PAKISTAN SCIENCE FOUNDATION ANNUAL REPORT 1978-79

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LETTER OF TRANSMITTAL

Islamabad

Dear Mr. Secretary

I have the honour to transmit herewith the Sixth Annual Report of the Pakistan Science Foundation for the Fiscal Year 1978–79, 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.

Respectfully,

Sd/-

(DR. Z. A. HASHMI)
Chairman
Pakistan Science Foundation

Secretary,
Ministry of Science & Technology,
Government of Pakistan,
Islamabad.

PAKISTAN SCIENCE FOUNDATION

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LIST OF CONTENTS

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
HC	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 & Biology

Discpilines:

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

INTRODUCTION:

The creation of the Pakistan Science Foundation, as an alternate source of funding, for the financing of scientific research and the promotion of science, is a land-mark in the forward march of the nation on the road to modernization and building scientific and technical capability. It is a recognition of the crucial role of science and technology in change and development and is amongst the more important measures instituted by the Government of Pakistan to createa thriving scientific and technological tradition in the country.

The Foundation is also the fulfilment of a long outstanding demand of the scientific community. The scientists have worked under painfully difficult conditions - lack of funds and facilities for scientific work, under - utilization and mis-utilization of highly trained specialists, inadequacy of the information and documentation services, isolation of the scientific workers from the current of modern scientific thought and lack of appreciation by society of the vital role of science in development, etc. A science organization with the requisite authority and financial resources, such as the Pakistan Science Foundation, was badly needed to help the scientists overcome some of these handicaps.

The Pakistan Science Foundation was established on June, 30, 1973, under the Pakistan Science Foundation Act III of 1973 (Annexure I) as a financing agency for:–

(a) 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 of national significance relevant to the socio-economic development of the country.

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

iv) the establishement of science centres, clubs, museums, herbaria and planetaria;

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

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

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

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

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

(b) The Foundation was also charged with the responsibility to:

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

ii) Maintain a National Register of citizens of Pakistan who are highly qualified and talented scientists, including engineers and doctors, in or outside Pakistan and to assist them, in collaboration with the agencies concerned in finding, within Pakistan, employment most suited to their genius; and

iii) cultivate liaison with similar bodies in other countries.

Although the functions entrusted to the Pakistan Science Foundation, are wide-ranging, yet the allocation of funds has never been commensurate with the expenditures required to perform these functions. The Foundation has, accordingly, been constrained to be selective in its investment on the basis of established priorities. It has utilized funds mainly for the performance of one of the major functions assigned to it, viz. the Research Support programme. The research programme supported by the PSF has not only assisted in the reactivating of research in the universities which, by 1972, had come almost to a stand-still due to non-availability of funds but has also provided opportunities to the competent scientists to work in the country, as well as provide employment and research training to a large number of younger scientific workers under the guidance of the highly trained and mature scientists in the nation.

An attempt to high light the progress made by the Foundation in the performance of its statutory functions has been made in the chapters that follow.

CHAPTER 1

ACTIVITIES AND PROGRAMMES

The salient features of the progress made by the Foundation during 1978–79 in the discharge of the functions entrusted to it in the Charter are summarised below:-

I. Establishment of Pakistan Scientific and Technological Information Centre: (PASTIC)

The Foundation submitted to the Ministry of Science and Technology a revised project based on the recommendations of the Joint UNDP/IDRC Mission's report for obtaining necessary Government approval. The revised project envisaged the establishment of an Information Network with the cooperating scientific and technical libraries in the country. It also recommended the devolution of the responsibilities of the National Science Reference Library from sector to sector in order to build up their own resources so that the required material should be closer to the users. The revised PASTIC project was approved by the CDWP, in its meeting held on 11.10.79, at a cost of Rs. 7,383,800/- which would be provided under the UNDP Technical Assistance Programme. The project would now be submitted to the ECNEC for final approval.

The details of the activities of PASTIC during the report period is as under:

National Science Reference Library:

PASTIC received 250 books, 285 periodicals, and about 150 other items of literature for its science reference library. Furthermore, letters of Credit worth Rs. 1.8 million were opened with the foreign suppliers, for the purchase of scientific literature. The present holdings of the National Science Reference library are 6,617 books and 3,856 periodicals.

Information Transfer Services:

The information transfer services continued and information on subjects such as appropriate technology, solar energy, products and processes, sugar factories, pancreas and carbohydrates, zoonosis, solar electricity from photovoltaic cells, press and dye work, fish culture in cages, evaporation retardents, solar dryers, eales diseases, castor Oil, housing, construction of oil tanks, standard for pipelines, manufacture of brass cocks, etc. was furnished to various government departments and industry.

Documentation Services:

These services are provided regularly to the scientific workers in the universities, academic institutions and other R & D organizations in the country. The documentation services include supply of photocopies, microfilms, plain paper copies, and electrostatic copies of scientific literature. On an average, 250 requests for items of literature were received monthly by PASTIC, out of which 80% were obtained from foreign sources and 20% were made available from local sources.

UNEP International Referral System National Focal Point:

The National Focal Point for UNEP/IRS was established at PASTIC National Centre. The data forms regarding the production of national directory of UNEP/IRS Focal Points were circulated to 263 institutions. The replies are being received, which would be finalized and a directory published in due course. Apart from the collection of data, queries received from various organizations were forwarded to the UNEP/IRS for providing requisite information.

PASTIC Building:

During the period under review, demarcation of the land donated by the Quaid-i-Azam University, Islamabad, was carried out by the Pakistan Public Works Department (PPWD)' Since the work for the construction of

PASTIC building was handed over to the PPWD according to the CMLA's instructions, the question of settlement of terms and conditions between the two organizations have since finalised and an agreement drawn up. PEPAC would provide necessary drawing of the building to PPWD for constructional purposes. An amount of Rs.5.4 million was deposited with the PPWD on their request for carrying out the work without any break as soon as the constructional and engineering drawings are completed by PEPAC.

Equipment:

An IBM Electronic Composer was installed in PASTIC. The work so far undertaken includes the composing of draft Science and Technology documents for the Ministry of Science and Technology and the Directory of the Agricultural Scientists for the National Science Council of Pakistan. Composing work on the Bibliography on Cancer is in progress.

Publications:

(a) The National Centre of PASTIC produced the following publications during the period under report.

- List of PASTIC Bibliographies (from 1957 to 1978).
- Index to the Theses and Dissertations–Sind province, 1970–74.
- List of translations done by PASTIC.
- Pakistan Current Contents and Pakistan Science Abstracts.

(b) The patent information section of the PASTIC sub-centre, Karachi, brought out eight publications on Canadian patent holdings and distributed them to the various industries. These publications were on the following subjects:

(1) Waxes;
(2) Bleaching Agents and Techniques;
(3) Textile Dying and Printing;
(4) Sugar, Surcrose, Fructose, Maltose and Lactose;
(5) Chromium;
(6) Harvesting;
(7) Metal Treatment and
(8) Copper.

II. **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:

During the year the Foundation carries out its statutory responsibility for the support of research through a number of programmes, which include:–

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

(b) Organization of Integrated Research Programmes.

(c) Institutional Support–provision of equipment, literature, staff training facilities, etc., to build institutional capability for conducting research.

(d) Support for participation in regional and international research programmes.

(a) **Grants of Research projects submitted by individual research workers or groups of scientific workers:**

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

During the period under report, forty five (45) projects costing Rs. 9.5 million were received by the Foundation. And 45 projects proposals which had been at the various stages of their processing, were carried over from the previous year. Thus, in all, 90 proposals remained under active consideration of the Foundation during 1978-79. 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 available 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, (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 year, only 18 projects could, however, be sanctioned at an estimated cost of Rs. 2.14 million.

Discipline-wise distribution of grants made by the Foundation during the past six years, is shown in table-I.

Research Projects:

Summaries of the research proposals sanctioned, during the year 1978-79, are given below:

Biological Sciences F-FI/BIO (70)*

Title: *Study of food habits and population dynamics of Markhor (Capra Falconeri falconeri) in Chitral Gol:*

Markhor is one of the important game animals of Pakistan, which inhabits the northern and north western hilly tracts of Pakistan. In the recent past, it used to occur in abundance. However, the increased human settlements, hunting pressure and the destruction of natural habitat reduced the Markhor population to the level of near extinction. A number of steps have since been taken by Government to increase the population of the animal. These steps inter alia include the declaration of Markhor as a protected species, establishment of game sanctuaries and preservation of natural habitat of the animal.

The present study aims at investigating the general animal behaviour as well as its reproductive behaviour and population dynamics in northern areas of Pakistan.

The results of this study will help preserve the natural habitat of the Markhor and increase the number of the species to a safe level through better management techniques evolved on the basis of the proposed studies.

C-QU/BIO (83)

Title: *Studies on the Physiological role and regulation of Pancreatic Hormones i.e., Insulin and Glucagon in Amphibians:*

Pathological and clinical studies in man as well as experimental investigation on animals have not yet been able to elucidate the pathogenesis of diabetes mellitus. This is one reason why there has been a growing interest, during the last few years, in using other experimental animals for diabetes research rather than the conventional laboratory mammals.

The physiological role of the amphibians pancreas is not completely understood and there is no agreement on the cellular composition of the islets of amphibians. Besides, the blood sugar levels in frog, *Rana tigrina* is generally very low and completely absent in some individuals. It is, therefore, of interest to make a detailed study of the pancreas of amphibians.

*For names of the Principal Investigators and sponsoring institutions, refer to Annexure - III

TABLE – I

SCIENTIFIC RESEARCH PROJECTS SANCTIONED, DISCIPLINE WISE, DURING JULY, 1973 TO JUNE, 79

Disciplines	No. of Schemes	Amount Sanctioned	No. of Schemes	Amount Sanctioned	No. of Schemes	Amount Sanctioned	No. of Schemes	Amount Sanctioned	No. of Schemes	Amount Sanctioned	No. of Schemes	Amount Sanctioned
Agricultural Sciences	1	3,61,551.00	6	16,36,346.00	8	11,63,966.00	3	4,29,566.00	2	2,52,382.00	–	–
Biological Sciences	9	14,70,069.00	13	21,62,504.00	2	74,373.00	9	9,99,842.00	3	1,39,460.00	5	4,53,182.00
Chemical Sciences	7	14,09,038.00	9	12,62,804.00	8	10,36,757.00	11	13,18,656.00	6	3,72,272.00	6	9,79,863.00
Earth Sciences	1	3,00,000.00	3	3,91,628.00	3	78,845.00	3	3,39,118.00	–	–	1	49,680.00
Engineering Sciences	1	57,520.00	1	36,000.00	1	30,000.00	1	2,67,325.00	–	–	–	–
Environmental Sciences	–	–	–	–	3	3,79,206.00	6	6,86,236.00	–	–	1	1,14,830.00
Mathematical Sciences	1	69,395.00	1	1,00,000.00	1	44,835.00	–	–	–	–	–	–
Medical Sciences	1	14,000.00	7	1,85,071.00	2	2,70,968.00	5	4,46,504.00	2	1,22,500.00	1	49,776.00
Oceanography	1	1,46,237.00	–	–	1	35,940.00	–	–	–	–	–	–
Physical Sciences	4	4,41,174.00	1	5,14,855.00	–	–	3	9,33,980.00	3	5,37,930.00	4	4,91,826.00
TOTAL:–	26	42,68,984.00	41	62,89,208.00	29	31,32,890.00	41	54,21,227.00	16	14,24,544.00	18	21,39,257.00

Accordingly, the proposed investigation aims at studying the (i) histochemistry of the amphibian pancreas (ii) effect of different drugs on the regulation of pancreatic hormones, and (iii) physiological role of the pancreas on various metabolic parameters such as relationship of pancreas with other major endocrine glands.

C-QU/BIO (88)

Title: *Studies on the male reproductive physiology of primates with special reference to fertility regulation:*

Although a great deal of information is available about the female reproductive physiology, there are still many gaps in the knowledge of male reproductive physiology. Many processes such as the mechanism of action of hormones in spermatogensis and steroidogensis, the identification of valnurable physiological events in gametogensis and selective interfarence of testicular and epididymal functions need intensive investigation.

Under this project, studies will be undertaken on male Rhesus monkey (*Macaca mutata*) for investigating the mechanism of various factors involved in their reproductive physiology. The results will help elucidate a number of factors regarding the reporduction physiology of primates.

