

# ANNUAL REPORT

FOR THE YEAR 1976-77

Pakistan Science Foundation  
Islamabad

**PAKISTAN SCIENCE FOUNDATION**

**ANNUAL REPORT**  
**1976-77**

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

LETTER OF TRANSMITTAL

Islamabad

Dear Mr. Secretary

I have the honour to transmit herewith the Fourth Annual Report of the Pakistan Science Foundation for the Fiscal Year 1976-77, 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,

*Z. A. Hashmi*

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

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

**PAKISTAN SCIENCE FOUNDATION**

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Mr. S. Irshad Ahmad, Chairman, NESPAK, Lahore.

Dr. G.M. Khattak, Director General, Pakistan Forest Institute, Peshawar.

Dr. Abdul Khaliq, Secretary, Health Department, Government of Baluchistan, Quetta.

Mr. Asif Ali Sheikh, Joint Secretary to the Federal Government, Ministry of Science and Technology, Islamabad.

Sardar Habib Khan, (Ex-Additional Secretary and Development Commissioner, Azad Kashmir), Rawalpindi.

Note : The Director-General, Agricultural Research Council will be requested by special invitation to participate in the meetings of Board of Trustees of the PSF.

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LIST OF ABBREVIATIONSProvinces:

B	Baluchistan
C	Centre
F	Frontier
P	Punjab
S	Sind

Sponsoring Institutions:

AC	Agricultural College
AU	Agricultural University
EU	Engineering University
IU	Islamabad University
KU	Karachi University
MH	Mayo Hospital
PU	Peshawar University/Punjab University
SU	Sind University
KMC	Khyber Medical College
NHL	National Health Laboratories
CSIR	Council of Scientific & Industrial Research
JPMC	Jinnah Post Graduate Medical Centre
NIAB	Nuclear Institute for Agriculture & Biology

Disciplines:

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 Pakistan Science Foundation was established on June 30, 1973 under the Pakistan Science Foundation Act No.III of 1973 (annexure - I) "to promote and finance scientific activity having a bearing on the socio-economic needs of the country". Under the Act, the Foundation has been entrusted with the following functions :-

- a)
  - i) establishment of comprehensive scientific and technological information and dissemination centres;
  - ii) 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) utilization of the results of scientific and technological research, including pilot plant studies to prove the technical and economic feasibility of processes found to be promising on a laboratory scale;
  - iv) establishment of science centres, clubs, museums, herbaria and planetaria;
  - v) 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) organization of periodical science conferences, symposia and seminars;
  - vii) exchange of visits of scientists and technologists with other countries;
  - viii) grant of awards, prizes and fellowships to individuals engaged in developing processes, products and inventions of consequence to the economy of the country; and
  - ix) special scientific surveys not undertaken by any other organization and collection of scientific statistics related to the scientific effort of the country.

- b) The Foundation shall also:-
- i) review the progress of 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 the country, 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.

As will be seen from the statement of the functions entrusted to the Foundation, its responsibilities are wide-ranging. These include five broad areas of activity: (i) research support and building institutional capability for scientific work, (ii) establishment of a national scientific information system, (iii) promotion of public understanding of science, (iv) assistance in the utilization of the results of research and the transfer, generation and application of appropriate technology, and (v) utilization of the scientific manpower and arresting the flight of talent from the country.

CHAPTER - IACTIVITIES AND PROGRAMMES

The progress of the work done by the Pakistan Science Foundation during the year 1976-77 under the various functions entrusted to it is summarised below:

Item No. I ESTABLISHMENT OF PAKISTAN SCIENTIFIC AND TECHNOLOGICAL INFORMATION CENTRE

National Science Reference Library:

During the year under report the following information material was received by the reference library :-

1. Books	1821
2. Dictionaries	124
3. Periodical Issues	1533
4. Reports, Directories, proceedings etc.	125
5. Other Information Material	927

The present holdings of the National Science Reference Library are :-

i) Books/Reference Books	6283
ii) Periodical Titles	260 3061 issues

These books and periodicals cover various disciplines such as agriculture, biology, chemistry, earth sciences, environmental sciences, intermediate technology, medicine, engineering etc.

