chemotaxonomic Studies in Leguminosae (from Pakistan) with reference to Phenolics. |
| **Project Particulars:** | |
| - Duration | One Year |
| - Date of Commencement | 1.6.1987 |
| - Date of Completion | 31.5.1988 |
| - Location of scheme | University of Karachi, Karachi |
| - Principal Investigator | Dr. Khadija Aziz |
| - Total Expenditure | Rs 1.08,751/- |
| Main Objectives: | To study the uses of Phenolics for Plant Systematics and to Investigate the Taxonomy Oriented to Provide Species Differentiation for Future use of Plants in Pakistan. |

## Summary of the Work Done:

The use of chemical information in biological studies is a recent innovation of plant systematics and all the chemical constituents of a plant are not of great value to a biosystematists. Secondary metabolites have been most widely recognized to be useful in establishing systematic relationship, than any other plant constituent. This group includes Alkaloids, Amino acids, Carotenoids, Steroids, Coumarins, Phenolics, Quinones, essential oils, Terpenes. Phytoalexins, Glucosinolates, oils and Waxes and Carbohydrates. In addition, these compounds have shown to be important as defenses against pathogens, as allelopathic agents, and attractants in pollination and fruit dispersal in plants.

Phenolics constituents in the members of family Leguminosae have been investigated from Pakistan. The subfamily Mimosoideae consists of 11 genera and 56 species, and Caesalpinioideae include 15 genera and 52 species from Pakistan. A total of 23 genera with 45 species (and 6 sub-species) were analysed in the present investigation, of which 8 genera and 16 species (and 4 sub species) belong to the sub- family Mimosoideae, 10 genera with 23 species (one with 2 sub- species) to Caesalpinioideae and 5 genera with 6 species to the subfamily Papilionoideae. Leaves of 181

samples were analysed for phenolic constituents by both ascending and descending one and two dimensional paper and thin layer chromatography of which Mimosoideae includes 78, Caesalpinioideae 89 and Papilionoideae 14 samples.

The genera investigated for phenolics were Acacia, Albizia Mimosa, Prosopis, Pithecellobium, Leucaena, Adenanthera, Samanea, Bauhinia, Cassia, Caesaloinia, Cercis, Tamarindus, Hardwickia, Parkinsonia, Peltophorum, Delonix, Millettia, Dalbergia, Indigofera, Vicia and Lathyrus. A total of 90 phenolic compounds were tentatively identified in these genera by using authentic markers like Rf values, Color reactions with spray reagents, and UV-flourescence. A number of species have been confirmed for Caffeic acid, p-Coumaric acid, Kaempferol, Quercetin, Rutin, Myricetin, Luteolin, Pelargonidin and Malvidin on the basis of UV-spectral properties using various shift reagents.

Plants were also analysed for interplant and interlocality chemical differences and relationships etc This revealed the geographical, environmental and ecological stability of the compounds, clearly indicating that this approach is significant for taxonomic judgments.

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|---|---|
| **Project No:** | P-PU/Bio (141) |
| **Project Title:** | Studies on the Siwalik Artiodactyla (Souidea, Anthracotherioidea and Cervoidea). |
| **Project Particulars:** | |
| - Duration | Three Years |
| - Date of Commencement | 1.2 1986 |
| - Date of Completion | 31.1.1989 |
| - Location of scheme | University of the Punjab, lahore. |
| - Principal Investigator | Dr. Abu Bakr |
| - Total Expenditure | Rs. 3,62,912/- |
| Main Objectives: | To study the Fossils of Suoidea, Anthracotherioidea, and Cervoidea, in Siwalik of Pakistan. |

## Summary of the Work Done:

Fossils of Artiodactyla animals are abundant in the Siwaliks. Study of these fossils renders it easier to interpret the past history of these animals and also help in understanding the stratigraphy of the area

Field studies were carried out in Rawalpindi, Chakwal and Jhelum Districts of the Punjab for the fossil specimens of the order Artiodactyla. The specimens collected during the report period belonged to twelve species of family Souidae, five species of family Anthracotheroidae and five species of family Cervoidae. A detailed systemic account of the 22 specimens collected i.e. parts of skull mandibles and isolated teeth has been given which provides additional information on the known species. The important finding of the study is the collection of a new species belonging to the genus Hexaprotodon.The specimens collected will form part of the collection of Pakistan Museum of Natural History.

| | |
|---|---|
| **Project No:** | B-BU/Bio 9143) |
| **Project Title:** | Study of Genetic Potential of Local Breeds of Sheep/Goat of Quetta |
| **Project Particulars:** | |
| - Duration | One Year |
| - Date of Commencement | 1.6 1987 |
| - Date of Completion | 31.5 1988 |
| - Location of scheme | University of Baluchistan. Quetta. |
| - Principal Investigator | Mr Afsar Mian |
| - Total Expenditure | Rs 36,919/- |
| Main Objectives | To survey various genetic potentials of the productivity, disease resistance, and turn over rate of the different breeds of sheep/goat of Quetta. |

## Summary of the Work Done:

The present study was undertaken with the aim of developing basic infrastructure for a wider study on sheep & goat Flocks in Baluchistan Three resident stocks were selected at three different localities, i.e Agricultural College,Balalli, Urk and Randozai, where different number of the adults male/females and the newborn individuals of sheep/goat were selected, number tagged. Monthly records on body weight and other environmental and biological parameters were maintained throughout the year to draw results on adult weight, growth rate, and breeding performance, while limited informations were collected on wool, haematological and milk factors

The results achieved in case of sheeps indicate that with regard to the adult weight, stocks did not varied much. While the male were significantly higher than females. The seasonal variations in weight observed to be followed in all the stocks/sexes, the highest weight appearing in May and lowest in September. Such fluctuations in weight canbe explained on the basis of the general vegetative cycle

exhibited in the area. The females gain some 11 kgs weight progressively during the pregnancy and loose some 14 kgs at parturition. The general growth can be divided into three periods: first 4-months with a very rapid growth, a moderate growth period falling between 5-9 months of age and a slow period of growth persisting till 2-years of age. The growth rates are equivalant to other breeds maintained in Pakistan. However, the fact that stocks under study were maintained on stressful natural grazing, while the other stocks for which informations are available, were maintained under experimental controlled grazing/supplemented rationing,may suggest that the growth rate is generally higher in Quetta stocks than the other stocks. The fertility of the reproductively active females ranges from 90% in Urk, 75% in Karaculi, 69.23% in Baluchi and 64.43% in Randozai stocks. The frequency of twice a year lambing pattern was higher in Urk(67.67%), followed by Baluchi (44.44%), Karakuli (11.11%) and Randozai (0.00%), Urk and Baluchi breeds being better in producing twice a year lambing The frequency of twining was highest in Baluchi (30.77%) followed by Urk/Randozai (15.29%). The breeding activity mainly occurs during December-March period with some during May-July. An average of 1 69 kg wool is estimated to be produced by the sheep flock on per animal per year basis. The glucose, haemoglobin, WBC count, RBC count and ESR of blood suggested normal parameters, while fat (6 30%) SNF (9 30%) TS (15.33%) and PH (5.96) has been recorded for the milk samples collected from the area

The results in goat stocks have indicated that the adult weight fluctuated from 44.35/39.17 (male/females) in Khurassani, 35.63/30.75 in Urk and 30.93/29.67kgs Randozai stocks. The weight was highest during May and lowest during June-July, explainable on general vegetative cycle. The females accumulate some 12 kgs during pregnancy and loss some 13-15 kgs on parturition. Different stocks of goat appear to show some degree of variations in growth pattern, though it extends till the age of some 2-years The growth pattern occurs in three phases in Khurassani stocks (rapid 1-6 months, moderate 7-11, slow beyond), the initial period of rapid growth extends till 7th month in Randozai stocks, while in Urk stocks the distinct growth periods can not be separated and growth appears to be continued gradually through the 2-years of age. The growth rates seem to be higher in Khurassani stock (average 84.07/66 42, males/females), followed by Randozai (78.31/51 63) and lowest in Urk stock These growth rates are generally higher than Teddy breed The fertility of females was high 100% in Randozai and 92% in Urk. A higher proporation of females kidding twice a year in Randozai (55.56%) than Urk (0.00), 66.67% twin, 4 76% tripple births in Randozai and only 7 69% twin births in Urk indicates that Randozai breed appears to be significant better breeder (2.17 kids/year/female) as compared with Urk (1.08). The majority of births come during November-April period, though some (12.12%) in June. The haematological studies suggest glucose level of 77 80 mg/100 ml, haemologbin 12.17%, WBC count 7.25 thousand/$mm^3$, RBC count 4.50 million $mm^3$ and ESR of 2.13 mm after one hour.

These results have led to the conclusion that the flocks and farmers seem to be well adapted to general conditions in Baluchistan due to certain old practices. However, there are possibilities of (i) genetic improvement in sheeps and goats and (ii) increased economic gains for farmers by harvesting the males at the age of 6-9 months.

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| **Project No:** | C-QU/Bio (144) |
| **Project Title:** | Effect of Phytohormones Application in the Amelioration of Water and Salt Stress in Legumes. |
| **Project Particulars:** | |
| - Duration | One Year |
| - Date of Commencement | 24.2.1986 |
| - Date of Completion | 23.2.1987 |
| - Location of scheme | Quaid-i-Azam University, Islamabad. |
| - Principal Investigator | Dr. Asghari Bano |
| - Total Expenditure | Rs. 53,150/- |
| Main Objectives: | The objective of the present study is to asses the role of externally applied Abscisic Acid (ABA) and Kinetin the amelioration of salt and water stress in two legumes Porosopis sp. Vigna sp. (mung bean). |

## Summary of the Work Done:

Salinity induced growth inhibition causes severe damage to the cultivated crops especially at their critical stages of growth. Latest technology involves the application of plant hormones to keep growth rate of plants normal in stress conditions like salinity and water logging.

Accordingly, studies were undertaken to assess the role of externally applied plant hormones in the amelioration of stress conditions in the legumes namely Prosopis sp. and Vigna sp. (Mung bean). Results of these investigations are summarized below:-

**Effect of Phytohormones in the Amelioration of Water Stress.**

Pre-treatment of seeds with Indole Acetic Acid, Kinetin and Gibberalic Acid + Benzyl Adenine (IAA, K and GA + BA) affected the root and shoot growth Under water stress condition, only fresh weight of shoot was stimulated by IAA and K treatment. It was found that in water stress condition the response of plant growth substances is smaller than the normal ones and some hormones appear to be ineffective. Prolonged water stress inhibited the root fresh weight without affecting the shoot growth, so it was inferred that the type and magnitude of the effect of plant growth substances depend not only on the growing conditions (normal/water stress) but also on the duration of stress imposed.

**Effect of Phytohormones in the Amelioration of Salt Stress.**

Salt treatment, both 50 and 100 mM adversely affected the fresh and dry weight of plant parts and markedly reduced the nitrogenase activity of nodules. Seed soaking pre-treatment with GA + BA effectively ameliorated the adverse effects of salt stress. Pre- treatment with NaC1 induced the preosmotic adjustment of plant which caused slow water stress development in the treated plants.

Increase in the total Na and K content in the plants pre-treated with different hormones was noted and GA + BA was found most effective in increasing the salt levels. Results showed that seed soaking is more effective than foliar spray of growth substances.

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| **Project No:** | P-PU/Bio (149) |
| **Project Title:** | Hormonal Influences on Skeletal Muscle Grafts. |
| **Project Particulars:** | |
| - Duration | Two Years |
| - Date of Commencement | 1.5 1985 |
| - Date of completion | 30.4.1988 |
| - Location of scheme | University of the Punjab, Lahore. |
| - Principal Investigator | Dr. Shahzad A. Mufti. |
| - Total Expenditure | Rs. 2,38,345/- |
| Main Objectives: | To study the effects of anabolic hormones (Insulin, Androgens and Thyroid hormones) on the structure and function of the skeletal muscle grafts. |

## Summary of the Work Done:

The skeletal muscles in animals have a remarkable ability to regenerate after many kinds of injuries including transplantation. During this process almost all of the original muscle fibres degenerate, followed by an appearance of a whole new population of myoblasts which then gives rise to well differentiated muscle fibres.

In present project, the effects of three hormones namely Testosterone, Insulin and Thyroid on the regeneration of muscle fibres within rat EDL (Extensor Digitorum Longus) muscle grafts have been studied under various experimental conditions. It was observed that EDL muscle grafts reacted negatively to the lack of androgens showing considerable degree of atrophy and degeneration. On the other hand, after exogenous administration of Testosterone, it developed normally or even better than the control ones. Accordingly, it was inferred that mammalian skeletal muscles in general are more

sensitive to the presence or absence of androgens during development, growth and regeneration processes.

In another series of experiments, the Insulin production in rats was inhibited by Allaxone treatment and its effect were studied on the EDL muscle grafts. In such rats, EDL grafts showed very poor regenerative activity as compared to the control grafts. On the contrary, in Hyperinsulinaemic rats prepared through exogenous administration of Insulin, EDL muscle grafts regenerated much better. In such grafts the hypertrophy of the individual muscle fibres was evident as exhibited in significantly higher cross- sectional area of the muscle. These observations indicate that Insulin also plays an important role in the regeneration and growth of mammalian skeletal muscles.

When thyroid activity was inhibited through the administration of Thiourea, it was once again noticed that EDL transplants in rats made hyperthyroid through Thyroxine administration, show a considerable degree of hypertrophy. Thus, it is concluded that (a) three anabalic hormones namely: Testosterone, Insulin and Thyroxine play a very important role in the regeneration of EDL muscle grafts (b) complete absence or physiologically lower concentrations of these hormones results in atrophy and regeneration of the muscle fibres within the grafts and (c) higher concentrations of these hormones affect the EDL muscle grafts positively; apparent by higher average cross-sectional area of muscle fibres in such transplants.

The findings of this project are not only helpful in the management of muscle transplantation in patients with endocrine disorders, but are also of great importance in solving the problems of obtaining better regenerates with better structural and functional parameters.

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| **Project No**: | C-QU/Chem (73 & 73/1) |
| **Project Title:** | Kinetics, Electro Chemical and Optical Investigation of Bipyridilium Herbicides and Related Compounds. |
| **Project Particulars:** | |
| - Duration | Two Years |
| - Date of commencement | 1.11.1981 |
| - Date of Completion | 31.10.1983 |
| - Location of scheme | Quaid-i-Azam University, Islamabad. |
| - Principal Investigator | Dr. Mahboob Muhammad |
| - Total Expenditure | Rs. 44,400/- |
| Main Objectives: | To carry out extensive studies on pyridilium and pyridilium salt. |

## Summary of the Work Done:

Electrochemical, kinetics and optical studies were carried out on two important biologically relevant compounds: N, N-dimethyl, 4,4- bipyridilium dichloride (and homologues) and 1-ethyl 4-carbomethoxy pyridiliumiodide, the former which is called paraquat (or methyl viologen)is a known herbicide while the later is a biological model compound for NAD. It was hoped that the present study would directly or indirectly help in understanding the mechanism of the biological reactions in which the two compounds (and homologues) are either directly involved (e.g. paraquat as herbicide) or act as model compound. The studies encompassed a large variety of subject matter, e.g. determining $E_{1/2}$ (reversible) protonation reaction, solvation free energies, ion pair phenomenon etc..