S-ZSP/BIO (90)

Title: *Survey of the reptilian fauna of Sind;*

Reptilia is an important group of the fauna and consists of lizards, grecks, turtles, crocodiles, alligators and snakes. Sporadic research work has been done on reptiles, but no detailed survey has so far been carried out or research conducted on this group with a view to preparing an inventory of reptilian fauna of Pakistan.

This project envisages to (i) undertake a survey of Reptiles in the province of Sind; (ii) study their distribution, ecology and behaviour; (iii) investigate the causes of decline in the populations of certain important species.

The results of this survey will help (i) provide authentic data regarding the occurence of reptiles at least in one province of the country; (ii) maintain a representative collection for display and reference in the Pakistan Museum of Natural History being established under the auspices of the Pakistan Science Foundation; (iii) suggest appropriate measures for the conservation of menaced rare species so that their export could be rationalised.

S-KU/BIO (94)

Title: *Bio-ecological Survey of Indus Delta Estuary*:

Estuaries are important fishery resources of a country with a coastline. Their environments are bio-ecologically more productive per unit area than the open sea, because most estuarine ecosystems are natural store-houses of nutrients. Estuaries serve as nursery grounds for both migrating oceanic species of shrimps, blue crabs and fishes as well as resident commercially important oysters. The Indus Delta constitutes the principal estuarine system to the Pakistani coast bordering the Arabian Sea.

The project aims at studying the environmental factors, benethic and pelagic communities and primary and secondary production of the Indus Delta with special reference to species of commercial importance such as those of shrimps, crabs, oysters, mussels and fishes such as hilsa and mulles.

The results of the study will contribute significantly to the development of fish and fisheries in Pakistan.

Chemical Sciences:

S-KU/CHEM (10/1)

Title: *Structural and synthetic studies in some B-carboline basis:*

The present proposal is an extension of the project conducted under the same title. As a result of these

investigations, nitro-derivatives of whole range of alkaloidal bases were prepared and their pharmacological activity tested out at the Jinnah Post Graduate Medical Centre and a leading German Pharmaceutical firm. Further, during the course of the study of germination metabolities of *Peganum harmala* seeds, it was found that the alkaloidal constituents are wholly located in the husk of the seeds, to the extent of upto 7 per cent. On the other hand the kernels, which form about 50 per cent of the whole seed, yield 20 per cent of an oil which is completely free from the toxic alkaloids and compares in its physical data with cotton seed oil. These findings have already been published in International Journals and local Journals of International repute.

In the extension project, it has been proposed to further prepare nitro and other derivatives of B-carboline in order to obtain new pharmacologically important substances, which could find use in medicine. Work on the alkaloids from *Peganum harmala* seeds would continue to obtain new B-carboline derivatives from *harmaline* and *harmine*. Investigation on commercially feasible procedures for the extraction of oil from kernels of *Peganum harmala* seeds would also be continued with a view to developing a process for ultimate large-scale isolation of edible oil.

S-CSIR/CHEM (91)

Title: *Effect of germination on the protein and carbohydrate fractions of legumes and the study of other constitutents of nutritive significance.*

The importance of legumes as an essential constitutent of our daily diet can hardly be over emphasised. Normally, average Pakistani meals consist mostly of cereals supplemented by legumes as animal-protein even at sub-optimal level is, by and large, beyond the reach of the poor people. The four most commonly used lentils ordinarily prepared as 'daal' are mash, mung, masur and arhar.

The project envisages (i) to determine optimum conditions for the germination of four lentils before cooking so as to achieve maximum assimilation and dietary advantage, and (ii) to study the carbohydrate and protein fractions and other constituents of these legumes with references to changes taking place during germination. Effect of germination on antitryptic, tryptic inhibiting factors will also be studied.

S-KU/CHEM (94)

Title: *Isolation, identification and structural modification of some of the benzyl isoquinoline alkaloids for their use as anti-cancer agents*:

The anti-tumor activity of plant material has been known for many countries. Plant preparations were prescribed for what is thought to have been cancer as early as 1500 B.C. and have continued to be employed even today. In some countries with high standards of medical practice, popular herbal medicines are still found in use as cancer remedies. Three plants namely: *Vinca rosea Linn, Sanguinaria canadensis* and an Australlian tree *Achronychia baueri schott*, have so far been found to contain most important and therapeutically active alkoloid having anti-cancer properties.

This proposal aims at screening a number of plants in and around Islamabad belonging to the families Ranunculacea, *Lauraccae Menispemacae* for isolation and identification of alkaloid. The isolated alkaloids will then be structurally modified through demethylated selectivity and tested for anticancer activities.

S-KU/CHEM (96)

Title: *Synthetic and isolation studies towards vinblastine and their Novel Derivatives:*

The linary indole alkaloids vinblastine and the closely related vincristine are presently considered to be among the most potent chemotherapeutic agents available to man for the treatment of a variety of malignant condi-

tions including Hodgkins disease, choriocarcinoma and acute leukaemia in children. The low occurence of these alkaloids in plants has posed a serious problem to the pharmaceutical industry and attracted the attention of many organic chemists towards developing syntheses of these substances.

Earlier studies by the authors of the present proposal have led to the development of a semi-synthetic approach resulting in the synthesis of anhydrovinblastine, acetoxydihydrocatharanthine, 5-acetoxydihydrocatharanthine and, more recently, vinblastine and vincristine.

Under the present project, further elaboration of the semi-synthetic approach to vinblastine and vincristine will be investigated with particular reference to the feasibility of the synthesis of vinblastine and vincristine on a large scale. Chemistry of catharanthine and vindoline will also be investigated with a view to synthesising novel analogues of vinblastine with varying antitumour properties.

S-KU/CHEM (100)

Title: *Reactions and Industrial application of ortho-phenylbenzaldehyde:*

The ortho-phenylbenzaldehyde, a basic organic compound, was earlier prepared by the Principal Investigator of this project. The compound has already yielded synthetic green dye, and a detail study of its reactions may lead to further industrial applications.

The proposal envisages the preparation of alcohols and cinnamic esters derived from the ortho-phenybenzaldehyde, study of their anaesthetic and antispasmedic properties and large-scale preparation of these derivatives, if possible.

The result of these investigations may help in establishing the anaesthetic antispasmodic properties of this compound for its possible use for medicinal purposes.

C-QU/CHEM (101)

Title: *Synthesis and testing of 1,2,4,–triazines as potential antimalarials:*

The structural modification of active antimalarial substances is one of the most important approaches to the synthesis of new drugs. Many pyrimidine bases have shown enhanced antimalarial activity. For example 2,4–diamine–5 (P-Chlorophenoxy) pyrimidines has been investigated as an antagonist of folic acid and showed a striking similarity to chloroguanide, an antimalarial drug known for its multiplicity of action and low toxicity. Then 2,4–diamine–5–(P-Chlorophenoxy)–6–methyl pyrimidine was found to be five times as potent as Quinine against *Plasmodium berghei* and *Plasmodium gallinaceam*. Additional modification of the 2,4-diamine-5-benzyl-pyrimidine structure led to 2,4-diamino-5-(3,4,5, trimethoxybenzyl)-pyrimidine or Trimethoprim.

The antimalarial activiety of Trimethoprim was of great interest since it was found active against pyrimethanine-resistant *Plasmodium falciparum*. However, it was essentially inactive against *Plasmodium berghei*.

Certain 3,5-diamine-1,2,4-trizines have been reported to exhibit antimalarial activity. 3,5,-Diamino-6-(4-Chlorophenyl)-1,2,4-triazine and similar analogs showed antimalarial activity towards both *Plasmodium berghei* and *Plasmodium gallinaceam*.

Uptil now, no systematic study has been carried out on the activity of substituted triazines as antimalarial. Even the pharamacological activity of 6 AZA anology has not been reported.

The project envisages the preparations of a number of compounds and test their antimalarial activity. It is further anticipated that 3,5,-bio (methylthio) derivatives, which are intermediate in the synthesis might show enhanced antimalarial activity due to the presence of sulphur in the nucleus. However, their toxic side-effects cannot be ruled out.

Earth Sciences:

C-GC/EARTH (25)

Title: *Resource potential of Potowar; A study for the identification of resource Management Area and Growth Points*:

Potowar is an important agricultural area of the Punjab Barani region. The main economic resources are agricultural products, forests and minerals. However, the resources are not utilised properly on account of certain natural draw backs, as well as due to mismanagement. As a result, not only are the existing resources being wasted but also the agricultural land area is shrinking day by day. Settlements which could serve as nodes for economic activities are established further apart and are comparatively limited in number. Their growth is slow because the tributary areas do not provide enough economic support to them. Larger urban centers are consequently very few and these too are located either on main arteries of traffic or at points, where they serve as headquarters of the various tehsils. The major trading, financial and other institutions are located only in these centers. Therefore, there is a lopsided development and the major part of the region lacks the means to develop on a sound economic base.

This scheme has been prepared in accordance with the theoretical models proposed by the Punjab Barani Commission in its report to the Punjab Government for the development of Barani Lands. The scheme envisages (i) a survey of the existing Physical and human resources and human settlement in the Potowar and (ii) analysis of the data collected for the demarcation of resources management areas.

The study will be a pilot work and as such it will provide guide-lines for similar studies in other parts of the Punjab Barani area.

Environmental Sciences:

C-IU/ENVR (22)

Title: *Biological Control of termites with pheromones*:

The present proposal is an extension of the work conducted under a PSF- supported project entitled "Biological Control of termites with pheromones and pathogenic fungi," wherein isolation purification and identification was made of the trail, alarm and sex pheromones of *odontotermes obesus* and it was concluded that these chemicals, if evaluated biologically as well as behaviourally and analysed chemically, many may offer effective means of controlling the termites.

The extension work envisages detailed study on the chemistry of pheromones with a view to synthesise it for large scale production to use it for the biological control of termites.

Medical Sciences:

C-AFMC/MED (42)

Title: *Survey of worm infestation in Pakistan:*

Small scale investigations carried out in the country notably in the Army have pointed to the existence of high worm infestation. Data collected by the Principal Investigator during 1976-77 among the 2000 recruits joining the armed forces have shown the presence of worm infestation in as many as 49 per cent of them. The breakdown of different worms was found to be as follows:–

Ancylostoma 30%

Ascaris	5.1%
Hymenolepsis	5.2%
Giardia	4.2%
Trichuris	2.3%
Entamoeba	1.7%

Similar small-scale surveys carried out by earlier workers have pointed to the magnitude and extent of the worm prevalence. The figures furnished under these survey reports however, do not represent the real situation of the problem in the country as the investigations were patchy and restricted to limited geographical areas. The nature of worm infestation varies with the age, sex and geographical location. It is, therefore essential to conduct a country-wide survey of the problem.

The project envisages a nation wide survey of the worm infestation by collecting samples and taking laboratory examinations of representative cross-section of country's population. As the proposed survey would entail elaborate arrangements, it has, therefore, been suggested to devetail this survey with the nutrition survey of Pakistan, which is planned to be undertaken by the Government of Pakistan. (Chief, Health Planning Division).

The findings of this survey will enable the investigators to prepare a worm map of Pakistan which would act as a baseline for proposing suitable measures for the eradication of worm infestation from the Pakistan.

Physical Sciences:

P-PU/PHY (11/1)

Title: *High Energy Phemonenology*:

The construction of high energy machines has given an extra dimension to the field of elementary particles and, during the last few years, a tremendous amount of literature has been published on the subject. However, there does not exist any comprehensive theory of elementary particles. Even the piecemeal explanation of the experimental data is not entirely satisfactory.

The studies proposed under this scheme aim at using different models with appropriate modifications to explain the freshly available experimental data concerning particle-particle and particle-nucleus interactions. The results of these investigations might be a useful addition to the existing knowledge regarding the nature of elementary particles.

P-PU/PHY (29)

Title: *Material studies by Auger and Photoemission spectroscopy*:

Auger electron spectroscopy is one of the most sensitive techniques developed in recent years for material analysis. This technique is based on the energy analysis of the secondary electrons which, in turn, provides information regarding the electronic structure of the solid and the atomic species present in the solids.

The main objective of this project is to investigate electronic structure of various materials especially those which have application in electronic and other industries like, copper and its alloys, aluminium, glass, steel, ceramics etc.

Besides giving an understanding of the electronic structure of solids, the proposed studies would provide research facility to M. Phil. and Ph. D students in this field at the Centre of Excellence for the Solid State Physics.