The data on library holdings of periodicals of the Peshawar and Quetta regions is being collected by the respective PASTIC Sub Centres. This data will be included in the updated National Union Catalogue of scientific and technical periodicals in the libraries of Pakistan for computerization.

A proposal for the establishment of NASDATA BASE Computer Oriented Union Catalogue System for PASTIC Network, prepared in consultation with the Netherlands technical expert for PASTIC Reference Library, has been approved by the Foundation and funds have been released for the initiation of the work. The proposed data base will provide upto-date information about documents and periodicals (both foreign and national) available in PASTIC and other libraries of Pakistan, facilitating rapid dissemination of this information to the users and research workers.

During the year under review purchase orders for books and periodicals worth \$ 18340 were placed with the foreign publishers. The books ordered for the library include materials on the progress, advances, reviews, transactions, proceedings etc. covering various scientific and technological disciplines whereas the periodicals include indexes, and abstracts, which serve as important tools for the information work.

Apart from the above purchase orders, six lists consisting of 992 reference items such as reports, abstracting and indexing periodicals, proceedings of symposia and conferences, Technical Dictionaries, U.N. publications and bibliographies etc. have been forwarded through the Economic Affairs Division to the Government of Netherlands for obtaining the same under the Netherlands Assistance Programme.

#### Information Transfer and Current Awareness Services

The services of U.S. NTIS were utilized and the research reports and catalogues pertaining to 35 subjects including inter-alia low-cost housing, environmental pollution, non-conventional resources of energy, etc. were circulated to 200 institutions in the country.

In response to the requests received from individual researchers, information gathered from within the country and from foreign data bases was regularly supplied to the users.

#### Documentation Services

PASTIC Documentation Service consists of procurement of scientific and technical papers, reports, etc., in the form of microfilms or hard copies, compilation of bibliographies, translations and reproduction of documents. Out of the orders for 3441 documents received during the year 1976-77, 2950 documents (i.e. 84%) were supplied to the indentors.

### Publication Programme

Two volumes of "Pakistan Science Abstracts" pertaining to the year 1974 were published. Volume No.15 of 1975 has since been composed and is ready for printing.

### Patent Information

The Patents Information Cell at PASTIC sub-Centre, Karachi, during the year 1976-77, sorted out 30,000 Canadian patents subject wise and notified the same to the relevant industries. Information on 125 for patents queries was procured from U.S. Department of Patents, British Patents Office and Patents Offices of other countries and provided to 15 industrial organizations and institutions in the country. The patents cell is regularly bringing out publications on subjects of industrial importance.

### Foreign Technical Assistance for PASTIC

In order to revise and update the PASTIC Project according to the recent developments in the information since, a UNDP/IDRC Mission consisting of 5 members from UNESCO, UNIDO and IDRC visited Pakistan Science Foundation in October/November, 1976. The mission was entrusted primarily with the task of making a comprehensive review of the nation's information needs in the areas of science and technology particularly health, industry, agriculture, development economics and studying the existing infra-structure, with a view to making it more responsive to users requirements and identifying optimum methodologies to provide the required services: The mission was also required to define the priorities for PASTIC and its role in the overall national information network.

The mission submitted its report in February, 1977 which has since been approved by the governing body of PASTIC in principle and has been sent to the Ministry of Science and Technology for government approval.

The recommendations of the mission are :-

- 1) That the concept of a centralized National Science Reference Library should be replaced by an effort to build a decentralized network of co-operating libraries. The responsibility for providing a national service in information should be delegated sector-by-sector to the most

appropriate institutions. A focus for the network (PASTIC) will still be required to provide co-ordination and the development of appropriate tools. Some of the financial resources that might otherwise have been budgeted for the centralized operation should now be administered by PASTIC as straight grants (or as materials and equipment) to institutions that agree to cooperate in the network and provide national information services in their particular sectors.