Through electrochemical studies, the existance and stability of the pyridinyl anion and methyl viologen "neutral" were established and the disproportionation equilibrium constant for the reduction processes for pyridinium, bispyridilium and 1:n:1 type pyridinium compounds were obtained. The highest reduction products of 1:3:1 were investigated (some of the higher reduction products were never reported) Kinetics, i.e. protonation reactions of the higher reduction products of pyridinium and bipyridilium compounds were investigated in various solvents and on various electrodes. From these electrochemical and kinetic investigations, it was proposed that the higher reduction product of methyl viologen, now named methyl viologen neutral, might be taking part in the herbicidal activity of methyl viologen (paraquat).

The electrochemical data gave $F_{1/2}$,s of a series of pyridinium and bispyridilim compounds, which were correlated with the molecular orbital energies (in w-technique prescription). The solvochromic property of 1-ethyl 4-carbomethoxy pyridinium iodide was utilized in developing a method for the evaluation of solvation free enegies of transfer of anions, The method was found to be as good as Pleakov or Forrocene method.

Through the conductance studies of pyridinium ioide in solvents like acetonitride, dimethyl formamide, acetone, and methanol gave the equilibrium constant for the dissociation of the ion of pair into free ions was found to be $10^{-3}$ - $10^{-2}$ in chloroform no dissociation was observed.

Magnetic resonance studies gave interesting and useful information. Through the chemical shifts of the pyridinium ring protons in various solvents, the equilibrium constants for the charge transfer complex (or very tight ion pair) going to loose ion pair, were obtained. This was also the first time such equilibria were studied. The equlibrium constant varied varied from 0.5 in chloroform to 10 in formamide. It was established that though Py1 does not dissociate into ions in chloroform, it exists in CT complex and loose ion pair form. Studies have shown that charge transfer complex and loose ion pair are two different moieties. Also, through NMR studies exchange equilibrium between a CT complex and loose ion pair was studied. The exchange was found to be fast on NMR time scale. Through these NMR studies it was also found that Py1 does not exist as CT complex in water. A new Z-value (a solvent polarity parameter) for water was proposed. Also it was found that the chemical shift of Py1 varied linearly with the Z-value of solvent and hence the chemical shift can itself be utilized as solvent polarity parameter.

In the process of carrying out the project two new analytical techniques were developed (i) the Py1 method for solvation free energies of transfer (ii) the Mohammad - Nicholson - Shain method for studying kinetics of reactions of reactive intermediates like free radicals, radical anion and dianions. The later method is very elegent, simple rapid and theoretically sound for studying fast reactions.

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| **Project No:** | S-KU/Chem (96/1) |
| **Project Title:** | Synthetic and Isolation studies towards Vinblastine and Vincristine and their novel derivatives. |
| **Project Particulars:** | |
| - Duration | Three Years |
| - Date of Commencement | 1.7.1983 |
| - Date of Completion | 30.6 1986 |
| - Location of scheme | University of Karachi, Karachi. |
| - Principal Investigator | Dr. Ata-ur-Rehman |
| - Total Expenditure | Rs. 4,14,200/- |
| Main Objectives: | i) Isolation of Catharane and Vindoline in sizeable quantities. |
| | ii) Isolation of Vinblastine. |
| | iii) Optimisation of the coupling reaction as well as functionalisation of the binary alkaloids synthesised. |
| | iv)Improvement and optimisation of procedures developed for the synthesis of Catharanthine and its analogue. |
| | v) Development of synthetic approaches to secodine and B-carboline systems for conversion to Iboga and Aspidosperma system. |
| | vi) Investigation of new procedures for oxidation of Vinblastine to Vincristine. |

## Summary of the Work Done:

Catharanthus roseus (L) locally known as "Sada Bahar", belonging to the Apocynaceae family, has assumed great therapeutic importance, as it has yielded six-neoplastic alkaloids. Amongst these,

Vinblastine and Vincristine are the most powerful anti-tumor agents available in medicine for the treatment of a variety of cancers. Unfortunately, these compounds are present at very low concentrations in the plant material. The synthesis of these compounds is therefore, a subject of great interest these days.

The project was undertaken to isolate and synthesize Vinblastine and Vincristine and their derivatives. The achievements made during these investigations are as under:-

i) A new procedure has been developed forthe isolation of Vinblastine using tartaric acid/HC1 for adjusting the pH followed by solvent extraction, yielding crystalline Vinblastine upon addition of ether, methonol or acetone.

ii) The binary alkaloid Leurosine exists in the leaves of C. roseus in 8 to 10 fold greater quantity than Vinblastine. Leurosine has in one step, been converted to anhydrovinblastine which can then be converted to Vinblastine. This represents a novel approach to the synthesis of Vinblastine and utilizes the hitherto useless Leurosine

iii) A number of new and known alkaloids were isolated from the leaves and flowers of Catharanthus roseus namely, 16-epi-19-S- vindolinine, catharanthine vindoline, vinblastine, 16-epi-19-Svindolinine-N-oxide, fluorocarpamine-N-oxide, vindoline-N-oxide, Fluorocarpamine, pleiocarpamine, Gomaline, Rhazimol, Rosamine, Rosicine, 14,15-dehydroepivincadine, 19-hydroxy-tabersonine, Norharmane, Catharine, Cathovaline, Bunnucine and Leurosinone; whereas Coronaridine, 11-methoxytabersonine, Teraphydroalstonine, Ajmalicine, Mitraphylline and vindorosine were isolated from the flowers of Catharanthus rosues.

iv) The physiologically active alkaloids, Vinblastine and Vincristine, are biogenetically derived from the B-carboline system, and have iboga and aspidosperma types of skeletal system. Attempts were accordingly directed to the synthesis of B-carbolines and the biogenetically important secodine systems. It is known that secodine derivatives can be converted to the Iboga and Aspidosperma alkaloids. These studies have led the investigations to the first synthesis of N-methyl-secondine and N-benzylsecondine The synthesis of the closely related Hunterin alkaloids has also been achieved. They closely resemble the Aspidoserma alkaloide which constitute the lower half of Vinblastine. These studies have led to a novel synthesis of vincamine, which is convertible to the Aspidosperma type alkaloids in a one-step process.

v) Oxidation of Vinblastine and Vincristine were sucessfully carried out by using a number of oxidizing agents.

vi) A new derivative of Leurosine (dinitroleurosine) was prepared and submitted to a foreign pharmaceutical company for evaluation of its biological activity.

The project work has resulted in the publication of 23 papers in reputable international journals.

**Project No:** C-QU/Chem (122)

**Project Title:** Silicones from Locally Available silicate Minerals.

**Project Particulars:**

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| - Duration | One Year |
| - Date of Commencement | 1.5.1982 |
| - Date of Completion | 30.4.1983 |
| Location of scheme | Quaid-i-Azam University, Islamabad. |
| - Principal Investigator | Dr. Muhammad Mazhar. |
| - Total Expenditure. | Rs. 51,800/- |
| Main Objectives: | i) To collect mineral silicate of high parity and their conversation into Polyorgano-Siloxanes, and utilization in industry.<br><br>ii) Synthesis of Silicon analogues of carbon compounds of biological importance to investigate their role in biological processes and preparation of silicon metal for its use in solar cells. |

## Summary of the Work Done:

Silicate compounds constitute about one third of all the mineral species known in nature. Silicon, a member of this class has wide industrial application as an alloy in metals take Al, Mg, Fe. etc. to increase their strength and to confor their corrosion resistant properties. Silicate mineral deposits e.g. Biotite, Phogopite and Muscovite are available in Pakistan and can be exploited for conversion into useful Siloxanes, pure Silcone etc.

Samples of mineral silicates were collected and analysed to establish their composition. Trimethylsilylation of these mineral silicates was studied in different experimental conditions to give the optimum yield of trimethylsilylated silicates. It was found that muscovite and phogopite give 25% yield of silylated product. Sodium silicate undergoes silylation to give 99% trimethylsilylated product which can be industrially exploited. Silylated products of all the silicates studied did not react either with Grignards reagent or with methyllithium to give methylpolysiloxanes.

$Sio_2$ was found to react with catechol under certain reaction conditions to yield hexaco-ordinated complexes which were characterized by UV. IR spectroscopy and thermogravimetric and differential thermal analyses. These complexes seem to have potential to exploit them for the conversion of $Sio_2$ into solar grade silicon, and industrially useful material such as polysiloxanes.

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| **Project No:** | S-SU/Chem (133) |
| **Project Title:** | Preparation and Development of new Sensitive Chromogenic Reagents for the Analysis of Metal Ions. |
| **Project Particulars:** | |
| - Duration | Two Years |
| - Date of Commencement | 1.1.1985 |
| - Date of Completion | 31.12.1986 |
| - Location of scheme | University of Sind, Jamshoro. |
| - Principal Investigator | Prof. Dr. Iftikhar-ud-Din Arain |
| - Total Expenditure | Rs. 1,45,464/- |
| Main Objectives: | i) To prepare new highly sensitive, selective ferroin and cuperoin type reagents within the country.<br><br>ii) Apply the ligands to develop new methods for the qualitative and quantitative determination of metal ions with the aid of spectrophotometer and spectroflorimeter.<br><br>iii) To train a person not only in the field of synthetic organic chemistry but also as analytical chemist for the quantitative determination of metal ions. |

## Summary of the Work Done:

The reactions of 1, 10-phenanthroline 2,2-bipyridine and their derivatives with ferrous ions yielding red, soluble compounds are of great value in analytical chemistry. The pyridyl-substituted pyrazine and quinoxaline compounds containing ferrion and cuperion functionalities are also of considerable importance because of their close resemblance to 1,10-phenanthroline and 2-2 bipyridine. In view of this importance, a number of pyridyl substituted pyrazine ligands were prepared and studied by earlier researchers.

Under this project, twenty seven (27) Copper and Iron selective reagents were prepared and their structures determined with the help of IR, UV, H, NMR and Mass Spectroscopic Techniques.

The effect of methyl, ethyl, phenyl, furyl and pyridyl substitution in dihydrophyrazine, pyrazine and quinoxaline ring on the reactions towards Copper (I), Iron (II) Ruthenium (II), Cobalt (II) and Nickel

(II) were investigated in terms of solution stability, molar absorptivity, wavelength of maximum absorbance and extractability from the aqueous to organic solvents. The results of these experimentation showed that the reagents BPPDP, BPPP, PDPDP, PDPP, BPEMDP and BPPMDP, react with Copper (I), Iron (II) and Ruthenium (II) to form highly coloured solution, where colour development with Iron (II) and Copper (I) is immediate but Ruthenium takes longer time. The colour reactions of other reagents toward iron is sterically hindered because of the substituents adjacent of inine nitrogen atom.

The calibration range for copper (II) is within 0.5-7.0 ug/ml and for iron (II) and copper (I) in mixture is 0.5-7 ug/ml iron and 0.5- 5ug/ml copper. The effect of diverse ions on the copper determination with the reagent BMPTDP was investigated and the reagent was applied for quantitative determination of copper in different water samples and human head hair. The results are compared using independent spectrophotometric method using bathocuprine (2,9-dimethyl-4-7 diphenyl-1,10 phenathroline) as complexing reagent. Finally, the reaction of the furyl substituted dihydropyrazine and quinoxaline towards copper, iron cobalt and nickel were studied qualitatively and spectrophotometrically.

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| **Project No**: | S-KU/Chem (170) |
| **Project Title:** | Studies on the chemical Constituents of Capparidaceous Plants of Pakistan |
| **Project Particulars:** | |
| - Duration | Three Years |
| - Date of Commencement | 1.1.1986 |
| - Date of Completion | 31.12.1988 |
| - Location of scheme | University of Karachi, Karachi. |
| - Principal Investigator | Prof. Viqar-ud-Din Ahmed |
| - Total Expenditure | Rs. 3,44,507/- |
| Main Objectives: | To screen the extracts and pure compounds of Capparidaceous Plants for any biological activity. |

## Summary of the Work Done:

Plant Family Capparidaceae, composed of 45 genera and nearly 600 species, is native in tropical and sub-tropical regions. It is represented by 7 genera and 23 species in Pakistan. four plants of this family namely; Cadaba farinosa, Capparis decidus, cleome brachycarpa and crataeva adansis

famous for their medicinal properties, were selected for detailed investigation of their chemical constituents. The result achieved are as under:-

a) Three new spermidine alkaloids named as Cadabicine, Cadabicine diacetate and Cadabicine methyl ether were isolated. The structure of cadabicine was determined by means of spectroscopic techniques as well was single crystal X-ray diffraction analysis The structure of cadabicine diacetate was determined by means of spectroscopic studies and compare with synthetic product obtained from acetylation of cadabicine Similarly, the structure of cadabicine methyl ether was established by means of spectral data and confirmed by its total synthesis. Alongwith spermidine alkaloids, a sesquirterpene cadabicilone was also isolated from the same plant and its structure was proved by means of spectroscopic techniques including 2D-NMR.

b) Capparis decidua: Six new spermidine alkaloids named as Captaridisine, Capparisine, N-acetyl Capparisine, Capparisine isocodonocarpine, and N-acetylisocodonocarpine were isolated All these alkaloids are structurelly related to cadabicine The structures of all these alkaloids were determined by means of spectral data.

c) Cleome brachycarpa does not contain alkaloids but it was possible to isolate from it three new triterpenoids of dammarane series and were named as Brachycarpone, Deacetoxy brachycarpone, and Cleocarpone. The structures of these compounds were elucidated on the basis of spectroscopic as well as chemical methods, while structure of brachycarpone was confirmed by X-ray crystallographic techniques.

d) Crataeva adansonii: Four alkaloids Cadabicine, Cadabicine diacetate, Cadabicine methyl ether and Capparisine were identified which have already been isolated from Cadaba farinosa and Capparis decidua.

Five research papers based on findings of this project were published in international journals. Two students were awarded Ph. D. degrees while four Ph.D. students worked partially under this research project.

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| **Project No:** | C-QU/Chem (175) |
| **Project Title:** | Estimation of Heavy Trace Metals in Various Local Fish Species and Relevent Marine/Fresh Waters. |
| **Project Particulars:** | |
| - Duration | One Year |
| - Date of Commencement | 1.8.1987 |
| - Date of Completion | 31.7.1988 |
| - Location of scheme | Quaid-i-Azam University, Islamabad. |
| - Principal Investigator | Dr M Jaffar |
| - Total Expenditure | Rs. 99,400/- |

Main Objectives: To estimate heavy trace metals such as Mercury, Cadmium, Copper Zine, Lead, Chromium, Iron and Nickle in fish from Pollu'ed fresh and marine waters

## Summary of the Work Done:

The pollution of aquatic environment in terms of heavy trace metals is on the increase. The adverse effects of this sort of pollution on human health through the use of fish as good are well known and well documented In Pakistan, however even the base line data on aquatic environment is not available.