P-PU/PHY (30)

Title: *Trapping levels and mobile charge determination in thin solid films:*

Amorphous thin films as used in silicon device technology are known to contain a spatical and energetic

distribution of traps. Mobile ion contamination in thermally grown dielectric films of silicon dioxide to be used as gate insulator has been recognised as a serious problem in the production of silicon Mo_s structure. These two factors produce instabilities and break down in practical silicon devices.

The scheme envisages to determine the density and distribution in energy of the trapping centres in different dielectrics. Mobile charge will also be determined. These two parameters will be used to characterise the films for their use as passivating and marking layers in components technology. This will be tried on limited scale to improve preparation methods and to minimise these two sources of trouble in device performance.

P-PU/PHY (31)

Title: *Electromagnetic properties of rocks, building materials and ceramics*:

Electrical properties of rocks are used in induced polarization, resistivity and electromagnetic methods of mineral exploration, in crustal, lunar, planetary and glacier soundings. Studies of electrical properties in rocks have been performed as function of frequency, temperature, applied field, pressure, oxygen, water content and other variables. These properties are further being explored to develop new and improved conventional sounding system for locating oil and gas deposits. Similar system, if developed, can find wide application in locating underground water channels.

The present research scheme envisages experimental studies of electrical properties and propagation characteristics of materials such as sand, cement, rocks and bricks in order to obtain data which could be of great use to Geophysicists in obtaining underground information using electromagnetic waves. The data will also be helpful to the electrical industry for the development of electrical insulating materials with lower losses at high frequencies.

(b) **Institutional Support**:

The Pakistan Science Foundation assists the Universities in the provision of equipment, chemicals, literature etc., to research workers who for one reason or another, are unable to obtain these from their own institutions and it is established that such support would lead to quick progress of research of national significance. The emphasis is on (i) fostering and equipping multi-disciplinary research units directed towards the solution of areas of high research priority; (ii) provision of equipment, literature, staff training facilities and improvement of data processing, documentation and information systems and similar facilities which would build up research capability, selected research centers and units.

During the current year a number of requests for financial assistance were received by the Foundation, However, only a small grant of Rs. 15,000/- was sanctioned to the Army Medical College, Rawalpindi, for the purchase of research literature.

Requests by the Gomal University and the Sind Agriculture University, Tandojam i.e. Rs. 0.15 to 0.5 million respectively, could not be aceeded to due to paucity of funds.

(c) **Participation in regional and inter-national Programmes**:

Research programmes specially identified as major research efforts, are undertaken by the international scientific community, at regional as well global levels, to accomplish designated objectives, related to one or more fields of science or to achieve a defined economic or social goal. The Foundation has been engaged in identifying such programmes and is endeavouring to arrange for the participation of the Pakistani Scientists in regional and international conferences.

At the International level, Pakistan Science Foundation is participating in the UNESCO sponsored 'Man

and the Biosphere Programme'. A project entitled: "Impact of Metropolitan Expansion on the Ecology of Rural-Urban Fringe: A case study of Peshawar",. was approved by the MAB Headquarters, UNESCO, for a total cost of Rs. 0.276 million of which a foreign exchange component of US $ 11,000/- shall be provided by the MAB Programme of financial assistance under their Human Settlement Project No. 11.

PSF has also established links for collaborative research programmes with organizations such as NSF (National Science Foundation) and EPA (Environment Protection Agency) of USA. Four research projects have been sent to the Ministry for onward transmission to the US National Science Foundation, through the Economic Affairs Division. Necessary provision for these projects was also made in the PSF budget.

III. **Utilization of Research Results:**

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:

The most pressing problem of Pakistan is to equalise technological levels with contemporary world. Except in the tiny modern sector, the prevailing technology is traditional and low in productivity. Effective utilization of the results of research from world as well as indigenous sources, technology transfer and its widespread application, is dependent upon the adequacy of institutions, mechanisms and programmes aimed at this specific purpose. The Pakistan Science Foundation, with its limited resources is endeavouring to provide financial assistance to the R & D institutions to utilise the results of research and develop appropriate technologies.

Some of the projects submitted to the Pakistan Science Foundation for financial support at the pilot plant scale are listed below.

(i) Preparation of cement from rice husk.
(ii) Mini hydel units.
(iii) Utilization of over-ripe dates for preparation of vinegar.
(iv) Conversion of petrol engine to bio-gas.
(v) Hand-made paper from banana pulp.
(vi) Animal feed mix machines.

The R & D component of the above projects is being completed at various institutions in the country after which support will be given by the PSF for those processes which would be found economically more feasible.

IV. **Science Centres:**

The establishment of science centres, clubs, museums, herbaria and Planetaria:

The Establishment of Science Centres, Clubs, Museums, Herbaria and Planetaria in various provinces of the country is one of the important functions of the PSF.

(a) *Establishment of the Pakistan Museum of Natural History*:

PC-I of the first phase of the scheme for the establishment of Pakistan Museum of Natural History was approved by the Central Development Working Party (CDWP) in its meeting held on 4th November, 1978 at a total cost of Rs. 7.197 million for a period of 27 months. The Government approval was communicated to the PSF in January, 1979. The implementation of the project was undertaken according to the approved plan and following achievements have so far been made:

(i) Four Senior posts (i.e. those of the Director General and three Directors, one each for Zoological, Botanical and Earth Sciences Divisions, were advertised to select appropriate persons for these specialised jobs. Selections have been made for the post of Director General, Director Zoological

Sciences and Director Earth Sciences.

(ii) A suitable building has been hired for housing the Museum as per provision in the approved project.

(iii) Services of two trained officers were requisitioned, on deputation, from the Geological Survey of Pakistan. One of these officers has since joined the post of Associate Curator w.e.f. 16th June, 1979, and work has, accordingly, been initiated in the Earth Sciences Section.

(iv) Part payment of the balance cost of 20 acres of land for the permanent Museum Building in Sector F-9/3, has been made to the Capital Development Authority (CDA).

(v) An allocation of Rs. 0.750 million was made in the ADP of the year 1978-1979 against which a sum of Rs. 0.744 million only was released. These funds have been fully utilised.

(b) *Establishment of National Science Centre*:

During the period under report, the National Science Centre arranged a number of talks, seminars, symposia, film shows etc., for creating public awareness and generating general interest in Scientific and Technological advancements made within and outside the country.

V. **Scientific Societies/Learned Bodies**:

The promotion of learned bodies, 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:

The Foundation is making annual grants to the established learned bodies and scientific societies and endeavouring to provide all possible assistance to the new ones. Annual grants amounting to Rs. 350,000/- were released during the year to various non-governmental scientific societies and learned bodies for the achievement of their approved objectives (Annexure-III).

Special grants totalling Rs. 105,000/- were sanctioned to various scientific societies/institutions for their publication programmes (Annexure-IV).

VI. **Science Conferences:**

The organization of periodical Science Conferences, Symposia, Seminars etc. -

During the year under report, grants totalling Rs. 52,900/- were given to various scientific organizations and institutions for holding seminars, symposia and conferences (Annexure – V). A brief account of some of the seminars/symposia is given below:

a) A symposium on "Recent Advances in Physics" was held at the University of the Punjab, from 5th to 7th February, 1979. The symposium was attended by distinguished physicists from all over the country and a large number of papers were presented.

b) A one-day seminar on "Aflatoxin and Human Diseases" was held at the PCSIR Laboratories, Karachi, on 21st April 1979. Eminent Scientists from all over the country attended the seminar to discuss the problem of Aflatoxin contamination.

c) An FAO/SIDA Follow-up Seminar on "Animal Reproduction" was held at the University of Agriculture, Faisalabad from October 29th to November 17th, 1978. A number of distinguished foreign

experts delivered lectures and held clinical demonstrations on the topic. The seminar was also attended by eminent Pakistani scientists.

d) A seminar on "Solid State Physics" was held at the Centre for Solid State Physics, University of the Punjab, Lahore, in April 1979. A good number of review papers and research papers were presented by the eminent physicists of the country.

e) A four-day seminar on "Explosives and propellants was held at DESTO, Rawalpindi from 24th to 27th July, 1978. Representatives of Defence Establishments, R&D Agencies and Universities attended the seminar and discussed measures to create interest among the R&D institutions of the country in the science of explosives and propellants.

VII. Exchange of Visits:

Exchange of visits of Scientists and Technologists with other countries:

A major weakness of Pakistani science is its isolation. Due to lack of contact with the scientists in advanced societies and the absence of intellectual inter-action, many of our scientific workers become obsolescent and lose enthusiasm, freshness and spontaneity. There is an urgent need to end the isolation from world science of Pakistani science and scientists. Our scientific workers must be enable to meet their counterparts in the advanced societies, and visit international and regional research centres and universities of repute.

This activity has been minimal during the period, under report, mainly due to financial constraints. However, a small amount of Rs. 3,415/- was sanctioned to a scientist as partial financial assistance to enable him to attend a seminar on "Operational control and management of activated Sludge Plants treating industrial wastewaters" held in New York.

VIII. Awards and Fellowships:

Grant of awards, prizes and fellowships to individuals engaged in developing processes, products and inventions of consequence to the economy of the country:

A system of public recognition, awards and financial support to creative individuals was considered necessary, invention and innovation through research.

a) *Awards:*

As stated in the annual report of the year 1977-78, that in order to provide an incentive for scientific research of merit, the PSF Board of Trustees in its 9th meeting had decided to grant monetary awards (up to Rs. 500/- for each paper) to the researchers working in the PSF-supported projects. Accordingly, a circular was issued during the year under report to the Principal Investigators of the PSF projects inviting reprints of papers published by them in Journals of International repute for consideration for the grant of cash awards up to Rs.500/– for each paper, as decided by the PSF Board of Trustees.

In reply to this circular, 29 papers: one in Agriculture, six in Biology, four in Chemistry, 17 in Physics. and one in Earth Sciences were received.

These publications were placed before the Executive Committee of the Foundation for consideration. The Executive Committee appointed an advisory committee to examine the technical merit of these papers and make suitable recommendations.

The said advisory committee met on 22nd April 1979, at the PSF Headquarters and laid down the following

rules for the evaluation of research papers and grant of cash awards to the researchers.

1. Paper published in the international journals only shall be accepted for consideration.

2. Only papers published in the following local journals (already on the approved list of the Academy of Sciences and the University Grants Commission) shall be accepted:

   i) Pakistan Journal of Scientific Research.

   ii) Pakistan Journal of Scientific and Industrial Research.

   iii) Proceedings of the Pakistan Academy of Sciences.

   iv) Pakistan Journal of Zoology.

   v) Pakistan Journal of Biochemistry.

   vi) Pakistan Journal of Botany.

3. Papers read or abstracts presented in conferences shall not be accepted unless they are published either in proceedings of high standard Science Associations, or in Scientific Journals specified vide 1 and 2 above.

4. Papers not falling in the above catogeries shall be considered on their own merit.

5. Short communications of high merit shall be given an award of Rs. 250/– only.

6. Amount sanctioned for each publication shall be equally distributed among the authors if it is the work of more than one scientist.

7. Action will be taken only on the published papers and not on the manuscripts.

The committee examined the papers published under the PSF projects and recommended 19 papers out of 29 for the grant of an award of Rs. 500/– to each of them.

b) *Fellowships:*

In order to provide research opportunities at the Post-Graduate Institute of Chemistry, Karachi University, under the able guidence of Dr. Salim-uz-Zaman Siddiqui, two fellowships of Rs. 750/– per month, were sanctioned by the Foundation for a period of three years each for undertaking research in the field of Alkaloid chemistry.

A grant of Rs. 5,000/– was sanctioned to the Nuclear Institute of Agriculture and Biology, Faisalabad, on account of fellowships to be provided to the scientists from the Universities and Research Organizations to enable their participation in the training courses on (i) Nuclear and other advanced technique in Agriculture and Biological research and (ii) DNA Replication and repair

IX. SURVEYS AND STATISTICS:

Under this programme, a project for the review of the research work done so far as well as of current research in major fields such as Agriculture, Medicine, Irrigation, Housing and Works, Industry, etc. was assigned to the National Science Council.

The achievements made so far in this project are as under:-

i) A directory of current research in Agriculture including Animal husbandry, forestry and fisheries has been prepared and sent to various research organizations. The analysis of the current research efforts in Agriculture as depicted in this Directory indicated trends of current research, which in turn pointed out certain serious deficiencies and imbalances in the present research effort in Agriculture.

ii) A draft directory of the current research in fields other than agriculture has also been compiled and has been sent to the concerned institutions for a close scrutiny and updating the information contained in the draft.

iii) A directory of the research establishments in Agriculture in Pakistan has also been compiled. This directory gives detailed information about each establishment like, its size and facilities available in terms of manpower, funds, library, equipment, buildings etc., and also the nature of research work being done.

iv) A directory of scientists and technologists engaged in R & D in Agriculture, giving a brief profile of each scientist and field of specialization has also been compiled. It is being composed and would shortly go to the press.