- 2) That, to reflect this fundamental change, a new constitution should be written for PASTIC and for the network that it will help to develop, possibly by enacting appropriate legislation. The report recommends creation of a network to be known as "Pakistan Scientific and Technological Information Network - PAKSTI Network" whose focus would be PASTIC itself. PASTIC's location in the national government structure should be selected to reflect its role as the focus of the PAKSTI Network, whose other members may be in a variety of federal and provincial institutions, in universities, etc.
- 3) That the scope of the PAKSTI Network (and also of PASTIC) should be defined to cover the social and economic sciences as well the pure and applied sciences (including agriculture and medicine). This change should also be reflected in the composition of the National UNISIST Committee which should, in future, concern itself also with information activities in the social and economic sciences.
- 4) That PASTIC should have the following principal functions:
  - a) the organization, co-ordination and support of the PAKSTI-Network as a network of libraries co-operating sector by sector to provide access to their holdings to bonafide users throughout the nation;
  - b) the preparation and dynamic maintenance of an "Information for Development Policy" for consideration by the Government. This policy would cover both domestic and international aspects;
  - c) the maintenance of a national inventory and clearing house of information produced in Pakistan;

- d) the organization, in co-operation with appropriate institutions, particularly the universities, for the development of Pakistani competence in information-handling (e.g. computer processing) and for the training of an adequate corps of information scientists;
  - e) the continuance of its present service of procurement of foreign documents needed by Pakistani users;
  - f) the maintenance of translation and bibliographic services to supplement those available at other co-operating institutions within the PakATI Network; and
  - g) the development of services to re-package technological information in suitable forms and languages to make it more readily assimilated, either directly or through extension services, by small and medium-scale industries.
5. That the role of the provincial sub-centres established by PASTIC should be critically reviewed with the object of possibly reducing them to small offices (two professionals) providing liaison with clients and with the co-operating libraries in the PakSTI Network.
  6. That the Government of Pakistan should give consideration to the status of information scientists within the Civil Service and that, in particular, the grading of staff within PASTIC should be such as to permit the maximum flexibility of assignments, as well as promotion and transfer on merit.
  7. That the Government of Pakistan should give high priority within its UNDP country programme to a project that will permit an early start in the building of the infra-structure that will be needed for the PakSTI Network. The report submitted also contains a draft project for securing UNDP assistance. The project after having been examined by the Board of Governors and other technical experts was submitted for further processing with EAD/aid giving agency.

#### Building for PASTIC

A UNESCO consultant-architect visited Pakistan in November, 1976 to help PASTIC to draw up proposal for building

of PASTIC office and National Science Reference Library. The report of this consultant was received alongwith the conceptual plan of the National Science Centre including PASTIC building. The consultant will be visiting Pakistan again in July/August, 1977 to finalize the architectural details in collaboration with the local consultants likely to be engaged for the project design and engineering supervision.

Item II : RESEARCH SUPPORT

Promotion of basic and fundamental research in Universities and other Institutions on Scientific problems relevant to the socio-economic development of the country:

The Foundation carried out its statutory responsibility for the support of research through a number of programmes which, inter-alia include: (a) research grants for projects submitted by individuals or groups of scientists in the universities and other research institutions; (b) institutional support to build institutional capability for conducting research; provision of equipment, literature, staff training facilities, etc., (c) organization of integrated research programmes; (d) support for participation in regional and international research programmes.

A) Grant of research projects submitted by individual research workers or group of scientific workers:

Research support is the Foundation's principal programme for the promotion of basic and fundamental research in the universities and other research establishments.

Thirty five proposals costing Rs.72,00,000/- were received by the Foundation during the report period whereas sixty eight proposals were carried over from the previous year. In all 103 proposals remained under process out of which 41 were sanctioned by the Foundation during 1976-77 costing approximately Rs.54,21,227/-. Discipline-wise distribution of research grants is given in table I.

The criteria for research grants are : (a) competence of the principal investigator to accomplish the proposed plan of work in an efficient manner, (b) availability of requisite facilities at the institution sponsoring the research proposal, (c) the number of persons likely to benefit from it, (d) possibility of wide-scale application of the results of the proposed research, (e) likelihood of the completion of the project within the stipulated time.