The local fresh water bodies as well as the marine waters (that serve as breeding places for various species of fish) were surveyed for the estimation of heavy trace metals concentration like Mercury, Cadmium, Copper, Zine, Lead, Chromium, Iron and Nickle Sixteen marine, fifteen creeks and thirty four fresh water commercial fish species togather with relevant waters were analysed for trace metals concentration. The study on marine fish revealed that Ni, Cr, and Pb concentration in Scomberomorus commerson were higher than those found in other species so being true about Cd and As content of Nadus nandus In general, the metal levels in all the species were found to be within the permissible levels for human consumption with the only exception of Pb (1 895 ug/g) in Scomberomorus commerson that crossed the upper allowed level

Various marine and creek fish, harvested from the coastal waters of the Arabian Sea along the Karachi shore, were analyzed as to their trace metal content The distribution of trace metal in the fish was found to be highly species-specific, with mean concentrations of the metals fulfilling the recommended daily allowance (RDA) laid down for safe consumption Only mercury was found to exceed the safe limit (1 ug/g) in three species Sillago plateado (1 203 ug/g), Scomberoides commersonnianus lecepede (1 025 ug/g) and Cynoglossus bilineatius (1 211 ug/g)

The fresh water fish, obtained from local market streams and hatchery ponds in the provinces of Punjab, NWFP and Sind, were analyzed alongwith relevant waters to establish possible correlations between the heavy metal concentrations in fish muscle and in relevant water The estimated concentrations (in ug/g. wet weight) in the muscle showed a big scatter The study showed a positive correlation between the concentrations of Zine and Arsenic in the fish muscle and in relevant waters, while the distribution of metals was found to suffer largely from individual variability, irrespective of area of catch.

It was concluded that on the whole, local marine and fresh water fish are a potential source of [illegible] nutrients and except for a few identified cases, do not pose any physiological problem to the consumers

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| **Project No:** | P-CSIR/Eng (20) |
| **Project Title:** | Development of Fluidized Bed Coal Combusting System Based on Low Grade Coal for the Supply of Clean Heat for Industrial Use. |
| **Project Particulars:** | |
| · Duration | Three Years |
| · Date of Commencement | 1.11.1984 |
| - Date of Completion | 31.10.1987 |
| - Location of scheme | PCSIR Laboratories, Lahore. |
| - Principal Investigator | Dr A B. Choudhry |
| - Total Expenditure | Rs. 3,24,499/- |
| Main Objectives: | To develop an economic combustion system for the efficient use of indigenous coals of Pakistan. |

## Summary of the Work Done:

Fluidized Bed Combustion is a technique particularly applicable to the combustion of low grade fuels with high ash and sulphur contents. This technique avoids slag formation which fouls the ordinary coal combustion hearths It also reduces, if not eliminates, the quantity of sulphur in flue gases, which causes corrosion to the combustion and related equipment. In order to develop an economic combustion system, studies were undertaken to design a Pilot Scale Fluidized Bed Combustor based on indigenous low grade coal for steam generation. The combustor alongwith a heat recovery system was fabricated in the workshop of the PCSIR laboratories, Lahore and successfully operated on the indigenous coals of Gulakhel, Shahrig, Khoast, and Degari areas. The combustor was subjected to a 72 hrs continuous test operation in which no manufacturing defect of the components was traceable The theoretical bases of the design of the Fluidized Bed combustor used were experimentally tested for their applicabilities.

For further improvement and scale up deign, various parameters such as the effects of (i) coal feed size and rate, (ii) different bed materials like Silica, Marble, Calcite (iii) air flow rate on the efficiency of the combustor and (iv) absorbents for removal of sulpher dioxide were investigated.

It was established that.

- Among dry absorbents used, calcite is the best one but no absorbent possesses the capability to retain all the sulphur even at the very outset of combustion.

- Coal size plays a significant role not only in combustion but also in sulpher retention of the absorbent.

- Quartz, being a good thermal shock resistant, can be used as a bed material

- Uniform air distribution through the plate is a corner stone for the success of FBE. Channelling of the bed results in incomplete mixing, uneven bed temperature, and incomplete combustion of the coal.

- Sight glass always breaks due to the Thermal Shock.

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| **Project No:** | P-MHL/Med (57) |
| **Project Title:** | Epidemiological studies on Orbital Tumours. |
| **Project Particulars:** | |
| - Duration | Two Years |
| - Date of Commencement | 1 1.1982 |
| - Date of Completion | 31.12.1983 |
| - Location of scheme | King Edward Medical College, Lahore |
| - Principal Investigator | Dr Mohammad Munir-ul-Haq |
| - Total Expenditure | Rs. 64,200/- |
| Main Objectives | To study the Orbital Tumours in cases which are referred to Mayo Hospital, Lahore, and to link the study in early diagnosis and treatment saving the sight, miseries and life of the patients. |

## Summary of the Work Done:

The orbital tumours, though occur in all age groups are more prevalant and severe in children and younger age groups. Most of the cases are registered in hospitals when the tumour is in its advance stages.

In order to link the early diagnosis with early treatment, the project was undertaken to study the orbital tumours cases which were referred to Mayo Hospital, Lahore (during 1962-1983). Out of the total of 1200 cases of orbital tumours registered 368 cured during the last 21 years. The tumours of orbital origin were 250, whereas those of extra-orbital origin were 118, which included three main types, namely: (i) From adjacent structures e.g. Lids and Paranasal sinuses and then involving the orbit, (ii) From distant organs to Metastasise the orbit, (iii) Systemic diseases with impact as a tumour in the orbit.

The study has led to the following conclusions:

- Malignant tumours are more common in North-Western area of Pakistan.
- Among pigment tissue tumours, Malignant Melanoma is less common than Benign Melanoma and its occurance is independent of age groups.
- There is no link in the family history and occurance of orbital- tumours. The treatment of retino blastoma results in an increase of only 3-4 years in life. As the young patients die at a maximum age of 12 years so the question of inheritance does not arise.
- Tumours in children are mostly fatal.
- When tumours matastasise in the orbit, no treatment, even the chemotherapy or radiotherapy, is helpful.
- The tumours of RES (reticuloendothelial system) may appear in the orbit without any evidence in the body. It occurs only at the age of 2-10 years.

| | |
|---|---|
| **Project No:** | S-JPMC/Med (85) |
| **Project Title:** | Biochemical Studies on Trauma. |
| **Project Particulars:** | |
| - Duration | Two Years |
| - Date of Commencement | 16 6 1986 |
| - Date of Completion | 15 6.1988 |
| - Location of scheme | Jinnah Postgraduate Medical Centre, Karachi. |
| - Principal Investigator | Prof. M. Atta-ur-Rehman |
| - Total Expenditure | Rs. 2,14,348/- |
| Main Objectives: | - To assess the severity of injury, and further investigation based on bio-chemical parameters. |
| | - To find out a suitable index for relating the degree of severity of trauma |

- To find some specific relationship to different parameters i.e. sodium, potassium, cyclic guonosine-monophosphate, cyclic adenosine- mono-phosphate, lactate, protein, and urea, to the type and serverity of trauma in patients who have either undergone surgery or of neurosurgical cases who remain unconscious due to trauma.

## Summary of the Work Done:

Biochemical studies on blood, urine and CSF (cerebre spinal fluid) of traumatic patients conducted earlier have shown disturbances in electrolyte balance (especially sodium and potassium) as well as changes in hormones, and endocrine variations in metabolic disturbances of carbohydrate and protein. In no instance, serverity of trauma was associated with specific biochemical parameters except in the case of cerebral trauma where high CSF lactate concentration was sometimes associated with severity of cerebral injury. Further investigation of biochemical parameters is required to assess the severity of injury and to find a suitable index for relating the degree of severity of trauma.

Under the project, a number of biochemical parameters including sodium, potassium cyclic guonosine mono-phosphate, Cyclic adenosine mono phosphate, lactate, protein, and urea with special emphasis on energetics were studied in 247 patients i.e. who have undergone surgery or neuro surgical cases who remain unconsious due to trauma. 28 normal healthy subjects were used as control. The results of these investigation are as under:-

Most of the trauma patients were male and highest number of these patients suffered from motorcycle accidents Impact was sever in most of the grade IV patients and large number of them were deeply camatose. Biochemical studies were conducted on blood, urine and cerebrospinal fluid. Alterations in CSF, sugar, urea, magnesium, and inorganic phosphorus were observed. There was destinent hyperglycemia in acute phase of 1-3 days followed by recovery to normal or near normal values. Discrepancies in blood lactate, pyruvate, serum cortisol were also observed for all the three days. Blood ATP was increased in all the trauma patients with a decrease in ADP and AMP. Serum total protein, albumin, globulin, A/G ratios and urea concentration levels also varied from the controls. Serum sodium, postassium and magnessium were also found to be elevated with a decrease in calcium and inorganic phosphorus. Nochange was observed in serum alkaline phosphatase in all the trauma patients. In few instances, mostly in grade IV head injury patients, serum amylase was elevated on just two days of trauma. Urinary retention of sodium, potassium, inorganic phosphorus, magnesium, calcium, and urea were observed for all the three days with a decrease in urinary volumes Most of the grade III and IV patients suffered from moderate type of scalp injury and fracture if present, was mostly in the frontal bone.

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| **Project No:** | S-DMC/Med (103) |
| **Project Title:** | Early Detection of Carcinoma Cervix using Colpomicroscope and Comparing with other Methods. |
| **Project Particulars:** | |
| - Duration | Two Years |
| - Date of Commencement | 1.12 1985 |
| - Date of Completion | 30.11.1987 |
| - Location of scheme | Dow Medical College, Karachi. |
| - Principal Investigator | Prof. Noor Jahan Samad |
| - Total Expenditure | Rs. 4,75,912/- |
| Main Objectives. | - Cervical Cytologic Screening for the dignosis of epithetial abnormality.<br>- Identifying Carcinoma of Cervix at a Pre-invasive Stage.<br>- Comparison of histological diagnosis of pre-malignant/malignant lesions of the Carvix obtained by Colposcopically directed biopsy with the diagnosis based on tissue removed at more intensive subsequent operation (Hystectomy or Cone Biopsy). |

## Summary of the Work Done:

In developed countries, screening of women for detection of cervix cancer in its early stages is a routine practice Whereas, in the developing countries women come to the Gynae clinics with carcinoma of cervix in its advanced stages, resulting in high mortality rate. Various studies have indicated that usually an interval of 10-15 years is lapsed between the appearance of cervical lesion and the development of an invasive carcinoma.

The present study was conducted to screen women for the detection of cervix carcinoma in its early stages at Civil Hospital Karachi. A total of 1903 patients were screened and their cervical smears were taken for exfoliative cytology be standard techniques. Cervical smears were catagorised into five classes i.e. (I) Normal cells, (II) Inflammatory cells, (III) Mild Dysplasia, (IV) Moderate Dysplasia, and (V) Severe Dysplasia

Colposcopy was found to be significant when there was abnormal vascular pattern and appearance of white areas (by applying 3% acetic acid) Patients with significant colposcopy had biopsies taken under the colpomicroscope. These punch biopsies were then analysed by a pathologist and on confirmation of diagnosis, relevant treatment was carried out.

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| **Project No**: | P-PMI/Med (104) |
| **Project Title**. | Maternal Serum Alpha Fetoprotein Levels in Second Trimester of Pregnancy and its Correlation with Prenatal diagnosis of Impending Fetal Death and Open Neural Tube Defects. |
| **Project Particulars**: | |
| - Duration | One Year |
| - Date of Commencement | 1.5 1985 |
| - Date of Completion | 30.4.1986 |
| - Location of scheme | Postgraduate Medical Institute, Lahore |
| - Principal Investigator | Dr. Shahnaz Javed Khan |
| - Total Expenditure | Rs. 59,120/- |
| Main Objectives | - Special care to mothers by identifying multiple pregnancy, impending fetal death, molar pregnancy, ectopic pregnancy and placenta-praevia<br><br>- Implementation of routine maternal serum AFP screening for all pregnant women with an expected reduction in the prevalence rate at birth of neural tube defects.<br><br>- Reduction in the number of children handicapped by spina bifida and then substantial needs in terms of special care and education |

## Summary of the Work Done:

Congenital malformations are studied by earlier researchers mainly as anatomical and pathological curiosities. However, recent investigations have shown that several complications and malformations of pregnancy can cause fetal neural tube defects. An increase in Alpha Fetoprotein (AFP) level in amniotic fluid of the fetus having neural tube defects has made the AFP estimations the most suitable and comprehensive test for screening congenital malformations.

A total number of 164 subjects were screened out of which 20 subjects could not be followed up, 40 subjects (20 pregnant and 20 nonpregnants) were kept as control. Among 104 experimental subjects, 49 had normal deliveries, 49 aborted., 2 had neural tube defects and 4 were with molar pregnancies. Estimates of the maternal serum clearly showed that the AFP levels of control group, and that of 49 subjects of experimental group with normal deleveries ranged between 15 to 30 ng/ml. Among 19 subjects, whose pregnancy ended in abortion, the range of maternal serum AFP levels was very high i.e., 15.3 15.3-229.5 ng/ml. Out of two subjects with fetuses having open neural tube, and had -AFP level of 102 ng/ml and the other 207 ng/ml, showing spina- and anecephaly in their fetuses respectively. In molar pregnancy, AFP levels were subnormal ranging from 3.4. ng/ml to 6.8 ng/ml.

The findings of this study clearly indicate that maternal serum AFP levels in the 2nd trimester of pregnancy can be used as an effective screening test for neural tube disorders of fetuses of molar pregnancies.

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|---|---|
| **Project No:** | C-QU/Phys (44) |
| **Project Title:** | Deep Level Transient Spectroscopy |
| **Project Particulars:** | |
| - Duration | Three Years |
| - Date of Commencement | 1.5.1985 |
| - Date of Completion | 31 4 1988 |
| - Location of scheme | Quaid-i-Azam University, Islamabad. |
| Principal Investigator | Dr. M. Zafar Iqbal |
| - Total Expenditure | Rs. 4,10,515/- |
| Main Objectives: | a) Developing the DLTS Method for Deep Level Studies in Semiconducting materials. |
| | b) Comprehensive understanding of the deep levels in red and green gap Light Emitting Diodes (LED's). |
| | c) Measurements of the parameters RT, $O_{nt}$, $O_{pt}$, $O_{no}$, $O_{po}$, $N_t$ etc. for deep levels in Gap LED's and in home grown Si crystals with controlled impurity concentrations. |

## Summary of the Work Done:

Research on Semi-conductor materials for developing modern electron devices is expanding rapidly. Deep levels in Crystalline Semiconductors, caused by impurities and defects, are an important

field of research both from pure physics as well as its application's point of view. The standard technique of Deep Level Transient Spectroscopy (DLTS) was established at the Physics Department, Quaid-i-Azam University, Islamabad and manpower trained in the relevant field so as to undertake studies on (i) deep level content of green and red light emitting Diodes (LED's) and (ii), deep levels resulting from deliberate doping of silicon with known impurities, within the country.