X. **Research Evaluation:**

The Foundation evaluated the following technical/fiscal reports received during the report year as per procedure laid down, in its fifth annual report, for reviewing the progress of scientific research supported by the Foundation and evaluating the results of such research.

(i) *Semi-Annual Reports*:

Thirty-one six monthly reports, invited after the initiation of each project and after the submission of the annual reports, were scrutinised by the Science Wing of PSF to assess the interim progress of these projects.

(ii) *First and Second Annual Reports*:

As many as 25 First annual and 15 Second Annual reports submitted by the Principal Investigators, after initial scrutiny by the Science Wing, were sent for detailed evaluation to active scientific workers in the relevant fields of study. These progress reports were then submitted to the respective Technical Committees for consideration alongwith the evaluation reports of the experts concerned, which were ultimately accepted by the Technical Committees.

(iii) *Final Reports*:

Twenty-one final reports in respect of the completed projects, received during the year under report, were also submitted to the subject experts for review and evaluation and on receipt back from them, were submitted to the relevant Technical Committees for acceptance.

These reports, duly accepted by the Technical Committees, were placed before the Board of Trustees of the Foundation. The Board appreciated the research work done in these projects and letters of appreciation were also issued to the Principal Investigators of the following projects:

Project No.	*Title*	*Name of the Investingator*
P-BIO (56)	An annotated bibliography of fresh-water food fishes of Pakistan.	Dr. Nazir Ahmed, Ex-Director Fisheries, 97, 98 old Rifle Range Chauburji Park, Lahore.

P-MH/MED (19)	Bacteiological studies of tuberculosis.	Dr. Salman H. Siddiqi, Chief T.B. Research Unit, Mayo Hospital, Lahore.
PU-PHY (11)	High Energy Phenomenology.	Dr. Mohammad Saleem, Department of Physics, University of the Punjab, Lahore.
SU-PHY (3)	Investigations of Electronic spectra of Metallic Hydrides.	Dr. M. Rafi, Department of Physics, University of Karachi, Karachi.
S-BIO (68)	An annotated bibliography of Marine fishes and fisheries of Pakistan.	Dr. Rahim-ullah Qureshi, 210–A, S.M.C.H.S, Karachi–3.

A copy of the letter of appreciation is reproduced in Annexure VII.

XI. PSF Scientists' Pool:

The Scientists' Pool, established in the Pakistan Science Foundation in 1973-74, was a step aimed at utilising high-level trained scientific manpower. During the report period, nine scientists, who had returned from abroad after completing higher education and were looking for jobs suited to their qualifications, were placed on the Scientists' Pool and assigned to various Universities.

In addition to this, biodata of several Pakistani scientists living abroad and interested in returning to Pakistan, were circulated among various Universities and Research Institutions in order to assist them in finding appropriate employment in Pakistan.

XII. International Liaison:

Liaison with International Agencies and Scientific establishments in different countries serve as a means to solve numerous scientific problems by sharing knowledge, exhange of expertise, collaborative research etc. Such agencies were accordingly contacted. Besides, representatives of several foreign organizations paid visits to the Pakistan Science Foundation in order to explore possibilities of collaboration in scientific programmes of mutual interest.

CHAPTER – 2

PROGRESS OF PSF-SUPPORTED PROJECTS

An account of the progress reports of PSF-supported Projects, received during the year 1978-79, is given below:–

(A) **Final Reports**:

During the year under review, seven final reports were received. Particulars of these schemes and brief summaries of the achievements made in these projects are as under:–

Project No.	:	P-NIAB/AGR (17)
Project Title	:	Biological control of soil salinity and fertility.
Project Particular	:	
Duration of project	:	3 years + 1 year's extension.
Date of commencement	:	1st July, 1974
Date of completion	:	30th June, 1978
Location of Scheme	:	Nuclear Institute of Agriculture and Biology, Faisalabad.
Total expenditure	:	Rs. 2,58,560/-
Main Objectives	:	To study the relative efficiency of biological, chemical and combination (Biochemical) methods of soil reclamation and to devise an efficient method for increasing the productivity of saltaffected soils.

Summary of the Work Done:

The research work carried out to achieve the project objectives included basic studies, pot experiment and a field experiment carried out at Rakh Chahi. The laboratory studies on the dynamics of solubilization of calcium carbonate under the influence of different organic materials in saline-sodic calcareous soils have revealed that organic materials like kallar grass and kallar grass partially decomposed by different fungi helped in the removal of exchangeable sodium from the soil. This reaction became possible due to solubilization of calcium carbonate present in the soil under test and some of the solubilized calcium leached out in addition to the exchange of sodium with calcium in the soil comple.

In order to select salt-tolerant plants, a technique was devised to study the salt tolerance of *Diplachne fusca* and *Sesbaniaculeata*. Both these plants proved highly tolerant to soil sodicity and therefore, were considered quite suitable for colonizing highly sodic and saline-sodic soils.

An experiment to study the effect of *Sesbania* green manuring on productivity and composition of soil, indicated that green manuring had no special effect on the yield of wheat crop. however, green manured soils showed relatively high water-retaining capacity as they had a higher water infiltration rate.

Pot experiements to study the effect of chemical, biological and combinations under relatively controlled conditions revealed that growth of the *kallar* grass either alone or in combination with press-mud was instrumental in better removal of salts in leachate and increasing the organic-matter content of the soils but had very little beneficial effect on PH and SAR. Gypsum, was very effective in improving all the soil parameters except organic matter. Farm-yard manure and sheep droppings increased the biocarbonate content of the soil even more than was the case

with the growth of *kallar* grass but gypsum depressed the solubilization of Ca Co_3 into the bicarbonate which was most probably due to the commonion effect.

The field experiment to find a suitable biological, chemical or combination treatment for the utilization of salt-affected soil was carried out at Rakh Dera Chahi. The soil was in a highly deteriorated condition with a top layer PH of 10.5, $ECx10^3$ equal to 42.2 and SAR value of 729. The soil texture varied from clay loam to sandy clay loam. Gypsum requirement was 13 tons acre 6-1" and the available tube-well water had an EC of 0.96 mmhos cm and RSC 3.5 me/I-I. SAR of the available water was quite low (3.6). The experiment was carried out in two parts. In two blocks comprising 32 plots the tube-well water was used as such while the other two blocks were irrigated with the tubewell water after it had been passed through gypsum blocks to reduce its RSC to 1.3. Out of the 6 treatments tested in the first part maximum reduction in PH was noted in plots receiving gypsum at the rate of 100 per cent of the requirement. The next best was a combination treatment comprising addition of press mud and growth of *kallar* grass. Simple leaching with water had very little effect on PH of the soil. Maximum reduction in the salt content was noted before transplanting rice and after its harvest but it appreciably increased in the case of all treatments after the harvest of wheat. This phenomenon might have occurred due to stoppage of irrigation at that stage and the consequent migration of salts in the upward direction. Among the different treatments, the plots treated with gypsum and press mud plus *kallar* grass showed the lowest salt content throughout the profile. Salt content was high throughout the profile in the case of simple leaching while the growth of *kallar* grass reduced it in the top 30 cm, the lower horizons having progressively higher salt content. The behaviour of SAR was akin to electrical condutitivity being lowest in the case of gypsum and press mud plus *kallar* grass treatments and highest in the case of simple leaching. SAR values were higher after the harvest of wheat than after harvest of rice in the cases of all treatments. This could again be due to the upward movement of salt in the absence of any irrigation. The maximum paddy yield was obtained from plots treated with press mud plus *kallar* grass followed by *kallar* grass, gypsum and sheep droppings. The plots, which were leached with simple water, failed to support the growth of rice. In the case of plots receiving tube-well water passing through gypsum blocks, maximum reduction in PH was obtained where kallar grass was grown. Gypsum, applied at 50 per cent of the requirement, did not lower the PH throughout the profile. The use of gypsum-amended water was responsible for decreasing the salt content in the case of all treatments especially in the top 15 cm. *kallar* grass-treated plots were the ones where the reduction in EC took place throughout the profile. SAR value in the top layers was reduced to maximum extent by the gypsum treatment, the next best being the *kallar* grass treatment. On the whole, the beneficial effects of gypsum were observed at the earlier stages where as the biological treatments produced gradual changes in various soil parameters observed.

It can be safely concluded that for the farmers, who cannot afford to apply expensive soil amendments like gypsum, the best policy would be to start a plant succession and improve the soil physio-chemical properties and its productivity by stages. This would have the added advantage of providing green fodder for their animals while the process of amelioration is in progress.

Project No.	:	P-AU/BIO (40)
Project Title	:	Ecology of some avian and mamalian pests.
Project Particulars	:	
Duration of project	:	Three years
Date of commencement	:	1st June 1976
Date of completion	:	31st may 1979
Location of scheme	:	University of Agriculture, Faisalabad.
Total expenditure	:	Rs. 89,067/-
Main Objectives	:	To reduce the pest birds and rodent populations through a combination of ecological and chemical devices.

Summary of the work done:

In Pakistan, rodents and birds cause losses of grains, legumes, oil seeds, sugarcane and orchard fruits amounting to billions of rupees annually. They represent a grave threat to the effort of the country to become self-sufficient in food production. With increasingly progressive agricultural practices, the country is also experiencing an increase in the complexity and intensity of its pest problems. To alleviate these problems and reap the full benefit that modern agriculture can provide, ecologically sound pest control practices developed in the local context should be brought into use. Any attempts at developing such studies would lead to a judicious use of toxicants against the pests.

As a first step towards the development of suitable control practices, a series of basic studies investigating reproductive biology, demography, and ecological distribution of pest rodents of agriculture were initiated in June 1976. These studies were followed by a number of other studies investigating the food preferences and consunption and movement patterns of rodents in the croplands. The results of this study have already been published as per details given below:

Publications as a result of these investigations:

Rana, A Shahnaz, Beg, Mirza A.	1976	Field biology of *Mus musculus* and *Mus booduga* in the Punjab, Pak. J. Zool; 8(2): 135–141.
Beg, Mirza A, Ajmal. X.M.	1977	Reproduction in the Indian gerbille, *Tatera indica indica* (Hardwicke), Mammalia (France) 41(2): 213–220.
Beg, Mirza, A. Khan, A.A. & Yasin, M.	1977	Rodent damage to wheat crop in Faisalabad district, Pak. J. Agri. Sci. 14(4): 37–44.
Chaudhry, A. Mohammad and Beg, Mirza, A.	1977	Reproductive cycle and population structure of the northern paln squirrel, *Funambulus penti,* Pak. J. Zool., 9(2): 183.
Beg, Mirza A. and Rana A. Shahnaz.	1978	Ecology of the field rat, *Rattus meltada Pallidior* in central Punjab (Pakistan),. Pak. J. Zool., 10(2): 163–168.
Basit, Amtul and Beg, Mirza. A.	1978	Non-geographic variations in *Funambulus*.
Beg, Mirza. A. Khan A.A. and Yasin, M.	1978	Some additional information on rodent damage to wheat in central Punjab, Pak. J. Agri. Sci. 15(3-4): 105-106.
Beg, Mirza Azhar.	1979	Rodent problems in sugarcane fields of central Punjab, Pak. J. Agri. Sci. 15(12): 13–129.
	1979	Observations on reproduction in *Bandicota bengalensis* and *Nesokia indica*. (Submitted for publication in Biologia).
	1979	Inhibiting rodent damage to wheat crop. (Submitted for publication in Pak. J. Agri. Sci.).
	1979	Effect of flooding on rodents in wheat lands. (Submitted for publications in Pak. J. Zool.).
	1979	Pattern of rodent infestation of field crops on a farmland near Faisalabad. (Submitted for publication in Pak. J. Zool).

Project No. : C-QU/BIO (84)

Project Title : Studies on the breeding biology & behaviour of *Barbus pituitora* (Mahasher).

Project Particulars :

Duration of Project	:	One year
Date of commencement	:	1st January 1978
Date of completion	:	31st December 1978
Location of the scheme	:	Quaid-i-Azam University, Islamabad.
Total expenditure	:	Rs. 33,360/-

Main Objectives : To study the breeding activity and behavioural aspects of an economic fresh water fish (Mahasher) in the Rawal Lake.