RESEARCH PROJECTS:\*

Summaries of the research projects, sanctioned during the year 1976-77, are given below :-

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\* For names of the Principal Investigators and sponsoring institutions, refer Annexure-II.

**SCIENTIFIC RESEARCH PROJECTS SANCTIONED, DISCIPLINE-WISE  
DURING JULY, 1973 TO JUNE, 1977**

DISCIPLINE	1973-74		1974-75		1975-76		1976-77	
	Number of scheme	Amount sanctioned (Rs.)	Number of scheme	Amount sanctioned (Rs.)	Number of scheme	Amount sanctioned (Rs)	Number of scheme	Amount sanctioned (Rs.)
Agricultural Sciences	1	3,61,551	6	16,36,346	8	11,63,966	3	4,29,566
Biological Sciences	9	14,70,069	13	21,62,504	2	74,373	9	9,99,842
Chemical Sciences	7	14,09,038	9	12,62,804	8	10,36,757	11	13,18,656
Earth Sciences	1	3,00,000	3	3,91,628	3	78,845	3	3,39,118
Engineering Sciences	1	57,520	1	35,000	1	30,000	1	2,67,325
Environmental Sciences	-	-	-	-	3	3,79,206	6	6,86,236
Mathematics	1	69,395	1	1,00,000	1	44,835	-	-
Medical Sciences	1	14,000	7	1,86,071	2	2,70,968	5	4,46,504
Oceanography	1	1,46,237	-	-	1	53,940	-	-
Physical Sciences	4	4,41,174	1	5,14,855	-	-	3	9,33,980
<b>Total :</b>	<b>26</b>	<b>42,68,984</b>	<b>41</b>	<b>62,89,208</b>	<b>29</b>	<b>31,32,890</b>	<b>41</b>	<b>54,21,227</b>

1. AGRICULTURAL SCIENCES:

S-CS/AGR(19)

Title : Major crop weeds and their control:

Weeds are one of the most serious threats to our Agricultural production. They cause losses as serious and drastic as are caused by pathogens and insects.

With the introduction of dwarf high yielding and fertilizer responsive varieties of wheat, rice and some other crops the weed problem has become more serious as dwarf varieties are not good competitors of weeds whereby their growth and final yields are greatly reduced.

The project envisages (i) a survey of annual by-annual and perennial weed occurrence in major crops of Sind (ii) estimation of losses due to weeds (iii) development of control methods and (iv) determination of suitable weedicides.

F-PU/AGR(35)

Title : Effect of NPK on the yield and chemical composition of Australian hybrid variety of grain sorghum (Pacific 007).

The Pakistan Science Foundation has recently introduced an Australian hybrid variety of grain sorghum (Pacific 007) in Sind and Punjab which gives four times more yield than the local varieties. This new variety has lesser maturing period and can very well fit in the cropping pattern of our country. It is felt that this new variety of sorghum can give even greater yield and be more economical under optimum fertilizer application. This project, therefore, attempts to :-

- i) determine the optimum amount of Nitrogen, Phosphorous and Potassium (NPK) for increased production.
- ii) determine the crude protein, carbohydrates, crude fibre calcium, magnesium, potassium and phosphorous content as affected by various combinations of NPK in order to assess the feed values of grain and stem.
- iii) demonstrate the cultivation of sorghum in the trial areas, in order to identify the role of fertilizers for maximum yield at four different locations of N.W.F.P.

C-IU/AGR(40)(1)

Title : Preliminary studies on the Breeding Biology of Teddy Goats:

The importance of goats in the agricultural economy of Pakistan is widely recognised. It is, therefore, necessary

to carry out research in order to explore the possibilities of increasing and improving goat production. During the recent years a smaller breed of goat usually called "Teddy Bakri" has been introduced in certain parts of Pakistan, especially the northern areas of Punjab including Rawalpindi District. This breed is said to be more prolific and easily manageable as compared to the more common larger breeds in this area. Little authentic information however, is available on the breeding biology of this goat. This project envisages a preliminary study on (i) the breeding habits, (ii) fertility and (iii) reproductive physiology of this animal. An attempt will also be made to induce ovulation experimentally and synchronization of the heat period of individuals in a herd.