The study of green LEDS has shown the presence of five electron emitting and three hole-emitting levels Emission rate data for these levels were obtained and its was found that thermal emission rates of the already known 0 85 eV hole level were weakly field dependent This field dependance was investigated in detail By comparing with the previously published data on it and by fitting present results with theoretical models, important conclusion as to the origin and microscopic structure of this level were drawn as under:-

a) In case of the nitrogen related 0 45 eV level, it was discovered that its electron capture cross-sections were strongly temperature dependent.

b) The dominant deep levels in the green LEDS are two mid-gap levels that have not been reported in literature previously Detailed characterization of these levels was accomplished

c) While investigating the red emitting LEDS, it was discovered that the important oxygen level in Gap has strongly temperature dependent thermal emission rates This field effect was studied in detail and the results are expected to modify the well-established models for this level.

d) In Silicon diodes, doped deliberately with Platinum (Pt). three main levels were detected One of them, a mid-gap level, was made the focus of attention as it has been discovered only recently and lacks complete characterization. It was proved that contrary to previous claims of the two shallower levels being responsible for short minority carrier life-times in Pt doped Si, the mid-gas level is the dominant recombination centre

The project work has resulted in the publication of 4 papers in reputable international journals.

The work on preparation of II-volume of the summaries of PSF Supported projects is almost completed The same will be sent for printing to the PASTIC shortly

## 3. SCIENTIFIC SOCIETIES/LEARNED BODIES:

The promotion of learned bodies, scientific societies/associations and academics engaged in spreading the cause of scientific knowledge in general or in the pursuit of a specific scientific discipline or technology in particular.

a) The Foundation is making annual grants to the established learned bodies and scientific societies, as partial financial assistance for the achievement of their approved objectives and for the publication of their respective scientific journals. Annual grants amounting to Rs. 0.435 million were released during the current year to various scientific societies. The details of these grants are as under:

| Name of Society | Grant in Rupees |
|---|---|
| Pakistan Academy of Sciences. | Rs. 80,000/- |
| Scientific Society of Pakistan. | Rs. 65,000/- |
| Pakistan Association of Scientists and Scientific Professions. | Rs. 30,000/- |
| Pakistan Association for Advancement of Sciences. | Rs. 60,000/- |
| Pakistan Society of Nematologists. | Rs. 15,000/- |
| Zoological Society of Pakistan. | Rs. 30,000/- |
| Pakistan Botanical Society. | Rs. 30,000/- |
| Biological Society of Pakistan. | Rs. 30,000/- |
| Pakistan Society of Biochemists. | Rs. 15,000/- |
| Chemical Society of Pakistan | Rs. 35,000/- |
| Institute of Electrical Engineers of Pakistan. | Rs. 20,000/- |
| Pakistan Medical Association. | Rs. 15,000/- |
| Pakistan Institute of Metallurgical Engineers. | Rs. 10,000/- |

In addition to this grants totalling to Rs. 0.095 million were sanctioned to various institutions for the publication of scientific journals as detailed below:

| Institutions | Name of Journals | Amount of Grant |
|---|---|---|
| University of Karachi, Karachi. | Pakistan Journal of Pharmacology. | Rs. 10,000/- |
| Pakistan Council of Science and Technology | Journal of science, Technology and Development. | Rs. 25,000/- |
| Pakistan forest Institute, Peshawar. | Journal of Forestry. | Rs. 10,000/- |
| Mehran University of Engg. and Tech., Jamshoro. | Journal of Engineering and Technology. | Rs. 10,000/- |

| | | |
|---|---|---|
| University of Karachi, Karachi. | Journal of Pharmacy. | Rs. 10,000/- |
| Khyber Medial College, Peshawar. | Pakistan Oral and Dental Journal. | Rs. 10,000/- |
| University of Agriculture, Faisalabad. | Pakistan Veterinary Journal. | Rs. 5,000/- |
| Govt. College, Lahore. | Journal of Natural Sciences and Mathematics. | Rs. 5,000/- |
| Federal Urdu Science College, Karachi. | Tehqiq. | Rs. 10,000/- |

## 4. EXCHANGE OF VISITS:

The exchange of visits of Scientists and Technologists with other countries.

In order to enable the scientists to present the findings of research carried out by them within the country and to exchange information regarding recent advances in their respective fields of specialization, it is imperative that they should attend the international conferences and visit the reputed research laboratories in foreign countries. The Foundation provides financial assistance to Scientists, Doctors and Engineers to facilitate their visits abroad for the purpose.

Grants totalling Rs. 0.151 million were sanctioned to the following eight (8)Scientists for attending International Conferences/Symposia and to meet their counterparts in institutions of higher learning in developed countries.

| **Name and Address of Scientist** | **Conference/Seminar Attended** | **Amount Sanctioned** |
|---|---|---|
| Dr. Shaukat Ali, Department of Physics, University of Punjab, Lahore. | Research Workshop in Condensed Matter, Atomic and Molecular Physics, held at Trieste, Italy, 25th June to 4th Sept., 1987. | Rs. 8,650/- |
| Dr. M. Masoom, Institute of Biochemistry Baluchistan University, Quetta. | International conference on "Flow Analysis' held at Las Vagas, USA, 17-20 April, 1988. | Rs. 20,965/- |
| Prof. M. Ataur Rahman, Department of Bio-Chemistry, JPMC, Karachi. | 14th International congress held at Prague, Czechoslo vakia, 10-15 July, 1988. | Rs. 23,030/- |

| | | |
|---|---|---|
| Dr. Sheikh Ajaz Rasool, Deptt. of Microbiology University of Karachi, Karachi. | 16th International Congress of Genetics, held at Toronto Canada, 20-27 August, 1988. | Rs. 10,900/- |
| Prof. Dr. M. Rafique Abro Deptt. of Elec Engg , Mehran university of Engineering and Technology, Jamshoro. | International conference on Electrical Drives, held at Poiana, Romaina, 20-22 Sept., 1988. | Rs. 21,808/- |
| Dr Muhammad Nawaz, Deptt of Physiology, University of Agriculture, Faisalabad. | 4th Congress of the European Association of Veterinary Pharamacology, held at Budapest, Hungary, 28th August to 2nd September 1988. | Rs. 28,753/- |
| Dr. M Maqbool Ahmad, Deptt of Biological Sciences, Quaid-i-Azam University, Islamabad. | 178th Meeting of the Society for Endocrinology, held at London, 16- 18th Nov., 1988. | Rs. 6,696/- |
| Dr Hasan M Khan, National Centre for Excellence in PhysicalChemistry,University of Peshawar, Peshawar. | 7th International Meeting on Radiation Processing, held at Amsterdam, Netherlands, 23-29th April, 1989. | Rs. 30,280/- |

## 5. AWARDS AND FELLOWSHIPS:

The grant of fellowships to individuals engaged in developing processes products and inventions of consequence to the economy of the country.

The Foundation provided grants amounting to Rs. 21.360/- on account of the followings:

**AWARD** An amount of Rs. 3,360/- was released to the University of Azad Jammu and Kashmir for instituting award of Gold Medal to the best student of University during 1987-88 session.

**FELLOWSHIP** An amount of Rs. 18,000/- was released to University of the Punjab on account of a Ph.D. fellowship to a fellow at the Department of Physics.

## 6. SPECIAL SCIENTIFIC SURVEY AND STATISTICS:

A project entitled: :Science and Technology in the Muslim Ummah and its Methodical Development" is being implemented at the Pakistan Academy of Sciences since last 3 Years. The 7th instalment of funds amounting to Rs.34,217/- was released during the current financial year for the completion of studies.

## 7. SCIENTISTS POOL:

On the request of Punjab University, Mathematians namely. Dr. M. Aslam Noor and Dr Khalida Noor were placed on the PSF Scientists Pool and their services were assigned to the Mathematics Department, Punjab University for a period of 6 months A grant of Rs. 30,000/- was released to the Punjab University on account of their stipend @ of Rs. 2,500/- p.m.

## 8 INTERNATIONAL LIAISON:

The activities performed by the Foundation under this head are as under:

a) **Memorandum of Understanding Between the Royal Society of London U.K. and the Pakistan Science Foundation.**

The visits of following two Scientists were supported by the Foundation under the M O U

Dr S.R A Shamsi, Associate Professor, Department of Botany, University of the Punjab, Lahore and Dr. Ihsan Ilahi, Professor, Department of Botany, Peshawar University, Peshawar visited reputed Research Laboratories/Botany, Departments of Universities in U K. from 13-30 November, 1988 and 13-31 March, 1989 resectively to meet their counterparts and exchange information in relevent fields and benefit from the latest research being carried out in these institutions The Foundation provided an amount of Rs. 32,990/- on account of their return air-fare from Pakistan to U K

b) **Liaison with Other Agencies:**

i) **US NATIONAL SCIENCE FOUNDATION:** The Foundation is acting as a focal point for Universities in respect of collaborative research projects and Seminars/Conferences founded by the US National Science Foundation Under their special Foreign Currency programme. Currently a project entitled, "Chromosome Number of Vascular Plants of Pakistan" is being implemented at Botany Department of the University of Karachi During the year, ADP allocation of Rs. 0.380 million was released for continuation of project work

ii) **ISLAMIC ACADEMY OF SCIENCES** The Foundation was assigned the responsibility of organizing the 2nd Islamic Academy of Sciences Conferences on "Science and Technology Policy for Self Reliance in the Muslim World" from 3-7th December, 1988, at Islamabad. As many as 44-Foreign Scientists mainly from 21 muslim countries and 39 local Scientists participated in the Conference

iii) **CHINESE ACADEMY OF SCIENCES:** The Foundation accepted the proposal of Chinese Academy of Sciences for undertaking a Pak- Chinese Joint Survey of Karakorum Mountains and agreed to host the Chinese Team. The proposal was accordingly included in the 9th S&T protocol between the Islamic Republic of Pakistan and Peoples Republic of China vide item 9-204. This item will be implemented in September/October, 1989

iv) **Association of Pakistan Scientists and Engineers of North America (APSENA).**

To benefit from the experience of expatriate Pakistani Scientists & Engineers, the Foundation is acting as a focal point for the Association of Pakistani Scientists & Engineers of North America (APSENA). The members of this and other similar associations occasionally visit Pakistan to meet their counterparts in local Academic Institutions and R&D Organizations.

The Foundation arranged the visit of Dr. Mohammad Jameel, an expatriate Pakistani Scientist presently working in the AT&T Bell Laboratories, U.S A., to Pakistan Council for Science and Technology, T&T Department, National Institute of Electronics, Appropriate Technology Development Organisation, and Pakistan Scientific and Technological Information Centre to discuss priority areas wherein the expatriate Scientist could provide technical assistance

c) **Visits of Foreign Scientists:**

- The Foundation arranged Prof Dr. Abdus-Salam Nobel Laureate's Lecture on "Science Technology and Science Education for the Development of South" on 9th May, 1989 at Holiday Inn, Islamabad. The lecutre was attended by the Academicians, Educationists, Scientists, and Senior Government Officials An expenditure of Rs. 7,604/55 was incurred in this connection.

- The Foundation provided local expenses amounting to Rs. 4,626/29 of Dr. Kabir-ul-Haq Choudhry, Associate Professor, Navel Architect and Marine Engineering Department, Bangladesh University of Engineering and Technology, Dhaka, Bangladesh, during his participation in Statistical Conference held in Lahore on 27-31st August, 1988

- The Foundation supported the International travel of Dr. M.A. Wazed Mian, Bangladesh, to facilitate his participation in the 3rd Regional Conference on Mathematical Physics held on 18-31st August, 1988, at Islamabad.

  An amount of Rs. 13,650/- was provided for the return air-fare.

## SCIENCE POPULARIZATION SECTION.

The activities of Pakistan Science Foundation for promotion and popularization of Science in the country through varied programmes continued during the year 1988-89 A summary of these programmes is given below.-

## 1. FUNDING FOR CONFERENCES, SYMPOSIA, SEMINARS, WORKSHOPS.

The Foundation provided financial assistance for National and International Science Conferences, Seminars, Symposia and Workshops held in Pakistan. During the period under report grants totalling Rs 1,80,000/- were given to various scientific organisations and institutions for the organization of such events

| Name of Event | Organizing Agency | Grant Released |
|---|---|---|
| Second Symposium on Frontiers in Physics | Quaid-i-Azam University, Islamabad. | Rs. 20,000/- |
| National Workshop on Technology: Acquisition and Contract Negotiations | National Centre for Technology Transfer, Islamabad. | Rs. 15,000/- |
| National Workshop on International Joint Ventures | National Centre for Technology Transfer, Islamabad. | Rs. 15,000/- |
| Third Regional Conference on Mathematical Physics | Department of Physics, Quaid-i-Azam University, Islamabad. | Rs. 20,000/- |
| Seminar on Prospects and Problems of Mineral-based Industries of Pakistan. | Department of Mining Engineering, NWFP University of Engineering and Technology, Peshawar. | Rs. 25,000/- |
| Second National Congress of Soil Science on Soil for Agriculture Development | Soil Science Society of Pakistan | Rs. 20,000/- |
| Fourth Workshop on Application of Micro-computer in Education Technology | APWA Govt. College for Women, Karachi. | Rs. 5,000/- |
| First National Course on Materials Science. | Department of Physics, Bahauddin Zakariya University, Multan. | Rs. 20,000/- |
| Third Albert Einstein Seminar. | Quaid-i-Azam University, Islamabad. | Rs. 20,000/- |
| Seminar on Tele-communications. | Institute of Electrical Engineers Pakistan (Rawalpindi, Islamabad Centre). | Rs. 20,000/- |

## 2. SCIENCE FAIRS/EXHIBITIONS.

Pakistan Science Foundation collaborates with the Boards of Intermediate and Secondary Education in organization of Science Fairs for the Students. During 1988-89, grants totalling Rs. 65000/- were sanctioned/released for the events listed below:-

| Event | Organizing Agency | Grant released |
|---|---|---|
| 7th Science Exhibition September, 1988 | Bureau of Curriculum and Extension Centre, Department of Education, Baluchistan, Quetta. | Rs. 30,000/- |
| 8th Science Fair | Board of Intermediate and Secondary Education, Hyderabad. | Rs. 35,000/- |

## 3. POPULAR SCIENCE LECTURES

A total number of seven lectures were organized in which eminent scientists/scholars addressed themselves to the audience in non- technical language.