Summary of the work done:

The above project was conducted to investigate the primary productivity of the Ramli stream used for supplying running water to the experimental ponds employed for studying the breeding biology and behaviour of Mahasher fish which is economically important but difficult to breed in the local water bodies. It was, therefore, considered of interest to study the abiotic and biotic factors, which regulate the breeding of this particular fish. Investigations were, accordingly, carried out for a period of one year and the following results were achieved:

(i) *Feeding Behaviour*: Mahasher predates upon a number of phyto and zooplanktons such as *cyclops, magnees, diaptomus* sp. *Moina brachitata, Chydorus ovalis* etc. Feeding is initiated by travel stimulus and oriented by orghrokipases though teletaxis and dorsal light reactions play important role.

Growth rate of the fish under different dietary conditions was worked out using length-weight relationships and it was observed that 35 per cent protein in the fish diet was best suited for adequate growth rate and breeding of Mahasher.

(ii) *Protein behaviour*: Diurnal short length and long length migration are supported by protein behaviour, which acts as energy conservation machanisms. Both zigzagging and luping pattern is observable.

(iii) *Sexual Behaviour*: Breeding starts in the end of April and lasts upto middle of September. The optimum temperature and dissolved oxygen are important controlling factors in the breeding of Mahasher fish.

Induced spawning was also tried in the fish by giving injection of preserved pituitary gland in a ratio of 5 mg/kg of the body weight of the fish, Spawning occurred after 7--7½ hrs. of the injection.

Project No. : S-KU/CHEM (74)

Project Title : Conversion of petroleum hydrocarbons into cheap and effective insecticides and pesticides.

Project Particulars :

Duration of project	:	Six months.
Date of commencement	:	21st July, 1978.
Date of completion	:	20th January, 1979.
Location of scheme	:	University of Karachi, Karachi.
Total expenditure	:	Rs. 24,700/—.

Main Objectives — To prepare insecticides and pesticides from the indigenous raw materials by chlorinating hydrocarbons under different sets of experimental conditions namely temperature, concentrations of reactions, presence and absence of hydrochloric acid and testing the products for their effectiveness as insecticides or pesticides.

Summary of the work done:

The economy of Pakistan depends on agriculture, but unfortunately the yield per acre of food and cash crops is considered to be among the lowest in the world. The loss caused by plant diseases, insects, pests, weeds and rodents is estimated to be about 30 per cent of the total harvests. At present, Pakistan is placed at the bottom of the list of the countries using pesticides. This is because of the fact that import of these substances requires the expenditure of large sum of money in terms of foreign exchange. Only two pesticides namely, D.D.T. and B.H.C. are being produced in the country and these too in limited quantities.

The basic raw materials used for the production of insecticides and pesticides are chlorine and hydrocarbons. The former being a by-product in a number of chemical industries is readily available in the local market in abundant quantities, whereas the latter being produced in small quantities, has to be imported.

Under this project, in addition to chlorinating the petroleum and hexane, an attempt has been made to chlorinate an indigeneous substance namely, the turpentine for the preparation of pesticides by three different processes. These processes allow the production of pesticides by the chlorination of petroleum hydrocarbons at room temperature and diffused light, and do not involve efficient cooling arrangement thereby reducing the production cost considerably. Another important feature of the investigations is that danger of explosion and fire has been eliminated by feeding the hydrocarbons in the atmosphere of chlorine.

The pesticides prepared through these processes were tested for their biological activity against the insects in Laboratory and on crop-grown in the field. The results obtained are as under:

Ants	:	Not effective
Cockroach	:	High dose required
Housefly	:	High dose required
Borers growing on vegetables (Tori)	:	Effective even in very small dose.

The above data on the biological effeciency of these products is, however, inconclusive and more experiments need to be performed to find out their practical use against other types of pests. Their effect on mammals also remains to be checked and further evaluated for safety measures.

Project No. : P-CSIR/CHEM (49)

Project Title : Production of single-cell protein from Industrial wastes.

Project Particulars :

Duration of project	:	Three years.
Date of commencement	:	1st May, 1975.
Date of completion	:	30th April, 1978.
Location of scheme	:	PCSIR Laboratories, Lahore.
Total expenditure	:	Rs. 2,92,968.99

Main Objectives : To prepare single cell protein on pilot plant scale by using

the cultures of yeast and to study the economic feasibility of the process. To ensure higher growth rates and improved yields, attempts will be made to isolate some new microbial cultures besides those already available.

Summary of the work done:

Proteins are essential for all biological processes which sustain life. The gap in the demand and supply of proteins has widened with the present population explosion all over the world. In addition to conventional sources of proteins, attention is also being given to the biochemical synthesis of proteinous substances. Recently, single-cell proteins produced by the culture of yeasts and bacteria on various non-edible carbohydrates and hydrocarbons have attracted attention as non-conventional source of protein to avert the impending protein crisis.

Results obtained so far regarding growth characteristics of yeasts, nutrient requirements, yield and quality of biomass indicate that Single Cell Protein (SCP) will be available at a competitive price when compared with other protein supplements available in the feed industry market. Single Cell protein production from industrial wastes will result in an additional minimization in pollution.

Carbohydrates such as molasses and maize 'gur' are the good substrates for SCP, because they contain 50–55 per cent fermentable sugar and these can be easily recovered in the form of useful product i.e. protein for feed industry.

Experiments with molasses under nitrogen limitation will form a base for an ambitious hypothesis i.e. simultaneous production of protein and microbial fat. By manipulating the addition of nitrogen or carbon during fermentation, the priority can be shifted to lipids or protein ptoduction.

Pretreatment of sulfite waste liquor (SWL) is necessary in order to remove inhibitory effects of SO_2 before utilization. Thus 70–75 per cent of the sugar contents of SWL have been successfully utilised and converted to biomass which can be used for feed purposes. To make the process economical, supplementation of SWL with molasses or maize 'gur' is quite necessary as this will bring the level of fermentable sugar to a strength where maximum cell mass production capacity of the plant can be exploited.

Good quality protein can also be obtained from paraffins contained in the waxy fractions of petroleum such as waxy lubricating oils. Up-grading of the gas oil as a result of microbiological dewaxing will give us a very useful by-products to be used in cattle and poultry feed.

Project No. : P-GC/EARTH (23)

Project Title : Problems of Resource Utilisation in the Human Settlements of Murree-Kahuta Region.

Project Particulars :

Duration of Project	:	One year, three months.
Date of commencement	:	10th January, 1977.
Date of completion	:	10th April, 1978.
Location of scheme	:	Government College, Asghar Mall, Rawalpindi.
Total expenditure	:	Rs. 46,177/–

Main Objectives : To survey Murree and Kahuta Tehsils and to collect data on resources of the area which would assist in planning and development of the region.

Summary of the work done:

The survey covered 80 settlements (20.7 per cent of total), 45 in Kahuta tehsil and 35 in Murree tehsil, with a total population of 62,175, that constitutes 15.08 per cent of region's population. The region was divided into grids for the sampling of settlements. From each grid, three settlements were selected according to the size of population. Since the number of settlements and range of population-size showed wide variation in the two tehsils, gradation of population size was done according to the following:

Murree	*Kahuta*
Less than 1000	Less than 500
1001 to 2000	501 to 1000
2001 and over	1001 and over

The survey was conducted within two broad premises:

(a) Information was obtained on population, and material resources of the region, their organization and utilisation with particular reference to the limitations attaching to them. For this purpose, (i) a questionnaire was drawn up to cover aspects of resources and their utilization; (ii) through another questionnaire, information was obtained on human resources. Survey of the population was done in sample settlements on 15 per cent to 25 per cent household basis, depending whether the settlements were dispersed or nucleated.

(b) Official data and other information was obtained from the records of the following offices and agencies:

(i) Tehsils of Murree and Kahuta
(ii) Directorate of Agriculture, Rawalpindi
(iii) Municipalities of Murree and Rawalpindi
(iv) Divisional Forest Office, Rawalpindi
(v) District Education Office, Rawalpindi
(vi) District Health Office, Rawalpindi
(vii) Punjab Mineral Development Corporation, Rawalpindi
(viii) Water and Power Development Authority, Rawalpindi
(ix) District Gazetteer, Rawalpindi
(x) The Census Report, Rawalpindi District, for 1951, 1961, 1972.
(xi) Highway Department, Punjab Government, Lahore
(xii) Murree-kahuta Development Authority.

Besides, interviews were held with prominent local people, particularly zamindars, retired army and civil officers, members of the Union Councils and other elite, and opinions were elicited on the problems of the region.

Project No. : P-PU/ENG (3)

Project Title : Studies of atomospheric and under-ground corrosion—its control and prevention.

Project Particulars :

Duration of project : One year.
Date of commencement : 1st July, 1976.
Date of completion : 30th June, 1977.

Location of scheme	:	Institute of Chemical Engineering and Technology, University of the Punjab, Lahore.
Total expenditure	:	Rs. 29,850/-
Main Objectives	:	(i) To collect background information on corrosion of tubewells.
		(ii) To survey the distribution system of tubewells.
		(iii) To identify the types of corrosion.
		(iv) Work needed for prevention.
		(v) Workout economic feasibility for control.

Summary of the work done:

Keeping in view the aims and objectives of the proposed study, a detailed report was submitted by the investigators in April, 1979 wherein, besides corrosion and incrustation, scope of the study was further widened to cover many interrelated factors such as type of screen materials, water quality and other parameters of tubewell design, construction and maintenance, which are the major sources of tubewell failure as identified on the basis of the field work carried out by CMO, WAPDA through the assistance of foreign experts and consultants to WAPDA, appointed from time to time. Inspite of these efforts, the problem of deterioration of the performance of the tubewells has remained unsolved. It has been concluded that decline in specific capacity is caused by one or more of the sinultaneously operative complex factors which are yet to be clearly understood for an optimum design of a tubewell, its construction and maintenance. The authors have highlighted these factors in the form of following recommendations for further work which is a challenge for the scientists and engineers of the country.

1. The use of inert type of strainers, like fibreglass and stainless steel, has not improved the situation of the well efficiency. Further, field study of the performance of different types of screens indicates that the materials of the screens though with inherent limitations perhaps do not seem much involved in the rapid deterioration of the tubewells. As a result, conflicting opinions come forth specially in regard to the comparative utility of different types of strainers.

   Consequently, suggestions have been made that so far as the wells are deteriorating anyhow, cheaper materials should be developed through more fundamental research on corrosion and incrustation in order to resolve the above-said conflicting views.

2. According to the opinions of the consultants, the life of the high capacity costly tubewells was estimated to be 40 years, whereas the actual life span has proved to be about 15 years. In view of the dwindling efficiency of these tubewells and the resultant economic set-back, WAPDA has very wisely decided that future wells should be of the capacity of 2-3 cusecs in place those of 2–5 cusecs. In view of this situation, the cost of the tubewell is recommended to be further reduced by using cheaper materials. Further, the designed thickness of the casing may be critically examined in reducing its constructional cost.

3. It is less likely that corrosion-incrustation and bacterial growth may deteriorate a well too soon or in a short period of time. Premature deterioration of wells may thus occur due to the following factors which have been discussed in this report:

   (i) Deficiencies in tubewell construction.
   (ii) Gravel pack gradation and screen slot size mis-match to the aquifer.
   (iii) Improper emplacement of the gravel pack.

(iv) Mechanical failure of the screen through sand pumping and cavitation.
(v) Inadequate development of the tubewell.
(vi) Poor sampling method for stratigraphical logging.

This calls for coordinating and vigilance on the part of monitoring, design, construction and maintenance organizations so that timely failure of the tubewells is avoided.

4. In addition to other dissolved salts, the ground waters of the Indus Plains are saturated with minerals such as calcite and siderite and contain sulphate and iron reducing bacteria in certain areas. These waters are thus corrosive and incrustating to cause objectionable changes in metallic screens so that the well efficiency is reduced. Electrode potential measurements, corrosion rate determinations by Corrosometer and Langelier Index calculations have been of some qualitative significance regarding the water quality and the performance of metallic screens. Therefore, more original work is required in this field in relation to other factors of well deterioration discussed in this project.

5. In general, metallic corrosion does occur as a result of the action of sulphate reducing bacteria present in the aquifer which may cause severe damage to the mild steel screen. Sulphate reducing bacteria have been identified in some areas of SCARPS, but no work has been done in regard to corrosion intensity caused by these bacteria. This necessitates high priority research work on corrosion due to bacterial infection.