## 2. BIOLOGICAL SCIENCES:

PU-BIO(50-1)

Title : The control of the silkworm disease in Punjab, N.W.F.P. and Azad Kashmir.

A survey of diseases of silkworm in N.W.F.P., Azad Kashmir and Punjab was conducted under a PSF Grant during the years 1975-77. The survey has revealed the presence of several pathogens such as Nosema bombycis, Nuclear polyhedrosis virus, Bacillus thurengiensis, staphylococci, proteus vulgaris, E. Coli etc., in the Larvae, Pupae, moths and eggs of silkworm. These pathogens were isolated, techniques for their quick identification were developed and the modes of the transmission of some of the pathogens were established.

This project which is the extension of the above work, aims at investigating suitable control measures for the silkworm diseases in order to reduce the losses and to improve the quality of silk.

P-PU/BIO(9)

Title : Investigation into the occurrence, biology and histochemistry of larval trematodes in Pakistan

Trematodes are very important as parasites in man, fishes, domestic and wild animals. This is specially true of the digenetic trematodes, adults of which are found as endoparasites in various internal organs of representatives of all classes of vertebrates.

The project aims at studying the occurrence, taxonomy and histochemistry of larval trematodes. The effect of various

chemicals and environmental factors on trematodes will also be studied with a view to evolving methods of controlling them.

The results of the study are expected to give a better understanding of the functional significance of the larval glands in the biology of larval trematodes and the chemistry of the mode of penetration of larvae into the tissue of the host.

S-KU/BIO(14)

Title : Investigation on wood anatomy of coniferous trees of Pakistan.

The importance of forests in general and coniferous trees in particular is well understood throughout the world. Their direct as well as indirect uses (paper industry, resins, paints, gums etc.) have developed to such an extent, that the economies of some countries depend on their forest wealth alone. The importance of this wealth is no less in Pakistan. The proper studies on the anatomy, microscopic examination of their walls, as well as their polysaccharide contents are however lacking.

The project aims at studying the chemistry of the cell wall of coniferous trees with particular reference to the polysaccharide content.

The results of this study would be of great value in identifying improved marketable varieties as well as in making improvements in the afforestation plans by selecting more useful species.

S-KU/BIO(54)

Title : A survey of phytoplanktons of Sind area and their utilization as food for animal/men:

Protein is the most important constituent of food which can also be obtained in a sufficient quantity from microscopic green and blue algae, i.e. phytoplanktons. In the aquatic ecosystem, these phytoplanktons form an important link of the food chains as the zooplanktons depend on phytoplanktons for their food requirements which in turn are consumed by fish, birds and other animals. Phytoplanktons are also consumed directly by herbivorous fishes. Hence fish production can be increased if species of phytoplanktons preferred by fishes are known. The phytoplanktons have also been fed directly to cattle which is chief source of animal protein.

The project aims at: (i) isolating and preparing mass culture of suitable strains of phytoplanktons, (ii) chemical analysis of pure culture for their food value and (iii) feeding experiments on fishes, birds and domestic animals.

F-PU/BIO(72)

Title: Germination promotion of *Pinus halpensis*; *P. roxburghii* and *P. wallichana* seeds by stratification and chemical treatment:

The seeds of most species exhibit delayed germination. During this period a number of morphological and chemical changes take place. The following changes have been postulated during this period (a) ripening of the immature embryo (b) initiation and activation of certain enzymes responsible for germination (c) conversion of non-digestible food material to an easily digestible one and (d) regulation of hormonal inhibitor/promotor level.

The project aims at finding methods for reducing the germination period of local pine seeds. The result would help reclaiming pine forests at a rapid speed.

P-PU/BIO(75)

Title: Hetrotopic transplantation of entire Muscles in Mammals

Muscles that have been pre-denervated for 2-3 weeks have been freely autografted in rats, cats and humans with some success. In contrast, normal muscles that have not been pre-denervated do not survive free grafting and are replaced by bands of dense connective tissue. Despite the fact that muscle are already being transplanted in humans, very little is known about the mechanisms accounting for the success of the technique.