The names of the Speakers and the Topics are as below.

| Month | Name of Speaker | Topic of Lecture |
|---|---|---|
| 20th July, 1988 | Mr Harry Carey, Prof. of Extension, Pennsylvania State University, USA. | "Making of Charts and Posters" |
| 10th August, 1988 | Dr Mohammad Afzal, Incharge, Zoological Sciences Division, Pakistan Museum of Natural History, Islamabad. | Scientific Expedition: Collaborative efforts between Pakistan Museum of Natural History and Adventure Foundation of Pakistan |
| 4th September, 1988 | Dr Mrs Sadiqa Malik, Director, Botanical Sciences Division, Pakistan Museum of Natural History, Islamabad. | -do- |
| 28th September, 1988 | Dr S R H Baqri, Director, Earth Sciences Division, Pakistan Museum of Natural History, Islamabad. | -do- |
| Ist November, 1988 | i) Hafiz M Yaqoob Hashmi, Former Secretary, Education and Information, Govt of Azad Jammu and Kashmir. | Creating a favourable climate for Science and Technology. |
| | ii) Dr M.D Shami, Chairman, Pakistan Science Foundation, Islamabad. | -do- |

| | | |
|---|---|---|
| 19th January, 1989 | Dr. Everett H. Lindsay | Vertebrete Paleontology in Pakistan during last 15 years. |

## 4. FILM/PLANETARIUM AND SLIDE SHOWS.

### (A) Science Film Shows.

The Foundation continued screaning Science films in Islamabad/Rawalpindi area. A Total number of 68 shows were arranged during the period under report. Film shows were also arranged at the Science Fairs organized by the Board of Intermediate and Secondary Education. Hyderabad (50 shows), and the Bureau of Curriculum and Extension centre, Quetta (50 shows).

### (B) Planaterium Shows.

The Planaterium shows arranged during the report period are as under:-

| | |
|---|---|
| Shows arranged at schools in Islamabad/Rawalpindi. | 32 |
| Shows arranged at the premises of Pakistan Academy of Sciences. | 10 |
| Shows arranged at Science Fair, Hyderabad. | 50 |
| Shows arranged at Science Fair, Quetta. | 50 |

### (C) 16 MM FILM CONVERSION.

Thirty five 16 MM Britannica Films were copied in video format through courtesy of the Institute of Educational Technology, Allama Iqbal Open University, Islamabad.

## 5. Distribution of Science Books and Magazines.

The Foundation this year also distributed Science Books/Magazines to educational institutions free of cost The details of the distribution are as under:-

- One set of 28 volume Encyclopedia entitled "Science and Technology Illustrated, The World Around Us" was donated to the Library of Shaukat Model High School, Futhe Pura, Gujrat.

- Copies of the book "The History And Natural History of Ephedra As SOMA" by Dr. Mehdi Hassan were presented to eminent scientists working in related field in Pakistan and other countries. One hundred and forty three (143) copies of the same book were distributed to Universities, R&D organizations and the Libraries in the country.

The subscription of Science magazines, "Jadid Science" and "Science Bachoon - Key Lyea" to 400 schools was renewed for the year 1988-89.

## 6. Science Promotion through Press/Radio.

The following articles have been published in National Dailies.

| | |
|---|---|
| i) Chairman's Address at Sir Syed College, Rawalpindi. | The daily 'Markaz'. |
| ii) PMNH-Display Corner | The daily 'Nawa-i-Waqat. |
| iii) Science Corner | The daily 'Markaz' |

**Publications**

1 Illustrated brochures on (i) Pakistan Science Foundation Activities (ii) Popularization of Science were prepared.

2 Booklet on Science Projects for High School Science Clubs was sent for publication

## 7. Science Posters Project.

The 3rd package of Science Posters comprising of the following topics was prepared and printed for distribution.

1 Protrait of Muslim Scientist 'Jabar-Ibn-Hayyan'

2. Protrait of Muslim Scientist 'Ibn-Haitham'.

3. The Solar System

4. Story of Earth.

5. The Clouds.

6. Uses of Tree

7. The Potato Plant

8. Para-Saurolophus

9 Evolution of Elephants.

10 Parts of an Insect

Package of ten posters each was mailed to all the high schools falling with in the jurisdiction of the Boards of Intermediate and Secondary Education in the country and other R&D organizations This activity of the Foundation is being highly appreciated.

**Science Posters Contest.**

The 3rd Inter Board Science Posters Contest was announced by the Foundation in January, 1989. The theme of the contest "Science and the Natural Wealth" was conveyed to all the Boards of Intermediate and Secondary Education in the country for participation All Science Boards sent their best three posters for inclusion in the Inter Board Science Posters Contest All these enteries were awarded prizes of Rs 1000/-, Rs. 600/- and Rs. 400/- respectively.

## 8. Promotion of Science in Rural Areas.

**Science Caravans.**

(A) **Science Caravan Unit for Federal Area.**

The Science Caravan Continued its activities in the rural areas of the Federal Capital The Science Caravan Exhibition was arranged in the Federal Govt Girls Secondary School, Sihala from 12 9 1988 to 22.9 1988 3500 students (Boys and Girls) from eighteen Schools visited the exhibition. The Caravan then moved to the Tarnual Sector where the exhibition was arranged in the Federal Government Boys High Schools Tarnual from 25 9 1988 to 29.9.1988. Students from nine schools witnessed the exhibition

The Science Caravan also participated in the Annual day of the Lawrence College Ghora Gali. The exhibition was arranged in the College for two-days i e 3rd and 4th December, 1988 It was highly appreciated by the students and staff of the college.

The Caravan then visited the PAF Intermediate College Chaklala wherein exhibition was arranged from 27 5 1989 to 1.6.1989 Students from the host school as well as students from their sister institutions at Kamara and Kallar Kahar witnessed the exhibition.

(B) **Construction and Equipment of Science Caravans.**

Two Science Caravan Units were fully constructed by the firm M/S Technology Management International (Private) Ltd , Each Unit consisted of fifteen stands of four panels each i e in all 60 panels on different scientific themes, and 10-12 working models Equipment such as television, VCP's, Slide projectors, film projectors, computors was also provided.

The Foundation decided to launch these two units in the NWFP and Sindh provinces.

(C) **Operations of Science Caravans.**

Exhibition of the newly constructed Science Caravan Unit for NWFP was arranged in the Pakistan Academy of Sciences for the delegates of the Islamic Academy of Sciences Conference on S&T Policy for self reliance in the Muslim World. 25 foreign delegates and 50 local participants visited the exhibition and highly appreciated the efforts of the Foundation to popularize science in the rural areas.

The Science Caravan for NWFP participated in the Diamond Jubilee Celebration of the Islamia College Peshawar from 30th March to 2nd April, 1989. The Staff of the Seicnce Caravan displayed the Science Exhibition and arranged Planetarium and Film Shows. As many as five Planetarium Shows were shown daily to the students and General public.

The Science Caravan for NWFP was part of the Science Technology Exhibition-89 arranged by the Foundation on the eve of the 4th Comstech Meeting w.e f 13th-15th May, 1989. It was in a separate enclosure adjacent to main exhibition hall. Delegates from Muslim Countries visited the caravan exhibition and highly appreciated the idea of Mobile Science Exhibition. Planetarium Shows were also arranged. The staff appointed for the Science Caravan Unit-II for NWFP has joined and are being trained in handling/installation of Science Caravan. This staff also participated in the Science Caravan Exhibition organized during the 4th COMSTECH w.e.f. 13th-15th May and at the PAF Inter-College, Chaklala.

## 9. Science Clubs Programme.

The information procured from High Schools on proformae dispatched by the Foundation was scrutinized and five hundred High Schools were selected for inclusion in Phase-I of the programme. These were mostly schools of rural areas located in the following districts:

> Sukkur, Hyderabad, Lahore, Mirpur, Kotli, Bagh, Muzaffarabad, Faisalabad, Jhang, Toba Tek Singh, Bhakkar, Khushab, Mianwali, Sibbi, Sargodha, Quetta, Karachi, Kalat, Khuzdar, Panjgoor, Turbat, Kachi, Federal Board, Rajan Pur, Dera Ghazi Khan, Layya, Muzaffargarh, Multan, Khanewal, Sahiwal, Vehari, Peshawar, Mardan, Abbottabad, Malakand Agency, Swat, Dir, Mansehra, Chitral, Kohat, Bannu, North Waziristan Agency, Dera Ismail Khan, Gujranwala, Gujrat, Attock, Sialkot, Jehlum and Chakwal.

These schools were informed that they had been selected for Phase-I of Foundation's Science Clubs Programme. The following items were mailed to the selected schools:

- Cheques of Rs. 500/- each: The purpose of the donation was to enable Science Clubs to purchase equipment/material for carrying out science projects.

- Fifty copies each of the leaflets on Scientific topics, such as Baluchi-therium, the Planets World etc. The leaflets were prepared by the Foundation.

The Foundation obtained the services of an expert to design interesting Science Projects for the Science Clubs Programme. The Following projects were prepared by the expert:-

1. Investigation of a Community.

2. Investigating the Soil.

3. Measuring and monitoring Pulse, Body Temperature, Height and Weight of your Family Members.

4. Preparation of Filter Paper and its use in Paper Chromatography.

5. Understanding the Principle of Soap-Making and Detergents.

6. Food preservation through Dehydration.

7. Moisture in the Atmosphere.

8. Water and its Purification.

The Foundation decided to present Solar Cookers also to the Science Clubs. The preparation of 501 Solar Cookers for the Science Clubs was undertaken by Pakistan Council for Appropriate Technology at a cost of Rs. 2,25,450/-.

## 10. Intra Board Science Essay Contest.

The Foundation held an Intra Board Science Essay contest in collaboration with the various Boards of Intermediate and Secondary Education in the Country. The language of the contest was decided to be Urdu and Sindhi. The topic of the Contest was "Science and Our Society". Eight Boards of Intermediate and Secondary Education participated in the contest and submitted their best three essays. The Foundation awarded prize money of Rs. 500/-, Rs. 300/- and Rs. 200/- respectively.

# PAKISTAN SCIENTIFIC AND TECHNOLOGICAL INFORMATION CENTRE (PASTIC).

PASTIC under the aegies of Pakistan Science Foundation continued providing documentation and information services to fulfil the demands and needs of the R&D Sectors in the country. The activities carried out by the National Centre at Islamabad and the four sub centres at Karachi, Lahore, Quetta and Peshawar during the year 1988-89 are summerized below:-

**1. Document Procurement and Supply Services.**

Three thousand eight hundred and thirty three (3833) S&T documents were procured from National/International sources and supplied to researchers of S&T/R&D organizations. The number of requestes received were 4475.

**2. Article Awareness Service.**

The service was started with an aim to provide subject-wise list of research articles available in PASTIC to the clients on Agriculture, Botany, Chemistry, Fisheries, Medicine, Physics, Veterinary Science, Zoology etc.. Photocopies of 168 articles on various disciplines were supplied to 15 organizations

**3. Publications.**

a) **Pakistan Science Abstracts:**

This quarterly publication contains the abstracts of published papers on Scientific/Technological research work done in Pakistan. The following issues were published.

1988 Vol.28 No. 1-2.

b) **Technology Information.**

A monthly publication on the above title contains South Technology Information about the technology developed by 10-developing countries (TIPS). The following issues were published and mailed out to more than 2000 industries/organizations.

i. Vol.2 Issue No. 1-11

ii. Vol.2 Issue No. 12

c) Other Publications.

A Union list of Medical Journals of 18 Libraries was published.

**4. National Science Reference Library.**

a) One thousand two hundred and forty eight (1248) issues of periodicals and one hundred seventy (170) issues of other documents were received by the Library. The material received was duely classified and catalouged. PASTIC sub centre at Karachi received 289 copies of journals/reports/documents.

b) Computerization of data of PASTIC Library was started. 3630 records have been computerized.

**5. Programming and Data Processing.**

a) **Data Entry/Word Processing.**

i. Document Procurement and Supply Service.

Computerization of the documents procured and supplied to the clients was started. 1131 records were entered.

ii. Technology Information (South Tech-TIPS).

3936 records of technologies developed by 10 developing countries including Pakistan were entered.

iii. Scientific Research Literature Published in Pakistan.

Pakistan Science Abstracts.

Vol. 28 No.2 161 Abstracts.

No.3 161 Abstracts.

No.4 177 Abstracts.

iv. PASTIC National Science Reference Library.

3630 records have been computerized.

v. Subject Bibliographies.

Subject Bibliographies on 27 titles comprising 1333 records were entered.

b) Data Output.

Camera ready copies for printing of the following documents were prepared.

i. Pakistan Science Abstracts.
Vol.28, Nos 2-4 (1988)

ii. Union Catalouge of Medical Journals of 18 Libraries on 16 subjects.

iii. NTIS Reports on Pollution No.2, having 200 records.

iv. 27 subject bibliographies.

c) Computer Software facilities provided to:-

i. Ministry of Science and Technology.

ii. Pakistan Council for Science and Technology.

iii. National Book Council.

iv. Quaid-i-Azam University.

**6. Bibliographies.**

Twenty seven subject bibliographies containing 1333 references were prepared and supplied to clients.

**7. Union Catalogue.**

A Union list of Medical Journals of 18 Libraries was prepared and published.

**8. Current Content Service.**

The service to supply content pages of recent issues of journals to users continued. The contents were dispatched to more than 200 individual Scientists/Technologists of various disciplines. As a result 424 photocopies of 45 research articles were supplied to the clients on demand.

**9. Infoterra Referral Service.**

The University of Engineering and Technology Lahore was supplied with "Bibliography on Policy framing of Human Settlement".

**10. Reprography.**

The reprography unit completed 156 jobs for 11 organizations including PASTIC. For these 122044 pages of photocopy, 8470 pages of cyclostyles and 2054358 printing impressions were produced.

**11. Important Meetings/Decision/Visits etc..**

a) Following meetings were attended by PASTIC Delegates:

i. Meeting of the ECO Focal Points on S&T Information for establishment of a data base (IRAN).

ii. Second meeting of SAARC Documentation Expert Committee was organized by PASTIC in Islamabad from April 2-4, 1989.

iii. The first Regional Workshop on CEHANET procedures, June, 1989, Amman, Jordan.

b) Visit of Foreign Delegates to PASTIC.

i. A delegate from UNDP mission visited PASTIC to evaluate Technology Transfer System.

ii. Mr. M.W. Hill, Associate Director, British Library London and Chairman of F.I.D visited Pakistan from Ist October to 19th Oct, 1989 on invitation of the Government of Pakistan as a consultancy mission on STIS in the country.

iii. Director ENSIC, Mr. Arthur Vespry and Mr. Kiran Bhatrai form Bangkok visited PASTIC for establishment of National Focal Point.

iv. Dr. SAVIO, Executive Director, TIPS visited PASTIC.

V. Dr. Mohammad Arshad for IDRC Canada visited PASTIC.

## PAKISTAN MUSEUM OF NATURAL HISTORY (PMNH).

At present PMNH is functioning in three rented buildings as well as a Display Corner in Islamabad. It contains reference materials pertaining to fauna, flora, rocks, minerals and fossils of Pakistan as well as goal oriented educational messages to public.