6. As far as possible, a general well design including gravel pack gradation and screen alot size, methods of construction and well development have been standardised. However, the adoption of these standards has not solved the problem of well failure due to the following reasons:–

(i) Lack of precise related hydrogeological data and the consequential use of the empirical equations and bold assumptions in well design.

(ii) Poor stratigraphical logging and predominance of high silt and clay fractions in the aquifers which consist of fine to medium sands.

(iii) Lack of choice in the available gravel pack gradation.

(iv) Lower limit of percent open area for the type of screens being used.

(v) Deficiencies in well construction and development operations.

All the above factors ultimately regulate the ground water velocity inside and outside the screen which possibly controls the mechanical deterioration of the well by sand pumping, physico-chemical deterioration by corrosion-incrustation and invasion of fines and biological deterioration by bacterial growth. The above deficiencies must be over-come and research work in this behalf has to be carried out to eliminate the above said causes of well deterioration.

7. TV Camera inspections in certain cases have revealed that the screen slots are unicrustated and unchoked yet the specific capacity has been considerably reduced thereby suggesting that decline in well efficiency originates from the unfavourably state of the near-well hydraulics. Thus, it is obvious that well design plays a unique role in well failure. A preliminary solution to the problem of rationalising well design has been theoretically carried out by Barker and Grey, who have concluded that no general solution for rationalising well design is tenable for all wells. Thus, there are many outstanding problems for an understanding of the near-well hydraulics some of which are:–

(i) The importance of assessment of turbulent flow in aquifer and the gravel pack.

(ii) Critical examination of design entrance velocity and the design parameters.

(iii) Examination of other sources of well loss which undoubtedly are prevalent and need careful attention.

(iv) Precise understanding of frictional resistance within a slotted pipe.

The way in which different hydraulic engineers and hydrologists interpret and correlate field data is a controversial issue, hence more laboratory experimentation is required with simple modelling to arrive at precise relationship amongst various design parameters, which can be demonstrated more clearly and economically as compared to field studies regarding the problems outlined above.

8. The results of rehabilitation operations carried out so far by mechanical and chemical methods are not encouraging for any type of screen. It is believed that the failure of rehabilitative measures originates from the following factors:—

(i) Lack of regular and proper maintenance procedures for the well screens at different stages which are as important as the maintenance of mechanical and electrical components of the tubewells.

(ii) Delayed rehabilitation practices. The chances of restoring the specific capacity of tubewell are more remote if rehabilitation is carried out when the well capacity is reduced more than 50 per cent.

(iii) Unfavourable state of the near-well hydraulics results in the loss of well efficiency, the operative parameters of which are still obscure and unknown.

It is, therefore, recommended that proper maintenance of the screen should be carried out at regular intervals to check well deterioration even in its initial stages. Further that rehabilitation operation/s should be carried out at an earlier stage of deterioration. Maintenance and rehabilitation operations are very similar in natural and they differ only in their operational intensity. However, research work is needed to optimise these operations to arrest loss of well efficiency in time. Effective rehabilitation and maintenance measures through research work will only be possibly developed when all inter-related factors for well deterioration are precisely determined.

In view of the above recommendations, the problem of well failure requires a multi-discipline research at national level. The involvement of foreign experts and consultants by WAPDA relating to SCARPS tubewells has been encouraging but no efforts have been made to solve this problem on selfreliance basis. It is high time that the Pakistan Science Foundation may sponsor the coordination of a group of researchers such as chemists, hydrogeologists, chemical engineers, materials engineers, corrosion technologists, hydrological engineers and mathematicians drawn from the universities and research organizations of the country. The work is both of fundamental and applied nature for which universities can play a very effective role under PSF sponsorship. The author will help to coordinate this proposed integrated research work. It is further hoped that WAPDA will continue to collaborate without any financial implications on its part for the proposed venture. The financial sponsorship by Pakistan Science Foundation is, therefore, solicited and it is hoped that the project is economically highly feasible in view of the significant national exchequer involvement in the various SCARPS and continuous threat to our agriculture by the twin menace of water-logging and salinity.

(b) **Second Annual Reports**:

The second annual reports of the following projects were received and processed by the Foundation during the period under report:

Project No.	*Title of the Project*
P-AU/AGR (31)	Cytogenetic studies of branched ear derivatives in wheat.

S-AC/AGR (38)	Investigation on ecology and biology of cutworms in Hyderabad Region.
S-AC/AGR (36)	Investigations of nematode diseases in Sind Region.
P-AU/BIO (38)	Collection and study of fish fauna of Pakistan.
P-AU/BIO (40)	Ecology of some avian and mammalian pests.
P-PU/BIO (50/I)	Control of diseases of Silk Worm (B. Mori) in Pakistan and Azad Kashmir.
P-CSIR/BIO (69)	Production of amylolytic enzymes for industrial use.
S-KU/CHEM (7)	New calorimetric techniques and measurement of heat mixing of organic liquids.
C-IU/CHEM (41)	Infrared studies of organic compounds.
C-IU/CHEM (54)	Preparation of new medicinal compounds by structure modification and metal chelation of certain existing medicinal compounds and their study.
F-PU/CHEM (60)	Molecular weight and size measurements of colloidal polymers and macromolecular materials by light scattering techniques.
S-SU/CHEM (65)	Reactions of Thionyl chloride with sucrose, Trehalose, Methyle-B-maltoside and methyl B-sactoside.
S-KU/ENVR (4)	Problems of Eutrophication and control of aquatic weeds in fresh water lakes of Sind.
S-JPMC/MED (20)	Nutritional disorders in an urban community.
C-PC/MED (36)	Frequency and Natural History of Rheumatic fever in Islamabad and identification of Diagnostics for acute rheumatic fever.
S-KU/OCEAN (4)	Shore erosion studies of Pakistan coast in the vicinity of Karachi.

(C) **First Annual Reports:**

The first annual reports of the following projects were received and processed further by the Foundation:

Project No.	*Title of the Project*
C-IU/AGR (42)	The surveillance and monitoring of diseases naturally transmitted between vertebrate animals and man, and related health hazards.
P-AU/AGR (55)	Pathology of Trees, (Bacteria and Viruses in tree diseases).
S-KU/BIO (14)	Investigation on wood anatomy components of coniferous trees of Pakistan.

S-KU/BIO (54)	A survey of Phytoplankton of Sind Area and their utilization as food for animal/man.
F-PU/BIO (72)	Germination promotion of Pinus halepensis, P. roxburghii and P. wallichiana seeds by startification and chemical treatment.
P-PU/BIO (75)	Heterotopic transplantation of entire muscles in Mammals.
S-KU/CHEM (7)	New calorimetric techniques and measurements of heat mixing of organic liquids.
C-IU/CHEM (73)	Kinetic, electrochemical and optical investigation of the herbicide-methylviologen (paraquet) and the related compounds.
P-CSIR/CHEM (76)	Enzymes hydrolysis of raffinose for the improvement of sugar recovery in beet processing.
C-QU/CHEM (81)	Removal of Olefines, Naphthenes and Aromatics from various fractions of petroleum.
C-QU/CHEM (82)	Studies on catalytic activity of Nickel in the production of vegetable Ghee.
S-KU/CHEM (84)	Isolation and structural studies on the chemical constituents of some indigenous flowering plants.
S-SU/EARTH (5)	Exploration and evaluation of the economic mineral potentials and deposits of Nagar Parkar, South Eastern Sind.
P-CTT/ENG (14)	Dyeing problems in blended fabric – Study on Pakistan Textile Industry.
F-PU/ENVR (2)	Testing for Mitotic gene conversion in yeast by food colours and other chemicals.
P-IU/ENVR (3)	Ecological Studies on fresh water Hyphomycetes.
P-CC/ENVR (15)	Pollution and Aquatic organisms of the Leh Streams, Rawalpindi.

CHAPTER – 3

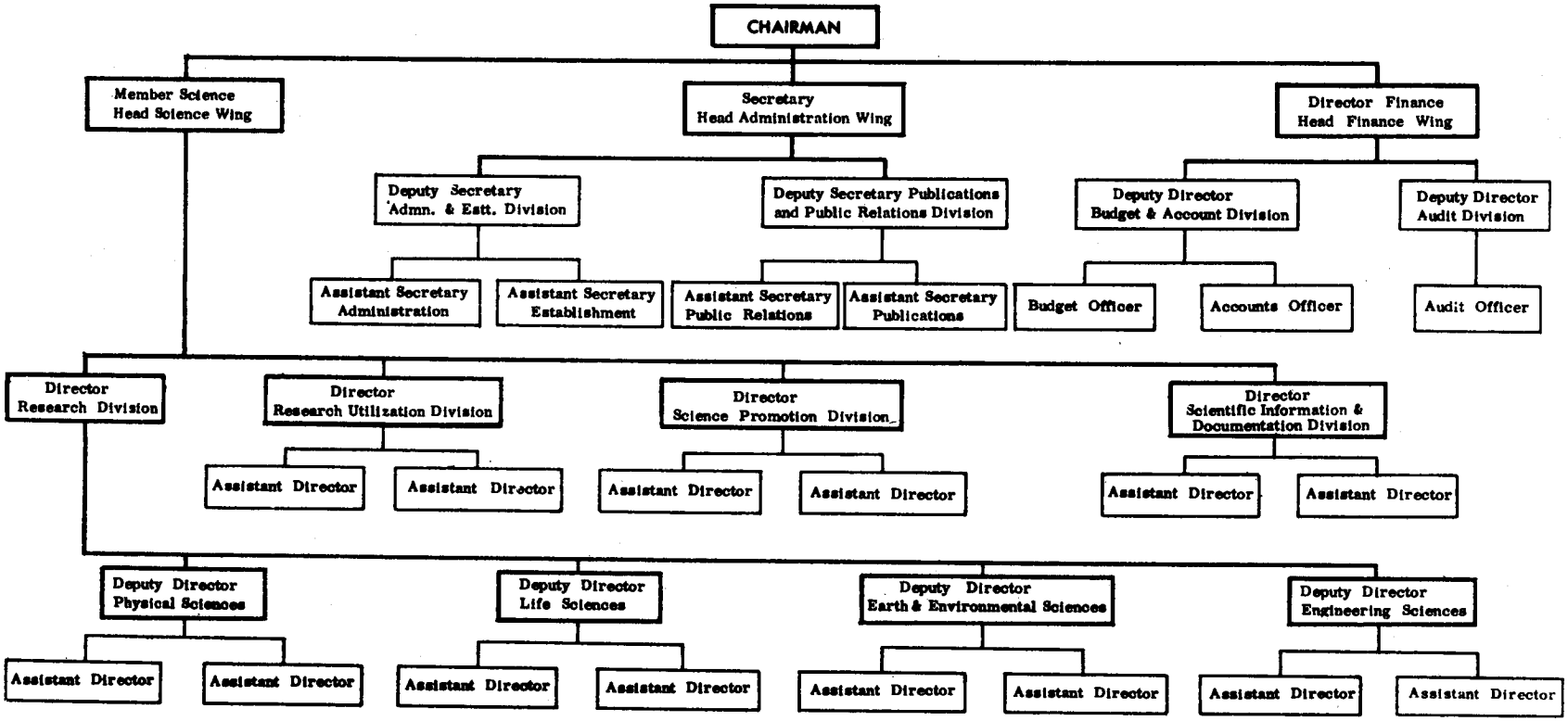
ORGANIZATION AND ADMINISTRATION

The ultimate organizational and administrative structure of the Foundation is represented in the chart on page 32 and 33 respectively. However, at the outset, only a small component of the proposed structure was inducted by the Foundation. The staff in position during the report period is as under:–