The project aims at determining (i) reaction of pre-denervation treatment to the muscle (ii) histological, histochemical and biochemical events during successful muscle transplantation, and (iii) new methods for more successful muscle transplantations in man. The result will help identifying the adaptive mechanisms which enable a mammalian muscle, pretreated by denervation or Marcaine, to withstand the early avascular period following free grafting and to become reintegrated both structurally and functionally with the body of the host.

P-PU/BIO(79)

Title: Studies on wood preferences of termites:

Termites are a serious pest of cellulose containing materials. They cause considerable damage to Agricultural crops, forest trees and wood work in buildings. Termite fauna of Pakistan is now fairly well known. An important aspect of the biology of termites of Pakistan; viz. feeding habits and food preferences, which is of considerable importance is not under investigation anywhere in the country.

The project aims at determining food habits of two species of termites namely *Odonotermes obesus*, *Coptotermes heimi*, by giving forced and choiced feeding at different temperatures and humidity conditions. Subsequently factors determining resistance

and susceptibility of various timber species to termite attack will be determined.

C-OU/BIO(83)

Title : Studies on the Physiological Role and Regulation of Pancreatic Hormones:

The physiological role of the Amphibian pancreas is not completely understood. The blood sugar level in frog (Rana tigrina) is generally very low and is completely absent in some individuals. The low level of blood sugar in amphibians has been attributed to the abundance of beta cells and absence of alpha cells.

The project envisages a study of amphibian pancreas with special reference to their biology, feeding habits and starvation to ascertain the variations in insulin secretion due either to the said conditions or to seasonal changes.

The results of this study will help elucidating the pathogenesis of diabetes mellites.

3. CHEMICAL SCIENCES:

C-SU/CHEM(56)

Title : Chemical investigation of the plants known to have significant pharmacological activities :

At present medicines based on foreign imported ingredients costing large amounts in foreign exchange are being utilized as curative agents. An effort is therefore needed to explore indigenous medicinal plants known to have therapeutic constituents effective in preventing or curing certain diseases.

The project aims at studying the chemistry of Provsikia abrotanoids which is used by locals for reducing fever. Significant medicinal properties will be studied using chemical and physical methods of analysis and testing the isolated compounds for their pharmacological activities.

P-CSIR/CHEM(66)

Title : Development of steroid chemistry because of its pharmaceutical as well as socio-economic impact

Steroids are well-known compounds for minimising, alluviating and curing several painful and distressing ailments. For example, Corticosteroids find much use in rheumatic arthritis, asthma, colitis, ophthalmology, dermatology etc. Apart from their value as drugs, the contraceptive steroids play an important role in population planning.

All these biologically active steroids viz. adrenocortical steroids, anabolic steroids, sex hormones and contraceptive steroids are being derived from naturally occurring steroidal saponins or other similar steroidal sources of vegetable and animal origin by a sequence of chemical and biochemical reactions.

There is tremendous research activity in various institutions and laboratories of the world to find new sources of steroids to meet their increasing demands and the improvement of existing methods of synthesis for the production of biologically active steroids.

The project aims at undertaking the :-

- i) Chemical transformation and synthesis of important steroid intermediates from readily available steroid precursors in Pakistan e.g. Diosgenin, bile acids, etc.
- ii) Chemical transformation and synthesis of contraceptive steroids, currently used in controlling fertility, from important key steroid intermediates.
- iii) Synthesis of adrenocortical and anabolic steroids and sex hormones from the key steroid intermediates.

C-OAU/CHEM (73)

Title : Kinetec, electrochemical and optical investigation of the herbicide: Methul violegen ( PARAQUAT ):1,1'-dimethyl, 4-4' - bipyridium and related compound :

Methyle violegen (Paraquat) as herbicide was an important discovery for the agriculturists, biochemists and chemists. The compound however has been reported to be toxic to the animals. The degree of damage in various system varies with the intake quantity of paraquat.

The project aims at investigating the toxicity of related compound and substituted paraquat by (i) synthesising the compounds, (ii) studying their kinetics, electrochemistry and optical properties for predicting their actions and (iii) comparing these actions with experimental results. The result of this study would help establishing an effective quantity of herbicide to be used per acre without being toxic to the animals.