Tenders for construction of PMNH new building were called and opened on 19.2.1988. There were six bidders which ensured very healthy competition. Tender of PMNH building was awarded to M/S KARCON (Pvt) Ltd., on 9th May, 1989; the agreement was signed on 25th May, 1989.

The museum is serving national needs in three vitally important but neglected areas: Research, Conservation and Education, involving Pakistan's heritage of natural resources. It will ultimately serve as national repository for permanent storage of reference material of plants, animals, rocks, minerals and fossils, deposited in other organizations/institutions of the country. PMNH consists of following sections:

1. Botanical Sciences Division.
2. Earth Sciences Division.
3. Zoological Sciences Division.
4. Public Services Division (including Design Section)

Summary of the progress made by Pakistan Museum of Natural History during the year 1988-89 is given below.

### A. BOTANICAL SCIENCES DIVISION.

#### Refernce Collection.

Collection of Flora: Feild works were carried out in Islamabad, Galiat, Tandiani, Malakand, Swat, Dir and Azad Kashmir and collected nearly 736 higher and 110 lower plants. Thirty eight species of trees, shrubs and herbs were collected from Galiat and Islamabad for diorama made at 6th Industrial Exhibition at Islamabad.

#### Laboratory Work

Five hundred lower plants and 1800 higher plants were identified and catalogued.

#### Research

A check-list of Higher Plants of Northern Areas was completed.

**Services Rendered to Other Organization.**

Four hundred plant specimens were identified for F.G. Colleges, Islamabad and Barani College, Rawalpindi.

## B. EARTH SCIENCES DIVISION.

**Reference Collection**

Collection of rocks, minerals, and fossils: Geological studies alongwith extensive collections were undertaken in parts of Rawalpindi, D.G. Khan, Chakwal, Dir, Malakand and Swat Districts. These field studies provided 700 kgs of sedimentary and 90 igneous/ metamorphic rock samples and 12 mineral specimens. In addition 40 specimens of vertebrate fossils from the Gali Jafir and Basal area (District Attock) were collected. Gemstone Corporation, Peshawar donated 37 specimens of Gemstone.

**Laboratory Work**

Forty three samples of Kussak Formation at Khewra Gorge were prepared for XRD/XRF analysis. Six larger forminifera were identified and preserved Seiving and weighing of 132 samples from Khewra Sandstone was carried out for grain size analysis Twelve chips of the Kussak Formation from Ludwah and thin sections of 16 rock samples of various igneous and metamorphic rocks were prepared for petrography. One upper molar and one left lower molar of Magacricetadon sp from D.G. Khan and Mirpur were identified.

**Research**

- Petrographic study of 6 thin sections of Jutana Dolomite, 155 thin section from Cambrian formation of salt Range and 6 of Malakand Agency carried out.

- Notes were completed on the distribution of Triplophysa griffithinziri in Pakistan.

## C. ZOOLOGICAL SCIENCES DIVISION.

**Reference Collection**

Collection of Fauna: Field trips were conducted in parts of the districts of Islamabad, Rawalpindi, Peshawar, Bannu, D.I Khan, D.G. Khan, Loralai, Quetta, Kalat, Khuzdar, Bela, Karachi, Thatta, Chakwal, Dir, Swat, Malakand and Azad Kashmir. Extensive representative samples of vertebrate and invertebrate animals were collected from these areas. These include about 11259 insects, 103 reptiles, 169 birds and mammals, 420 fishes and 128 land ivertebrates.

**Laboratory Work**

About 260 marine molluscs, 270 fishes, 1700 insects, 50 birds, 23 reptiles, 25 centipedes, 90 mammals, 55 birds, 12 mammals, 2 turtles, one pangolin and one mammalian head were identified and catalogued Stuffed 1 Snow Leopard.

**Research**

Following research studies were completed:-

- An unusual tail regeneration in Agama (Reptile).
- Studies on Megachiropteran bats of Muzzafarabad with a new record, Cynopterus sphinx from the area.
- Taxonomic studies of bugs belonging to a new genus completed.
- Record of Palm Givet from Rawalpindi and Hazara Division.

## D. PUBLIC SERVICE DIVISION.

**Museum display**

Following display assignments were completed:-

- The Diorama of "Salt Range" showing three Geological ages.
- The locations of minerals/rocks on the display description boards in Mineral/Rock Display Hall and updating of 43 write-up panels of Earth Sciences Display.
- Brief for following future exhibits:

  a. Fluorescent minerals.

  b. Earthquake.

  c. Energy (role of plants in energy capture).

  d. Fossil fuels.

  e Mushroom cultivation.

  f. Animals and their homes.

  g. reptiles of Pakistan.

h. Freshwater ecosystem.

i. Lake and bird migration.

j. Nocturnal animals.

k. Pollution.

- A temporary exhibition was arranged in the Parliment House for the presentation of Secretary S&T.

- A Stall of PMNH was displayed in the OCMSTECH Exhibition of Science and Technology in the State Bank Building. Islamabad.

- A Pavilion of PMNH consisting of three diamensional exhibits was displayed at the 6th Industrial Exhibition in Islamabad.

**Educational Activities.**

Lectures were delivered on "Fungi in Daily Life", "Wildlife Conservation", "Nutritional studies of Fungi", "Ecology/Ecosystem", "Animal migration" and "Life in the sea" in C B College, Rawalpindi; Beacon House and Model School, G-10/4, Islamabad, and "Management of nature and natural process" to the participants of the Management Course at Railway Training Institute, Walton, Lahore

Ten Posters were prepared for PSF in connection with science Popularization Programme.

**Number of visitors:-**

| | | |
|---|---|---|
| i. | Museum Building | 12000 |
| ii. | Marghzar Display Corner | 304000 |
| iii. | Guided Tours | Guided 4000 students from 90 different schools/colleges of Pakistan. |

# CHAPTER - 2

## ORGANIZATION AND ADMINISTRATION

The organizational structure of the Pakistan Science Foundation, Pakistan Scientific and Technological Information Centre and Pakistan Museum of Natural History are given on pages.

The staff position in the Foundation, PASTIC and PMNH during the period is as under:

## PAKISTAN SCIENCE FOUNDATION

| S.NO. | Designation | Number |
|---|---|---|
| 1. | Chairman | 1 |
| 2. | Member (Science) | 1 |
| 3 | Member (Finance) | 1 |
| 4. | Secretary | 1 |
| 5. | Chief Scientific Officer | 1 |
| 6. | Principal Scientific Officer | 1 |
| 7. | Senior Scientific Officers | 3 |
| 8. | Science Promotion Officer | 1 |
| 9. | Deputy Secretary | 1 |
| 10. | Deputy Director (F&A) | 1 |
| 11. | Administrative Officer | 1 |
| 12. | Accounts Officer | 1 |
| 13. | PS to Chairman | 1 |
| 14. | Librarian | 1 |
| 15. | Internal Audit Officer | 1 |

| | | |
|---|---|---|
| 16. | Scientific Officers | 6 |
| 17. | Assistant Scientific Officer | 1 |
| 18. | Accountant | 1 |
| 19. | Caravan Incharge | 1 |
| 20. | Graphic Artist | 1 |
| 21. | Superintendent | 1 |
| 22. | Assistant Research Officer | 1 |
| 23. | PA to Chairman | 1 |
| 24. | PA to Member (Finance) | 1 |
| 25. | Supporting Staff | 74 |
| | Total:- | 105 |

In addition to the whole-time Staff Members of the Foundation there are about 200 scientists and technologists in various universities and research organizations who are acting in an honorary capacity as reviewers of the research proposals and members of the Technical Committees or Principal Investigators of PSF Supported Projects.

# PAKISTAN SCIENTIFIC AND TECHNOLOGICAL INFORMATION CENTRE, (PASTIC).

| S.NO. | Designation | Number |
|---|---|---|
| 1. | Director General | 1 |
| 2 | Deputy Director (Doc ) | 1 |
| 3 | Senior Librarian | 1 |
| 4. | Senior Information Officer | 1 |
| 5 | Senior Administrative Officer | 1 |
| 6 | Documentation Officer | 1 |
| 7 | Accounts Officer | 1 |
| 8. | Indexing Officer | 1 |
| 9. | Abstractor | 1 |
| 10. | System Analyst | 1 |
| 11 | Bibliographic Officer | 1 |
| 12. | Cataloguer/Classifier | 1 |
| 13. | Patent Officer | 1 |
| 14. | Officer Incharge (Peshawar) | 1 |
| 15. | Officer Incharge (Lahore) | 1 |
| 16 | Administrative Officer (Karachi) | 1 |
| 17. | Statistical Officer | 1 |
| 18 | Assistant Documentation Officer | 1 |
| 19 | Superintendent (Doc.) | 1 |
| 20. | Superintendent (Admn) | 1 |
| 21. | Manager Reprographic Unit | 1 |

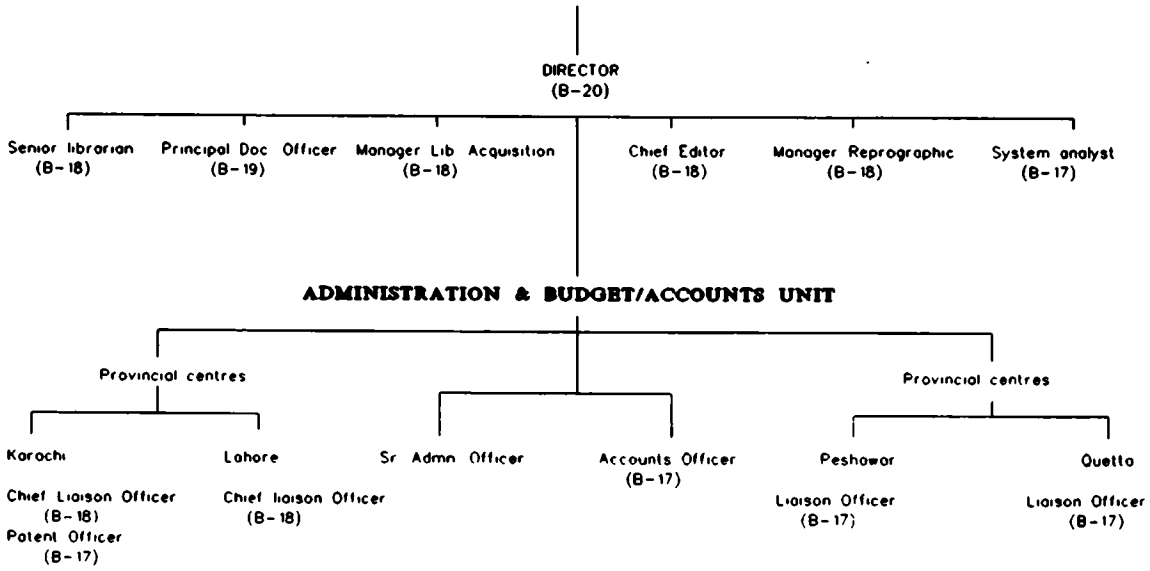
| | | |
|---|---|---|
| 22. | Assistant Programmers | 3 |
| 23. | Senior Plate Maker | 1 |
| 24. | Photographic Officer | 1 |
| 25. | PA to Director General | 1 |
| 26. | Senior System Analyst | 1 |
| 27. | Printing Officer | 1 |
| 28. | Supporting staff | 79 |
| | Total:- | 107 |

# PAKISTAN MUSEUM OF NATURAL HISTORY (PMNH).

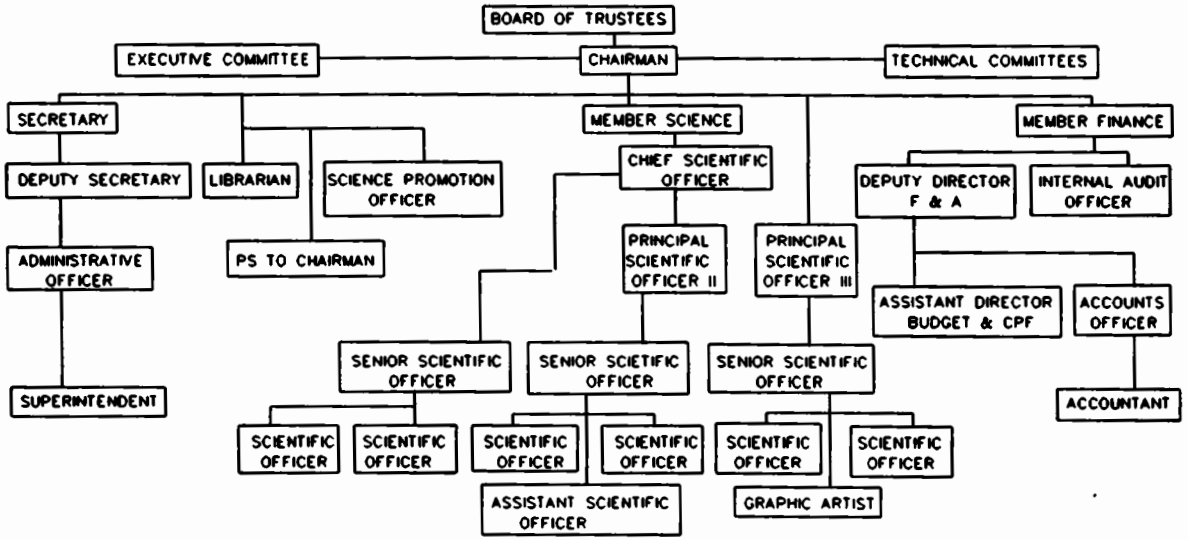
| S.NO. | Designation | Number |
|---|---|---|
| 1. | Director General | 1 |
| 2. | Director | 2 |
| 3. | Curator | 1 |
| 4. | Associate Curators | 6 |
| 5. | Research Associates | 22 |
| 6. | Administrative Officer | 1 |
| 7. | Product Designer | 1 |
| 8. | Accounts Officer | 1 |
| 9. | Librarian | 1 |
| 10. | Artist | 1 |
| 11. | Taxidermist | 2 |
| 12. | Teacher Guide | 1 |
| 13 | Superintendent | 1 |
| 14. | Accountant | 1 |
| 15 | Supporting staff | 82 |
| | Total:- | 124 |