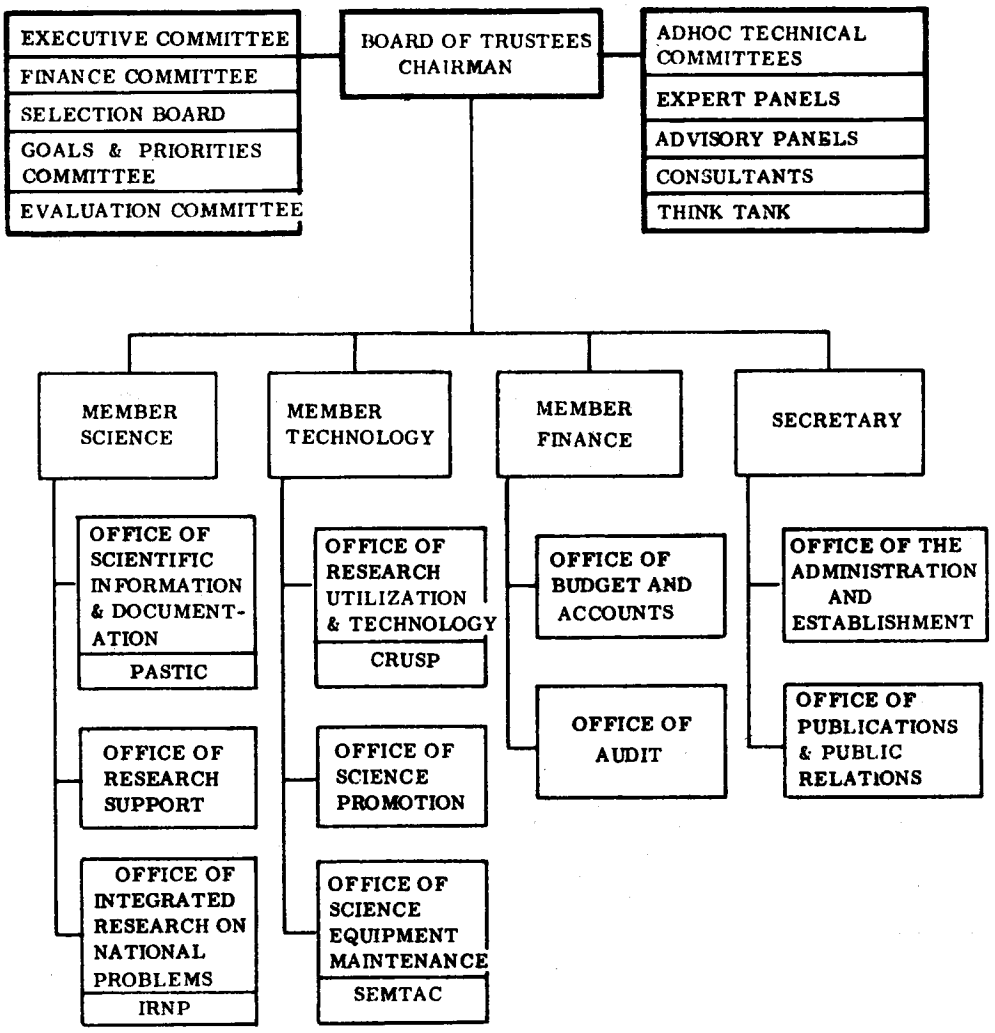
S.No.	Designation	Number
1.	Chairman	1
2.	Member (Science)	1
3.	Member (Finance)	1
4.	Secretary	1
5.	Deputy Director (Finance & Accounts)	1
6.	Senior Scientific Officer	1
7.	Scientific Officers	2
8.	Placement Officer	1
9.	Accounts/Audit Officer	1
10.	Public Relations Officer	1
11.	Administrative Officer	1
12.	Assistant Scientific Officer	1
13.	Supporting Clerical Staff	14

In addition to the whole-time members of the Foundation, there are about 250 scientists and technologists in various universities/research organizations, who are acting in an honorary capacity as reviewers of the research proposals or serving on the technical & other committees and expert/advisory panels of the Foundation.

PAKISTAN SCIENCE FOUNDATION
ADMINISTRATIVE STRUCTURE
1975



PROPOSED ORGANIZATION
PAKISTAN SCIENCE FOUNDATION



PASTIC : PAKISTAN SCIENTIFIC AND TECHNOLOGICAL INFORMATION CENTRE

CRUSP : CENTRE FOR RESEARCH UTILIZATION AND SPECIAL PROJECTS

IRNP : INTEGRATED RESEARCH ON NATIONAL PROBLEMS

SEMTAC : SCIENCE EQUIPMENT MAINTENANCE TECHNICAL ASSISTANCE CENTRE

CHAPTER 4

AUDITORS REPORT

The report of the auditors M/S A. F. Ferguson & Co., Chartered Accountants, appointed by the Foundation in consultation by the Accountant General of Pakistan, is reproduced below:—

Auditors Report

We have examined the annexed balance sheet of Pakistan Science Foundation as at June 30, 1979 and the annexed receipts and expenditure account for the year ended June 30, 1979 and subject to the contents of paragraphs 3.3, 4.1, 4.2 and 4.3 of our letter 311 dated October 12, 1981, we report as under:

The receipts of the Foundation during the year ended June 30, 1979 include apart from sums for the Museum project and PASTIC referred to in notes 3 and 4 to the accounts, sums for the Foundation by way of grant from the Federal Government.

We are satisfied that the grant so received has been spent on the objects for which it was made, within the specified time limit. There was no un-spent balance after taking into consideration expenses incurred but not paid at June 30, 1979.

We have also satisfied ourselves about the propriety of the disbursements made from the grant.

CHARTERED ACCOUNTANTS

Rawalpindi the 26th December, 1981.

PAKISTAN SCIENCE FOUNDATION

RECEIPT AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED JUNE 30, 1979

	Note	1979 Rupees	1978 Rupees
Grants received		4,078,100.00	5,624,000.00
Less: Grants paid			
Research support	8	2,081,838.90	3,340,010.42
Scientific sociaties and professional bodies		457,900.00	405,000.00
Scientific seminars and conferences		101,863.00	238,027.67
Utilisation		200.00	29,100.00
Others	9	91,392.18	302,733.65
		2,733,194.08	4,314,871.74
		1,344,905.92	1,309,128.26
Travel grants for science conferences and seminars		–	68,191.32
Scientist pool salaries		67,824.51	367,012.96
Administrative expenses	10	1,303,501.89	1,089,760.12
		1,371,326.40	1,524,964.40
		(26,420.48)	(215,836.14)
Miscellaneous receipts		6,746.08	90.75
Net deficit		19,674.40	215,745.39

PAKISTAN SCIENCE FOUNDATION

BALANCE SHEET AS AT JUNE 30, 1979

ASSETS AND LIABILITIES	Note	1979 Rs.	1978 Rs.	PROPERTY AND ASSETS	Note	1979 Rs.	1978 Rs.
GENERAL FUND							
Balance as at July 1, 1978		2,996,418.73	2,911,619.00	FIXED ASSETS		2,990,727.93	2,988,947.72
Prior year adjustments	11	105,896.36	218,523.12	(As per schedule annexed)			
				RESEARCH PROJECTS IN			
Recaipt and expenditure account surplus (deficit) for year		(19,674.40)	(215,745.39)	PROGRESS		18,948,495.32	16,866,656.42
				CURRENT ASSETS			
Grants not paid–PASTIC		–	82,022.00	Sundry debtors		4,066.00	7,916.00
		3,082,640.69	2,996,418.73				
				Advances, deposits and			
RESEARCH SUPPORT GRANTS	2	18,948,495.32	16,866,656.42	prepayments	6	135,594.00	53,800.10
CURRENT LIABILITIES	5	88,449.83	101,542.62	CASH AND BANK BALANCES	7	40,702.59	47,297.53
						180,362.59	109,013.63
		22,119,585.84	19,964,617.77			22,119,585.84	19,964,617.77

These accounts should be read in conjunction with the annexed notes

CHAIRMAN — Dr. M. D. Shami

TRUSTEE — Mr. S.M. Afzal

PAKISTAN SCIENCE FOUNDATION

NOTES TO THE ACCOUNTS FOR THE YEAR ENDED JUNE 30, 1979

1. Accounting policies

1.1 Grants received

Grants received from the Government of Pakistan are accounted for on receipts basis.

1.2 Fixed assets

Fixed assets are stated at cost less accumulated depreciation except leasehold land which is valued at cost.

1.3 Depreciation

Depreciation on fixed assets has been charged on reducing balance method.

2. Research support grants

The grants paid for the performance and execution of the research projects are being carried forward in the accounts of the Foundation and have not been adjusted for completed projects.

3. Museum

During the year Rs. 743,747.00 was received and disbursed as development grant for the Museum Project.

4. PASTIC

The following grants were received for PASTIC and paid to them:

	1979 Rupees	1978 Rupees
Non-development grants received from the Government of Pakistan	1,547,422.00	1,475,825.00
Development grants from the Government of Pakistan	3,450,281.00	2,825,000.00
	4,997,703.00	4,300,825.00

5. Current liabilities

These consists of the following:

Liabilities for expenses	1979 Rupees	1978 Rupees
Audit fee	11,000.00	6,000.00
Scientific pool officers pay	6,000.00	5,722.89
Salaries and other benefits	44,568.10	35,355.37
Other administration expenses	9,505.33	31,916.88
	71,073.43	78,995.14

		1979 Rupees	1978 Rupees
	Liabilities for other finance		
	Excess recoveries in respect of advance	600.00	–
	Man biosphere programme	14,707.00	14,707.00
	Punjab barani Commission	1,631.20	1,631.20
	P.C.S.I.R.	438.20	438.20
		17,376.40	16,776.40
		88,449.83	95,771.54
	General provident fund and contributory		
	Provident fund	–	5,400.00
	Group life insurance	–	371.08
		88,449.83	101,542.62
6.	Advances, deposits and prepayments		
	These are made up of		
	Advances to staff	8,906.00	9,359.00
	Deposits	3,700.00	3,700.00
	Prepayments	122,988.00	40,741.10
		135,594.00	53,800.10
7.	Cash and bank balances		
	In hand	3,371.87	2,026.36
	With bank	37,179.73	45,120.18
	Unesco coupens	150.99	150.99
		40,702.59	47,297.53
8.	Expenditure on research support		
	Maths and computing sciences	11,461.00	10,063.00
	Physical Sciences	430,226.00	733,548.24
	Chemical sciences	475,100.00	542,894.13
	Biological sciences	491,845.50	736,663.01
	Earth sciences	43,370.00	130,974.00
	Environmental sciences	143,304.40	192,393.00
	Engineering sciences	79,242.00	121,779.94
	Agricultural sciences	195,905.00	329,535.00
	Medical sciences	180,665.00	301,814.10
	Institutional support	15,000.00	187,000.00
	Occeanography	15,720.00	53,346.00
		2,081,838.90	3,340,010.42

		1979 Rupees	1978 Rupees
9.	Other expenditure		
	Scientific centres and herbaria	60,900.18	184,181.00
	Information and documentation	20,000.00	34,824.00
	Awards and prizes	4,992.00	28,000.00
	Scientific surveys and collection of statistics	500.00	55,728.65
	Man biosphere programe	5,000.00	–
		91,392.18	302,733.65
10.	Administrative expenses		
	Salaries and other benefits	801,355.20	706,372.41
	Travelling local	16,211.10	20,824.20
	Rent office	133,449.81	83,924.00
	Water electricity and gas	12,501.18	7,235.43
	Postage, telephone and telegrams	129,274.76	100,187.61
	Printing and stationery	40,723.87	8,616.15
	Vehicle running and maintenance	54,851.81	54,330.28
	Newspapers and periodicals	4,098.55	1,635.61
	Liveries and uniforms	2,494.00	6,299.80
	Insurance	–	4,822.15
	Entertainment	6,289.92	15,318.60
	Benevolent fund	241.50	–
	Repair and maintenance	17,542.50	7,817.36
	Depreciation	40,474.45	46,064.28
	Travel abroad	4,753.20	11,148.00
	Miscellaneous	31,591.53	7,257.15
		1,295,853.38	1,081,853.03
	Audit fee	6,125.00	3,000.00
	Advertisement	1,364.60	1,938.84
	Bank charges	158.91	2,968.25
		7,648.51	7,907.09
		1,303,501.89	1,089,760.12

11. Prior year adjustment

This represents refund of grants and cancelled cheques relating to 1977-78 which have not been revalidated subsequently.

CHAIRMAN

Dr. M.D. Shami

TRUSTEE

Mr. S. M. Afzal
Member Finance

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 are 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 thereto,

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 provisions of this Act, to acquire, hold and dispose of property, both movable and immovable, and shall by the said name sue and be sued.

(3) The head office of the Foundation shall be at Islamabad.

4. **FUNCTIONS OF THE FOUNDATION.**–(1) The Foundation shall function as a financing agency for:

(i) the establishment of comprehensive scientific and technological information and dissemination 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 a laboratory scale;

(iv) the establishment of science centres, clubs, museums, herbaria and planetaria;

(v) The promotion of scientific socities, 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 seminar;

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

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

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

(2) The Foundation shall also.–

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

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

(iii) establish liaison with similar bodies in other countries.