S-SU/CHEM(74)

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

The evergrowing need and demand for insecticides in our country presents vast opportunities for research in this field. The commercially available insecticides and pesticides which are generally chlorinated derivatives of benzene and its products are imported in order to meet the requirements of our country.

The project aims at preparing insecticides and pesticides from the indigenous raw materials by chlorinating hydrocarbons under different sets of experimental conditions namely, temperature, concentration of reactants, presence and absence of hydrochloric acid and testing the products for their effectiveness as insecticides or pesticides.

P-CSIR/CHEM(76)

Title : Fortification of human diet with leaf protein concentrates:

World food production is not keeping pace with the population growth. Despite mobilisation of resources, gap between production and consumption of protein-rich food is widening. An all-out attempt is needed to bridge this ever widening gap.

Grass is the largest single crop in the world. Large scale production of leaf protein concentrate (LPC) was accomplished by Morrison and Pirie. Feeding trials with LPC on human beings carried out in various countries of the world, have shown promising results. Some work on the extraction and evaluation of LPC has already been carried out in Pakistan.

This project envisages :-

- i) Preparation, evaluation and standardisation of LPC-fortified dishes.
- ii) Clinical tests and medical examination of children before feeding experiments.
- iii) Trial tests with 100 children (a) receiving regular diet (b) additional 200 g of milk (c) receiving LPC and periodic medical check-ups.
- iv) Clinical and medical tests at the completion of trials.

The findings would help commercialization of LPC for human consumption.

P-CSIR/CHEM(76)

Title : Enzymes hydrolysis of raffinose for the improvement of sugar recovery in beet processing :

Raffinose, a trisaccharide, is widely distributed in the plant kingdom and is also found in sugar beet. The amount of raffinose in sugar beet gradually increases during storage and usually comes to about 0.15%. In the beet sugar

industry raffinose affects the normal crystallization of sugar. Particularly during the later half of the harvesting season when the concentration of raffinose in beet molasses is 6-10 per cent, the crystallization of sugar is abandoned and the molasses is discarded because of the preventive action of raffinose. However, if raffinose in the beet juice or beet molasses is removed or hydrolysed, the crystallization of beet sugar from molasses is improved and consequently the yield of the sugar is increased.

The project envisages isolation of mould cultures from the soil capable of producing enzyme alpha-galactosidase, which will be utilized in the sugar beet molasses for raffinose hydrolysis. The hydrolysis of raffinose would result in the improvement of sugar from beet molasses and formation of large crystal of sucrose from un-hydrolyzed beet molasses.

F-PU/CHEM(77)

Title : Analytical uses of chelating agents

Metal chelation is involved in many important chemical and biochemical processes. A great deal of data concerning metal complexes of relatively simple amines has been accumulated and assessed, but complexes of multi-dentate cyclic diamines have received relatively less attention.

The aim of this research proposal is to synthesize some new chelating agents and their complexes and to study their analytical uses.

These investigations would supplement research efforts under another project on Geochemistry of Ores and Minerals of NWFP. The extraction of trace amounts of noble metals from the ore would be of considerable socio-economic significance for the country as these procedures may ultimately lead to the large scale recovery of noble metals from their raw materials.

C-QAU/CHEM(78)

Title : Terpenes from Cedrus deodara

Chemical investigations on Pinus deodara species reveal the presence of a number of terpenes some of which have been characterised but others are still unknown. Terpenes are basic building blocks in the biosynthesis of steroids which include many active hormones and carotenoids (such as vitamin A and carotene). The medicinal value of some terpenes like santonin, camphor, scoparone etc. is substantial and efforts are being made all over the world to find out the most economic industrial methods for synthesizing these terpenes.

The project aims at studying some of the unknown terpenes of Pinus deodora their isolation, characterizations and synthesis by cheaper methods.