# PAKISTAN SCIENCE FOUNDATION

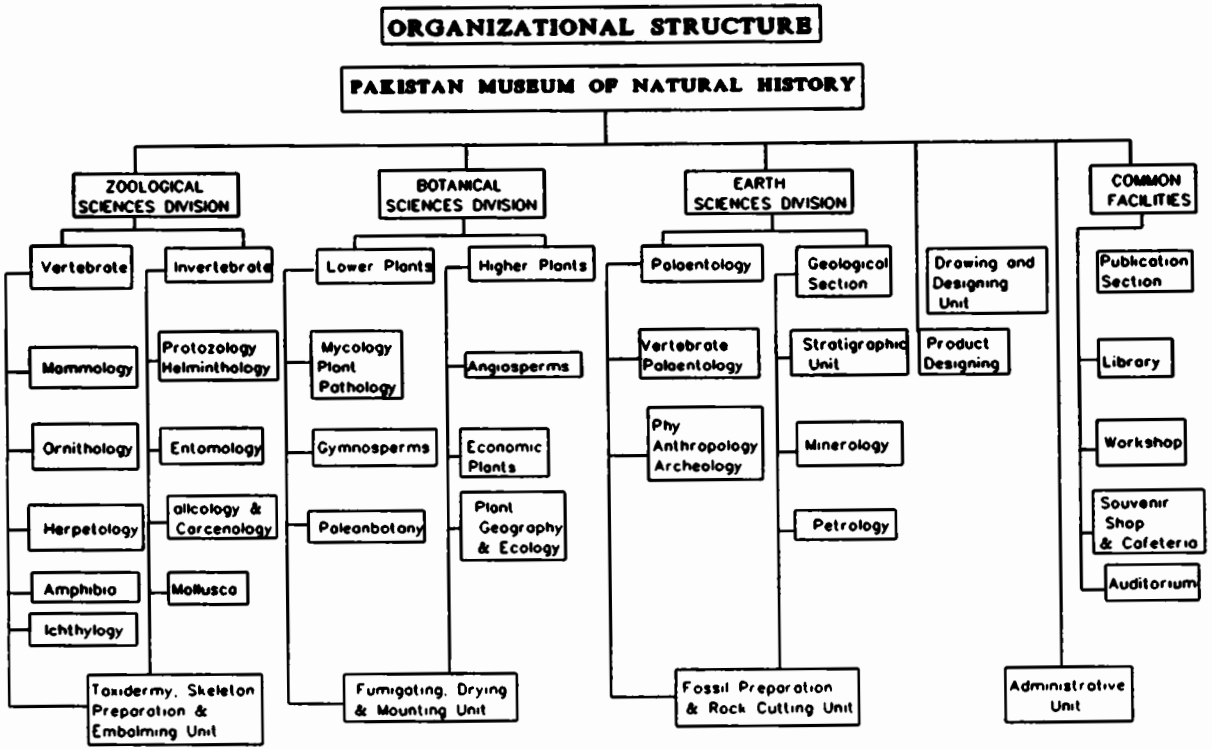
## PAKISTAN SCIENTIFIC & TECHNOLOGICAL INFORMATION CENTRE (PASTIC) ISLAMABAD



# PAKISTAN SCIENCE FOUNDATION
## ORGANIZATIONAL CHART



# ORGANIZATIONAL STRUCTURE



# CHAPTER - 3

## AUDITORS REPORT

The reports of the Auditors appointed by the Foundation in consultations with the Auditor General of Pakistan are reproduced with respect to Pakistan Science Foundation, and its attached departments Pakistan Scientific and Technological Information Centre and Pakistan Museum of Natural History.

The names and addresses of the Auditors are:-

| | |
|---|---|
| Pakistan Science Foundation | Akbar & Co.,<br>Chartered Accountant,<br>Amin Building,<br>65-Shahrah-e-Quaid-i-Azam,<br>Lahore. |
| Pakistan Scientific and Technological Information Centre | Taseer Hadi Khalid & Co.,<br>Chartered Accountant,<br>6th Floor, State Life Building No.5,<br>Blue Area, Islamabad. |
| Pakistan Museum of Natural History | Hussain Choudhry & Co.,<br>Chartered Accountant,<br>Co-operative Insurance Building,<br>53/8, Haider Road,<br>Rawalpindi. |

# AKBAR & COMPANY

CHARTERED ACCOUNTANTS

**MUHAMMAD AKBAR**

**B.Com (Hons) F.C.A.**

## AUDITOR'S REPORT.

We have examined the annexed Balance Sheet of PAKISTAN SCIENCE FOUNDATION as at June 30, 1989 and the annexed Receipts and Expenditure account for the year ended June 30, 1989 and report that:-

a). We have obtained all the information and explanations we required;

b). Such Balance Sheet exhibits a true and correct view of the state of the Foundation's affairs according to the best of our information and explanations given to us and as shown by the books of the Foundation;

c). The receipts of the Foundation during the year ended June 30, 1989, comprise of grants received from the Federal Government. We are satisfied that the grant so received has been utilized for the objects for which it was made within the specified time limit and that there was no unspent balance except for expenses incurred but not paid upto June 30, 1989. We are also satisfied of the disbursements made from the grant.

LAHORE: 65-SHAHRAH-E-AZAM:
AKBAR & COMPANY

DATE. AUGUST 18, 1990
CHARTERED ACCOUNTANTS

AMIN BUILDING,65-SHAHRAH-E-QUAID-E-AZAM,
LAHORE

PHONES: 323449-324737-321170

**AKBAR & Co**
**Chartered Accountants**

AKBAR & COMPANY
CHARTERED ACCOUNTANTS

# PAKISTAN SCIENCE FOUNDATION, ISLAMABAD
## BALANCE SHEET AS AT JUNE 30, 1989

| FUNDS & LIABILITIES | NOTE | 1989 Rupees | 1988 Rupees | PROPERTY & ASSETS. | NOTE | 1989 Rupees | 1988 Rupees |
|---|---|---|---|---|---|---|---|
| **GENERAL FUND** | 2 | 6,433,335 | 6.287,342 | **FIXED ASSETS.** As per Schedule Annexed. | | 7,785,561 | 7,458,175 |
| **RESEARCH SUPPORT/GRANT.** | 3 | 22,019,746 | 21,808,493 | **Less Accumulated depreciation** | | 2,249,080 | 1,806,540 |
| | | | | | | 5,536,481 | 5,651,635 |
| **CURRENT LIABILITIES** | | | | **RESEARCH PROJECTS IN PROGRESS** | 5 | 22,019,746 | 21,808,493 |
| For Expenses. | 4 | 99,954 | 37,133 | **CURRENT ASSETS.** | | | |
| | | | | Accounts Receivable | 6 | 40,000 | 25,000 |
| | | | | Advances Deposits & Pre-payments | 7 | 705,480 | 577,181 |
| | | | | **CASH AND BANK BALANCES** | 8 | 251,328 | 70,659 |
| TOTAL: | | 28,553,035 | 28,132,968 | TOTAL: | | 28,553,035 | 28,132,968 |

NOTES: Notes annexed form an integral part of these accounts.

LAHORE: 65-SHAHRAH-E-QUAID-E-AZAM:

**CHAIRMAN** **TRUSTEE** **TRUSTEE**

Sd AKBAR & COMPANY
CHARTERED ACCOUNTANT

# PAKISTAN SCIENCE FOUNDATION, ISLAMABAD.

RECEITP AND EXPENDITURE FOR THE YEAR ENDED JUNE 30, 1989.

| EXPENDITURE | NOTES | 1989 | 1988 |
|---|---|---|---|
| Grants | 9 | 5,384,214 | 5,639,370 |
| Development Grants | 10 | 3,022,000 | 1,760,000 |
| Travel grant for scientific survey | 11 | 241,023 | 181,890 |
| Other functions | 12 | 1,396,904 | 1,509,366 |
| Administrative expenses | 13 | 6,919,866 | 5,753,886 |
| | | 16,964,007 | 14,844,512 |
| INCOME | | - | 47,803 |
| Miscellaneous | | | |
| Net expenditure for the year transferred to General Fund | | 16,964,007 | 14,796,709 |

# PAKISTAN SCIENCE FOUNDATION, ISLAMABAD
## SCHEDULE OF FIXED ASSETS AS ON JUNE 30, 1989

| | COST | | | | | DEPRECIATION | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| PARTICULARS | AS ON 01.07 88 | ADDITION | Deletion | AS ON 30 06 89 | RATE % | AS ON 01 07 88 | For the year | Deletion | AS ON 30 06 89 | W.D V AS on 30 06 89 |
| Lease hold land | 3.013.919 | _ | _ | 3.013 919 | _ | _ | _ | _ | _ | 3,013,919 |
| Furniture & Fixture | 610.293 | 82.674 | _ | 692,967 | 06 | 207 578 | 29.123 | _ | 236,701 | 456,266 |
| Office Equipment | 785.156 | 42 020 | _ | 827 176 | 15 | 451.921 | 56.288 | _ | 508.209 | 318,967 |
| Airconditioners | 194,974 | _ | _ | 194,974 | 15 | 114,323 | 12,098 | _ | 126.421 | 68,553 |
| Motor Vehicles | 1,692,990 | 183,500 | _ | 1,876,490 | 20 | 692,733 | 236,751 | _ | 929,484 | 947,006 |
| Sci. Equipment | 969.833 | _ | _ | 696.833 | 15 | 307,193 | 99,396 | _ | 406,589 | 563,244 |
| Library Books & Films | 190.330 | 19.192 | _ | 209.522 | 05 | 32,203 | 8,866 | _ | 41,069 | 168 |
| Bicycle | 680 | _ | _ | 680 | 20 | 589 | 18 | _ | 607 | 73 |
| 1989 | 7,458,175 | 327,386 | _ | 7,785.561 | | 1,806,540 | 442,540 | _ | 2.249,080 | 5,536,481 |
| 1988 | 7,479,374 | 751,416 | 772,615 | 7,458 175 | | 1,644,783 | 474,090 | 312.333 | 1,806,540 | 5,651,635 |

W.D.V = Written Down Value

# PAKISTAN SCIENCE FOUNDATION, ISLAMABAD.

NOTES TO THE ACCOUNTS AS ON JUNE 30, 1989.

## 1. ACCOUNTING POLICIES:

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

### A. GRANT RECEIVED:

Grant from the Government of Pakistan has been accounted for on receipts basis.

### B. RESEARCH SUPPORT GRANT:

Research support grant has been accounted for on payment basis.

### C. FIXED ASSETS:

1. Fixed assets have been valued at cost less accumulated depreciation except leasehold land which is valued at cost.

2. Depreciation on fixed assets has been charged on reducing balance methods.

### D. GENERAL:

Figures have been rounded off to the nearest rupee.

## 2. GENERAL FUND:

Movements in the accounts during the year is as follows:-

| | 1989 | 1988 |
|---|---|---|
| Balance as on July 1, | 6,287,342 | 6,774,292 |
| Add: Grant received from Government of Pakistan during the year | | |
| Non-development grant | 14,088,000 | 13,001,000 |
| Development grant | 3,022,000 | 1,760,000 |
| | 23,397,342 | 21,535,292 |

| | | |
|---|---|---|
| Less: Expenditure during the year | 16,964,007 | 14,796,709 |
| | 6,433,335 | 6,738,583 |
| Less: Amount refunded to Government of Pakistan | - | 502,140 |
| | 6,433,335 | 6,236,443 |
| Less. Adjustment made in respect of accounts receivable from PASTIC | - | 162,000 |
| | 6,433,335 | 6,074,443 |
| Add: Adjustment made in respect of | | |
| i) Audit fee | - | 53,000 |
| ii) Grant refundable to Government | - | 159,899 |
| | 6,433,335 | 6,287,342 |

## 3.RESEARCH SUPPORT GRANT

| | | |
|---|---|---|
| 3 1 The made up is as under:- | | |
| Balance as on July 1, | 21,808,493 | 51,798,586 |
| Add Disbursed during the year3.2 | 4,625,320 | 4,674,368 |
| | 26,433,813 | 56,472,954 |
| Less.Projects completed during the year 3.3 | 4,414,067 | 34,664,461 |
| | 22,019,746 | 21,808,493 |

3.2. In accordance with the principle out lined in charter grants aggregating Rs. 4,625,320 have been paid by the Foundation during the year for constructing of various approved scientific research projects as detailed below:-

| | | |
|---|---|---|
| Medical Science | 339,776 | 192,011 |
| Chemical Science | 1,687,395 | 1,203,058 |
| Agricultural Sciences | 252,472 | 783,754 |
| Biological Sciences | 1,041,975 | 463,921 |
| Earth Sciences | 361,905 | 269,073 |
| Environmental Sciences | 200 | 13,000 |
| Engineering Sciences | 123,163 | 106,703 |
| Physical Sciences | 710,934 | 1,438,628 |
| Institutional support | 90,000 | 190.670 |
| Board Committee meeting | 17,500 | - |
| Honraria | - | 13,550 |
| | 4,625,320 | 4,674,368 |

3.3. The projects which have been completed during the year is as follows:-

| | | |
|---|---|---|
| Agricultural Sciences | 502,374 | - |
| Biology Sciences | 661,027 | - |
| Chemical Sciences | 1,477,585 | - |
| Engineering Sciences | 147,899 | - |
| Environmental Sciences | 252,854 | - |
| Medical Sciences | 1,372,328 | - |
| | 4,414,067 | - |

## 4. CURRENT LIABILITIES

| | | |
|---|---|---|
| Audit fee | 2,100 | - |
| Expenses payable | 43,044 | 37,133 |
| Payable to contractor | 54,810 | - |
| | 99,954 | 37,133 |

Expenses payable represent the amount of telex and telephone expenses amounting to Rs. 147 and Rs. 42,897 respectively.

## 5. RESEARCH PROJECTS IN PROGRESS:

This represents the expenditure incurred on various research projects which appears contra on the liabilities side under the head "Research Support Grant".

## 6. ACCOUNTS RECEIVABLE:

| | | |
|---|---|---|
| UNESCO Coupons | 40,000 | 25,000 |

## 7. ADVANCES, DEPOSITS AND PREPAYMENTS:

| | | |
|---|---|---|
| The made up is as under - | | |
| Advance to staff | 11,200 | 38,475 |
| Deposits | 5,500 | 5,500 |
| Advance rent | 688,780 | 533,206 |
| | 705,480 | 577,181 |

## 8. CASH AND BANK BALANCES:

| | | |
|---|---|---|
| Cash in hand | 29,494 | 24,160 |
| UNESCO Coupons | 167,024 | 46,499 |
| National Bank of Pakistan A/c No. 52 | 54,810 | - |
| | 251,328 | 70,659 |

Balance with National Bank of Pakistan of Rs. 54,040 as on June 30, 1988 was not accounted for and corresponding entry of Security Deposit was also not taken into account. During the year, both these entries representing bank account and security from Contractor have been taken in accounts.