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

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

Whole-time members

(i) the Chairman;
(ii) one eminent scientist;
(iii) the Director of Finance;

to be appointed by the President;

Part-time members

(iv) the Chairman of the National Science Council;
(v) four scientists to be nominated by the National Science Council; and
(vi) eleven eminent scientists to be nominated by the President.

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

6. **CHAIRMAN OF THE FOUNDATION.**–(1) The Chairman of the Board shall be the Chairman of the Foundation and shall be appointed from amongst 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 reappointment.

(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 members 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 of any member of the Board without notice and without assigning any reason.

8. **MEETINGS OF THE BOARD.**—(1) The meeting of the Board shall be held at least twice a year and shall be presided over by the Chairman or, in his absence, by its whole-time scientist member.

(2) All decisions at a meeting of the Board shall be taken by a majority of the votes of the members present and voting.

9. **QUORUM AT THE MEETING OF THE BOARD.**—To constiture a quorum at a meeting of the Board not less than nine members shall be present.

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

11. **DELEGATION OF POWERS.**—The Board may, from time to time, delegate to the Chairman or the Executive Committee such of its powers and functions as it may consider necessary.

12. **ADHOC COMMITTEE.**—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) donations and endowments; and
(c) income from other sources.

14. **BUDGET.**—The Foundation shall cause to be prepared and approve a statement of its receipts and expenditure for each financial year.

15. **ACCOUNTS AND AUDIT.**—(1) The funds of the Foundation shall be kept in a personal ledger account of the Foundation with the State Bank of Pakistan or with any Branch of the National Bank of Pakistan acting as an agent of the State Bank.

(2) The accounts of the Foundation shall be maintained in such form and manner as the Auditor-General of Pakistan may determine in consultation with the Federal Government.

(3) The accounts ot the Foundation shall be audited by one or more auditors who are chartered accountants within the meaning of the Chartered Accountants Ordinance, 1961 (X of 1961), and are appointed by the Foundation in consultation with the Auditor-General of Pakistan.

16. **APPOINTMENT OF OFFICERS AND SERVANTS.**—(1) The Foundation may appoint such officers and servants, and engage such consultants or experts, as it may consider necessary for the efficient performance of its functions, on such terms and conditions as it may deem fit.

(2) In fixing the terms and conditions of service of its officers and servants, the Foundation shall, as nearly as may be, conform to the scales of pay, allowances and conditions of service applicable to the corresponding class of employees of the Federal Government.

17. **ANNUAL REPORT.**—(1) The annual report of the Foundation, which shall among other things clearly bring out the benefits accruing to the nation as a result of the activities sponsored by the Foundation, shall be prepared by the Chairman and submitted, through the Board, to the Federal Government alongwith the audited accounts of the Foundation.

(2) The annual report alongwith the audited accounts of the Foundation shall be laid before the National Assembly.

18. **REGULATIONS.**—The Foundation may make Regulations for the efficient conduct of its affairs.

19. **REPEAL.**—The Pakistan Sceince Foundation Ordinance, 1972 (LII of 1972), is hereby repealed.

Annexure II

LIST OF SANCTIONED RESEARCH GRANTS 1978-79

No.	Title of scheme	Amount sanctioned	Name of Principal Investigator and organization supported.
		Rs.	
1.	To study the food habits and population dynamics of Markhor in Chitral Gol F-FI/BIO (70).	1,19,460/-	Mr. Abdul Alim, Wildlife Management Specialist, Pakistan Forest Research Institute, Peshawar.
2.	Studies on the Physiological role and regulation of pancreatic harmones [C-QU/BIO (83/1)].	32,630/-	Dr. M. Maqbool Ahmed Department of Biological Sciences, Quaid-i-Azam University, Islamabad.
3.	Studies on the male reproductive physio logy of primates with special reference to fertility control [C-QU/BIO (88)].	26,702/-	Dr. M. Arsalan, Department of Biological Sciences, Quaid-i-Azam University, Islamabad.
4.	Survey of the reptilian fauna of Sind [S-ZSD/ BIO (90)].	80,590/-	Mr. Mohammad Farooq Ahmed, Zoological Survey Department, Karachi.
5.	Bioecological Survey of the Indus Delta Estuary [S-KU/BIO (94)].	1,93,800/-	Prof. Dr. Muzammil Ahmed, Institute of Marine Biology, University of Karachi.
6.	Structural and synthetic studies of some B-Carboline basis [S-KU/CHEM (10/1)].	2,39,042/-	Dr. Salimuzzaman Siddiqui, HEJ, Postgraduate Institute of Chemistry, University of Karachi, Karachi.
7.	Effect of germination on the protein and carbohydrate fractions of legumes and the study of nutritive significance [S-CSIR/CHEM (91)].	57,300/-	Dr. S.A. Warsi, Senior Associate Scientist, P.C.S.I.R., Laboratories, Karachi.
8.	Isolation, identification and structural modification of some of the Benzyl Isoquinoline alkaloids for their use as anti-cancer agents. [C-QU/CHEM (94)].	1,60,775/-	Dr. Roshan Ahmed, Department of Chemistry, Quaid-i-Azam University, Islamabad.
9.	Synthetic and isolation studies towards vinblastine and vincristine and their novel derivatives [S-KU/CHEM (96)].	4,38,000/-	Dr. Ata-ur Rehman, HEJ Postgraduate Institute of Chemistry, University of Karachi, Karachi.
10.	Reactions and industrial applications of Ortho-Phenyl Benzaldehyde [S-KU/CHEM (100)].	49,299/-	Dr. S. A. Faseeh, Department of Chemistry, University of Karachi. Karachi.
11.	Synthesis and testing of 1,2,4-triazines as potential antimalartials [C-QU/CHEM (101)].	35,546/-	Dr. (Mrs.) Roshan Ahmed, Department of Chemistry, Quaid-i-Azam University, Islamabad.

12.	Resource potential of Potwar-A study for the identification of resource management areas and growth points [C-GC/EARTH (25)].	49,680/-	Dr. Zafar Ahmad Khan, Department of Geography, Government College, Rawalpindi.
13.	Biological control of termites with pheremones [C-QU/ENVR (22)].	1,14,830/-	Dr. Qazi Javed Iqbal, Department of Biological Sciences, Quaid-i-Azam University, Islamabad.
14.	Survey of worm infestation in Pakistan [C-AFMC/MED (42)].	49,776/-	Dr. (Col.) Ashfaq Ahmed, Director, D.E.R., Armed Forces Medical College, Rawalpindi.
15.	Material studies by auger and photo emission spectroscopy [P-PU/PHY (29)].	2,37,100/-	Dr. M. Suleman, Centre of Excellence for Solid State Physics, University of Punjab, Lahore.
16.	Trapping levels and mobile charge determination in thin solid films [P-PU/PHY (30)].	1,24,738/-	Dr. Fateh M. Nazar, Centre of Excellence for Solid State Physics, University of Punjab, Lahore.
17.	Electromagnetic properties of rocks building materials and ceramics [P-PU/PHY (31)].	50,000/-	Dr. M.A. Shah, Director, Centre of Excellence for Solid State Physics, University of Punjab, Lahore.
18.	High energy phenomenology [P-PU/PHY (11/1)].	79,988/-	Dr. Mohammad Saleem, Department of Physics, University of Punjab, Lahore.

Annexure III

PSF GRANTS SANCTIONED TO THE SCIENTIFIC SOCIETIES AND LEARNED BODIES FOR THE ACHIEVEMENT OF THEIR OBJECTIVES:

Year 1978–79

S.No.	Name of Society	Grant in Rupees
	A. ALL PAKISTAN SCIENTIFIC SOCIETIES/LEARNED BODIES:	
1.	Pakistan Association for the Advancement of Sciences	40,000/-
2.	Scientific Society of Pakistan	40,000/-
3.	Pakistan Academy of Sciences	50,000/-
4.	The Institute of Engineers	40,000/-
5.	Pakistan Association of Scientists and Scientific Professions	40,000/-
6.	Pakistan Engineering Congress	30,000/-
		2,40,000/-
	B. DISCIPLINE SOCIETIES	
1.	Zoological Society of Pakistan	10,000/-
2.	Pakistan Botanical Society	10,000/-
3.	Soceity for the Advancement of Agricultural Sciences	10,000/-
4.	Pakistan Medical Association	20,000/-
5.	Pakistan Association for Public Health Engineering	15,000/-
6.	Biological Society of Pakistan	10,000/-
7.	Pakistan Soceity of Bio-chemists	10,000/-
8.	The Institute of Electrical Engineers, Pakistan	15,000/-
		1,00,000/-
	C. PROVINCIAL SOCIETIES	
1.	Provincial Cancer Association, Peshawar	10,000/-

Annexure IV

PSF GRANTS SANCTIONED TO VARIOUS AGENCIES FOR THEIR PURBLICATION PROGRAMMES YEAR 1978–79

S.No.	Agency	Publication	Grant in Rs.
1.	Scientific Society of Pakistan	(i) Science Bachoon Ke liay (ii) Science Magazine	30,000/-
2.	Pakistan Association for the Advancement of Science	(i) Pakistan Journal of Science (ii) Pakistan Journal of Scientific and Industrial Research	20,000/-
3.	Pakistan Botanical Society	Pakistan Journal of Botany	10,000/-
4.	Biological Society of Pakistan	Biologia	10,000/-
5.	Pakistan Society of Biochemists	Pakistan Journal of Biochemistry	5,000/-
6.	Zoological Society of Pakistan	Pakistan Journal of Zoology	10,000/-
7.	Pakistan Forest Institute, Peshawar	Pakistan Journal of Forestry	10,000/-
8.	University of Peshawar	The Alembic	2,000/-
9.	Society for the Advancement of Agricultural Sciences	Pakistan Journal of Agricultural Sciences	5,000/-
10.	Gordon College, Rawalpindi	Bulletin of Hydro-Biological Research	3,000/-
			1,05,000/-

Annexure V

PSF GRANTS GIVEN TO VARIOUS AGENCIES FOR HOLIDING SYMPOSIA/SEMINARS/WORKSHOPS: YEAR 1978–79

S.No.	Agency	Symposium/Seminars/Workshops	Grant in Rs.
1.	DESTO Laboratories	Seminar on Explosives and propellants	5,000/-
2.	University of Agriculture, Faisalabad	FAO/SIDA Follow-up Seminar on Animal Reproduction	10,000/-
3.	Pakistan Medical Research Council, Karachi	National Seminar on Aflatoxin and Human Diseases	10,000/-
4.	University of the Punjab, Lahore	Seminar on Solid State Physics	10,000/-
5.	Pakistan Society of Biochemists	Symposium on Biochemistry of Cataract formation	2,900/-
6.	Quaid-i-Azam University, Islamabad	UNESCO Regional Workshop on Appraisal and Development of Curricula in Chemistry	*5,000/-
7.	University of the Punjab, Lahore	Symposium on Recent Advances in Physics	10,000/-
			52,900/-

* Funds released in 1975 earlier for a seminar on recent advances in chemistry lying unspent with the University were utilized for this workshop.

Annexure VI

TRAVEL GRANTS FOR VISITS ABROAD

S.No.	Name and Address	Institution to be visited	Purpose of visit	Amount sanctioned
1.	Dr. Mahboob Mohammad, Associate Professor, Department of Chemistry, Quaid-i-Azam University, Islamabad.	Dublin W. Germany	To participate in Euroanalysis conference	Rs. 1,338/- (not availed)
2.	Dr. Akhlaq Ahmed, Chairman, Department of Applied Chemistry, University of Karachi, Karachi.	New York	To participate in the seminar on "Operational control and management of activated sludge plants treating industrial waste waters".	Rs. 3,415/-
				Rs. 4,753/-

Annexure VII

PAKISTAN SCEINCE ROUNDATION

Q–13, Al-markaz, F-7/2 Post Box 1121

ISLAMABAD

Dr. Z. A. Hashmi
Chairman

No: RES/9 (1)/79
Dated: 27th March, 1979

My Dear

On behalf of the Board of Trustees of the PSF and on my own behalf, I have the honour to convey appreciation of the valuable work accomplished by you and your colleagues under the PSF research grant No. ..... entitled: " .....

....."

This we trust would not only assist in the advancement of knowledge but would also help in the social and economic development of Pakistan.

Yours sincerely,

Sd/=

(DR. Z. A. HASHMI)