## 9. GRANTS:

| | | |
|---|---|---|
| Research support | 4,625,320 | 4,674,368 |
| Scientific Societies and Professional bodies | 450,000 | 510,000 |

| | | |
|---|---|---|
| Scientific Conferences meetings and Seminars | 308,894 | 455,002 |
| | 5,384,214 | 5,639,370 |

## 10. DEVELOPMENT GRANT:

This represents the Grants in aid received from A.I.D. of the National Foundation of the United States of America Projects PL 480 through government of Pakistan and has been paid to the followings:-

| | | |
|---|---|---|
| Chromosome | 383,000 | 343,000 |
| Science Carvan | 2,639,000 | 1,417,000 |
| | 3,022,000 | 1,760,000 |

## 11. TRAVEL GRANT FOR SCIENTIFIC SURVEY

| | | |
|---|---|---|
| Visit of Scientists and Technologists | 241,023 | 181,890 |

## 12. OTHER FUNCTIONS

| | | |
|---|---|---|
| Science Centres and Herberia | 650,565 | 18,677 |
| Information and Documentation | 15,033 | 218,505 |
| Awards, Prizes and Fellowships | 21,360 | 41,000 |
| International Lisions | 57,622 | - |
| Collection of statistics | 39,217 | 155,248 |
| Science Promotion activities | 587,305 | 1,075,936 |
| Scientists pool | 25,802 | - |
| | 1,396,904 | 1,509,366 |

## 13. ADMINISTRATIVE EXPENSES:

| | | |
|---|---|---|
| Salaries and other benefits | 3,615,467 | 3,750,514 |
| Travelling expenses | 96,486 | 123,000 |
| Office rent | 1,730,578 | 615,011 |

| | | |
|---|---|---|
| Electricity, Gas and Water | 115,963 | 94,892 |
| Postage, Telegrams and Telephones | 391,110 | 308,500 |
| Printing and Stationery | 83,031 | 54,154 |
| Vehicle running and maintenance | 253,248 | 177,094 |
| Newspapers and periodicals | 23,865 | 24,297 |
| Liveries and Uniforms | 600 | 2,842 |
| Entertainment | 23,598 | 21,327 |
| Repair and maintenance | 49,771 | 50,157 |
| Miscellaneous | 63,161 | 22,457 |
| Audit fee | 12,500 | 15,000 |
| Advertisement | 17,948 | 17,940 |
| Bank charges | - | 2,611 |
| Depreciation | 442,540 | 474,090 |
| | 6,919,866 | 5,753,886 |

M. HUSSAIN CHAUDHARY & CO
CHAARTERED ACCOUNTANTS

# PAKISTAN MUSEUM OF NATURAL HISTORY, ISLAMABAD

## RECEIPTS AND PAYMENTS ACCOUNT (DEVELOPMENT FOR THE YEAR ENDED 30-06-1989

| RECEIPTS | 1989 Rs. | 1988 Rs. | PAYMENTS | 1989 Rs. | 1988 Rs. |
|---|---|---|---|---|---|
| RECEIPTS DURING THE YEAR | | | **PAYMENTS DURING THE YEAR** | | |
| Development Grants | 4,,511,000 | 5,600,000 | Purchase of Vehicle | 188,500 | - |
| Foreign Exchange Grant (for import of Scientific Equipment) | - | 1,500,000 | Laboratory Equipments | 167,690 | 370,938 |
| | | | Books & Journals | 73,647 | 36,138 |
| | | | Advance to CDA for construction of building | 2,059,939 | 4,294,004 |
| | | | Consultant's fee | 1,327,994 | 308,087 |
| | | | Pay and Allowances | 564,446 | 484,332 |
| | | | Petrol, Oil and Lubricants | 67,933 | 46,175 |
| | | | Insurance premium vehicle | 20,826 | 12,785 |
| | | | Display Centre | 39,878 | 47,541 |
| | | | **EXPENSES AGAINST FOREIGN EXCHANGE GRANT** | | |
| | | | Import License Fee | - | 19,740 |
| | | | L.C.Margin | - | 1,480,260 |
| | | | | 4,510,851 | 7,100,000 |
| **Note:-** The figures have beed rounded off to the nearest rupee. | | | **CLOSING BALANCE** | | |
| | | | Cash in hand | 149 | - |
| | 4,511,000 | 7,100,000 | | 4,511,000 | 7,100,000 |

**ACCOUNTANT** **ACCOUNTS OFFICER**

## AUDITOR'S REPORT

We have examined the Receipts and Payments Accounts of PAKISTAN MUSEUH of NATURAL HISTORY ISLAMABAD (DEVELOPMENT PROJECT) for the year ended 30th June 1989 and report that according to the best of our information and explanations given to us, we have found the same to be in order, in accordance with the books of accounts produced to us. We are satisfied that the amount of grant shown in the statement of account has been spent on the objects for which it was made with in the specified limit. We have also satisfied ourselves about the propriety of disbursement made from the grant.

53/8 Haider Road, Rawalpindi
Dated: 22 APRIL, 1990

( M. HUSSAIN CHAUDHRY&CO)
CHARTERED ACCOUNTANTS

# PAKISTAN MUSEUM OF NATURAL HISTORY, ISLAMABAD

## RECEIPTS & PAYMENTS ACCOUNT (NON DEVELOPMENT)
## FOR THE YEAR ENDED 30TH JUNE 1989

| RECEIPTS | 1989 Rs. | 1988 Rs. |
|---|---|---|
| **OPENING CASH AND BANK BALANCES** | | |
| Cash in hand | 9,755 | 8,027 |
| Cash at United Bank Limited | 8,058 | 6,406 |
| Cash at National Bank of Pakistan | - | - |
| | 17,813 | 14,433 |
| **RECEIPTS DURING THE YEAR** | | |
| Grants | 4,750,000 | 4,662,000 |
| Incurance claim | 18,840 | - |
| Miscellaneous | 7,618 | 1,652 |
| **RECEIPTS FROM P.S.F.** | | |
| C.P F. Loan | 51,810 | - |
| Rent share | 96,000 | - |
| Grant for project | 62,059 | - |
| Final payment of C.P.F Members | 623 | - |
| | 4,986,950 | 4,663,652 |
| | 5,004,763 | 4,678,085 |

| PAYMENTS | 1989 Rs. | 1988 Rs. |
|---|---|---|
| **PAYMENTS DURING THE YEAR** | | |
| Salaries and allowances | 2,724.746 | 2,459,562 |
| Office Building Rent | 612,918 | 604,776 |
| Rent of Residential accommodation | 405,905 | 298,308 |
| Entertainment | 6,344 | 12,449 |
| Telephone | 100,789 | 108,396 |
| Electric Gas & Water Charges | 141,908 | 134,169 |
| Advertisement | 13,190 | 4,524 |
| Postage and Telegram | 1,632 | 1,851 |
| Medical charges | 246,094 | 278,907 |
| Audit fee | 4,000 | 4,000 |
| Travelling Expenses | 35,884 | 35,033 |
| Consumable store, Printing & Stationery | 94,920 | 101,041 |
| POL Repair & Maintenance of Vehicles | 66,214 | 91,797 |
| Repair & Maintenance of Office: Equipment | 18,795 | 14,711 |
| Overtime | 25,716 | 11,074 |
| C.P.F. Contribution | 206,191 | 191,005 |
| Group Insurance Contribution | 8,060 | 4,839 |
| Office Equipments | 4,635 | 74,325 |
| G.L.I Contribution | - | 34,732 |
| Gratuity contribution | - | 137,656 |
| Furniture and Fixtures | 1,122 | 29,356 |
| Deputation pay | - | 4,568 |
| Ground Rent to C.D.A | 6,050 | 4,300 |
| Bank charges | 140 | - |
| Uniform and Liveries | 2,060 | - |
| Commission of property Dealers | 5,840 | - |
| Electricity Security | 2,000 | - |
| Miscellaneous | 10,787 | 11,575 |
| **PAYMENTS ON BEHALF OF PSF** | | |
| C.P.F. Loan | 51,810 | - |
| Rent share | 96,000 | - |
| Projects | 62,059 | - |
| Final payment to C.P.F. Members | 623 | - |
| | 4,964,408 | 4,660,272 |
| **CLOSING CASH AND BANK BALANCES** | | |
| Cash in hand | 9,754 | 9,755 |
| Cash at United Bank Limited | 30,601 | 8,058 |
| Cash at National Bank of Pakistan | - | - |
| | 40,355 | 17,813 |
| | 5,004,763 | 4,678,085 |

**NOTE:** The figures have been rounded off to the nearest rupee.

**ACCOUNTANT**

**ACCOUNTS OFFICER**

**AUDITORS' REPORT**

We have examined the Receipts & Payments Account of (DEVELOPMENT) OF " PAKISTAN MUSEUM OF NATURAL HISTORY ISLAMABAD" for the year ended 30 6.1989 and to report that according to the best of our information and explanations given to us, we have found the same to be in order, on the objects for which it was with in the specified limit We also satisfied ourselves about the propriety of disbursement made from the grant.

53/8 Haider Road, Rawalpindi
Dated: 17 March 1990

(M. HUSSAIN CHAUDHRY & CO
CHARTERED ACCOUNTANTS

Annexure I

# PAKISTAN SCIENCE FOUNDATION ACT 1973

National Assembly of Pakistan Islamabad,
the 2nd February, 1973

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**:-

I) The Foundation shall function as a financing agency for:-

i) The establishment of comprehensive scientific and technological information and dissemination centres;

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 laboratory scale;

iv) The establishment of science centres, 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 counties;

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**:-

I) 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 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 Foundation. (1) The Chairman of the Board shall be the Chairman of the Foundation and shall be appointed from amongst the eminent scientists of the country having experience of research and scientific administration.

(2) The Chairman shall, subject to sub-section (3), hold office for a term not exceeding three years and shall be eligible for re-appointment.

(3) The President may at any time terminate the appointment of the Chairman without notice and without assigning any reason.

7. Members of the Board. (1) The member of the Board, other than the ex-officio member shall, subject to sub-section (3), hold office for a term not exceeding three years and shall be eligible for re-appointment or re-nomination, as the case may be.

(2) A member, other than an ex-officio member, may at any time resign his office by writing under his hand addressed to the President but shall continue to perform his functions until his resignation has been accepted.

(3) The President may at any time terminate the appointment or, as the case may be, nomination ofany member of the Board without notice and without assigning any reason.

8. **MEETING OF THE BOARD**:-

I) 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 other 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 comsder necessary.

12. **ADHOC COMMITTEES:-**

The Foundation may set up ad-hoc 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 edowments; and

c) Income from other sources.

14. **BUDGET**:-

The Foundation shall cause to be prepared and approve a satement of its receipts and expenditure for each financial year.

15. **ACCOUNTS AND AUDIT**:-

I) 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 the 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**:-

I) 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 REPORT**:-

I) The annual report of the Foundation which shall, among other things, clearly bring out the benefits accuring 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 its affairs

19. **REPEAL**:-

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

**MEMORANDUM OF UNDERSTANDING ON COLLABORATION**
**BETWEEN**
**PAKISTAN SCIENCE FOUNDATION**
**AND**
**ROYAL SOCIETY OF LONDON**

Recognizing the mutual benefit of scientific interchange and the convenience of set procedures for its administration, the Pakistan Science Foundation and the Royal Society of London, hereinafter called the Sides, conclude the following Memorandum of Understanding.

## I. Scientific contacts

Both Sides will do all in their power to facilitate collaboration between specialists in the scientific disciplines within their mutual competence.

## ii. Exchange visits

In each year commencing 1st April, the Sides will organize and finance visits in each direction by research scientists of postdoctoral or equivalent status in pure and applied fields in two categories:

a) Study Visits:- Usually for short periods of from one to four weeks, to a total of four person-months on either Side, with the aim of visiting a number of laboratories or field study visits in the host country for discussions and liaison; and

b) Fellowships:- Usually for longer periods to carry out research projects or learn new techniques predominantly in one laboratory or site but with provision for short subsidiary visits to others.

## iv. Selection and proposal of visitors

The sending Side will be responsible for selecting and nominating visitors from that country to the host Side; but the host Side may suggest that particular scientists or subjects should be considered by the sending Side, when the work to be undertaken in the host country relates to a joint project, or will be especially valuable in the furtherance of scientific collaboration.

Nominations will be made on standard forms of proposal as may be agreed by the Sides.

Nominations are to be forwarded to the host Side in sufficient time for at least three months notice to be given in each case. Not later than two months following receipt of a nomination, the receiving Side is to inform the sending Side as to the acceptability of the proposed visit, the suggestions for the programme and the period of the visit. A provisional programme should be sent as soon as possible for the visitor's information and approval, the sending Side should cable travel details at least a week in advance of the visitor's arrival.

Once a nominated scientist has been accepted for a visit, the receiving Side will take all appropriate steps to facilitate the issue of necessary visa/work or residence permit etc..

## V. Attendance at meetings

Although the purpose of visits under Article II should not primarily be attendance at conferences, etc., such attendance may be included within a visit if both Sides agree.

## VI. Joint projects

Both Sides will encourage joint scientific research between laboratories in the two countries including the conclusion of inter- institutional agreements where this is necessary.

## VII. Medical treatment

Emergency medical treatment will be available to visitors in accordance with the laws of the country concerned.

## VIII. Validity of Agreement

This Memorandum of Understanding shall enter into force upon signature and shall remain in force for a period of five years thereafter, unless terminated earlier by either Side. Notice shall be given at least 60 days prior to the desired termination date by notification in writing from one Side to the other.

In witness hereof, the undersigned, being duly authorized, have signed this Memorandum of Understanding.

Done at London this 15th day of September 1981

Dr. M.D. Shami
PAKISTAN SCIENCE
Foundation

Sd. Sir Arnold Burgen
ROYAL SOCIETY OF
LONDON

# THE ROYAL SOCIETY

Financial arrangement's for visits under the Memorandum of Understanding between the Royal Society of London and the Pakistan Science Foundation.

Study Visits under Article II(a) will generally be on the basis of the sending Side paying international fares and the host Side local costs, whereas Fellowships under Article II(b) will be entirely at the expense of the sending Side.

## Study Visits

## Accommodation

The host side will reserve and pay directly for the visitor's occupation of the room with use of bath or shower in a hotel, college, hostel or other suitable establishment for the period of the visits.

## Maintenance

Additionally the visitor will be paid in advance an allowance of £12 p.d. in the United kingdom and Pakistan Rs. 250 in Pakistan for meals not included in the price of the accommodation and for incidental expenses (including bus and petty transport costs).

## Travel

For other local travel visitors will be given pre-paid tickets or, where this is impracticable, such expenses will be reimbursed retrospectively.

## Conference fees

At the request of the sending Side the host Side will pay the fees for attendance at meetings under Article V.

## Accompanying dependents

Accompanying dependents will be at the expense of the visitors concerned. However, if requested in good time, the host Side may help by reserving economiocally priced double rooms, making extra provision for local travel, etc. on the understanding that the extra cost will be repaid by the visitor.

## Fellowships

Although Fellowships under Article II(b) will be entirely at the expense of the sending Side, the host Side, if required, may help with accommodation by making enquiries and reservations on behalf of the sending Side, providing information on availability, cost, etc., either to the sending Side, or directly to the visitor.

Done in London on 15 September 1981.

For the Royal Society of London
(Signed)_____
Sir Arnold Burgen
(Title) Vice-President

For the Pakistan Science Foundation
(Signed)_____
Dr. M.D. Shami
(Title) Chairman