F-GU/CHEM(79)

Title : Tumor inhibitor diterpenoids

Plants of the family Euphorbiaceae have been used to treat cancers, tumors and warts from the time of Hippocrates and references to their use have appeared in the literature of many countries. Several reports indicate the use of Euphorbia species as remedy for various diseases. The project envisages to study in detail the diterpenoid constituents of Euphorbia caducifolia, Euphorbia walichii and Euphorbia royleana for possible tumor inhibitor activity.

C-QU/CHEM(81)

Title : Removal of olefines naphthenes and aromatics from various fractions of petroleum:

Crude petroleum consists essentially of a mixture of paraffines, naphthenes and aromatic hydrocarbons. In addition to these hydrocarbons, some amounts of bitumens (asphalts) sulphur, nitrogen and oxygen compounds are also present. The fractional distillation of crude petroleum gives liquid fractions over a wide range of temperature and consists of no single compound.

Pakistan has to spend a large amount of money on the import of petrochemicals for use in industry and other purposes.

The major objective of this research project is to separate various olefines, naphthenes and aromatic components from petroleum by using adsorption techniques, for the manufacture of petrochemicals as raw materials for ordnance factories, polyester fibre industries, detergent industry and also for use in the production of other chemicals, which are needed in scientific research.

C-QU/CHEM(82)

Title : Studies of catalytic activity of Nickel in the production of Vegetable Ghee:

The edible fat industry in Pakistan largely depends upon the hydrogenation process to convert liquid oil into solid ghee. Several thousands of pounds of nickel catalyst are used each year in Pakistan for production of Vegetable Ghee. The nickel, however, becomes inactive after it is repeatedly used

three to four times or more. This inactive nickel is heavily contaminated with impurities, much of which is discarded without reclamation. Some work has been done on the reactivation of the inactive nickel on laboratory scale.

The present project proposal aims at the production and testing of the catalyst at the industrial operation level. Tests on the physiological studies of nickel intake on rats and rabbits are also proposed to be performed in collaboration with the Biology department of Quaid-e-Azam University in order to find out the effects of nickel content in Vegetable Ghee on human beings.

On the successful completion of the project it is hoped that thousands of pounds of inactive poisoned nickel catalyst will be reused saving a large amount of foreign exchange.

#### 4. EARTH SCIENCES

S-KU/EARTH(7)

Title : Economic evaluation of clay and mineral deposits of Sind.

The use of clays and clay minerals is indispensable in refractories and modern industry concerned with the manufacture of earthen ware, procelains of all kinds such as china ware, glazed and enamel bricks, fire bricks and glass pots. The utilization of clays is also involved in the manufacture of paints and pigments, paper, abrasive wheels, plastics; cement, tiles, drilling muds, kiln material, bonding agents; foundry sands, for stopping leakages in dams and tunnels and in absorbing colouring material from oils and fats.

The project envisages a detailed geological study of clays and clay minerals found in the province of Sind regarding their quality and quantity and their classification for industrial, agricultural, chemical and constructional uses from economic points of view. Geological survey will be carried out to delineate the deposits quantitatively. Mineralogical and total elemental analysis by DTA, optical, chemical and X-ray diffraction techniques will be carried out to determine the composition and grades of the clays and clay minerals deposits.

Because of the multifarious uses of clays and clay minerals, economic evaluation of their deposits will contribute to self-sufficiency in the raw materials, bulk of which is presently being imported at a tremendous cost in foreign exchange.

Title : Changing pattern of resource use in Punjab

The pattern of land use in an area is a product of continued spatial interaction between three environmental factors i.e. rural, urban and natural. The rural and urban factors are man-created and are derivatives of the natural environment. The variations in land use patterns, however, are based on socio-economic needs and environmental perception of the people inhabiting an area at any given time. It would seem necessary to first appraise the pattern of urban and rural land use in a given area with a view to understanding the factors and processes which shape this pattern. The genesis of the pattern and its analysis will give an understanding of the land use structure and provide planning framework within which steps could be taken to increase efficiency of land use and productivity.

The project envisages to evaluate and examine the existing patterns of rural-urban land use in the Potwar region of the Punjab i.e. the districts of Jhelum, Rawalpindi and Campbellpur to understand the factors and processes which shaped this pattern.

The pattern analysis would help providing the framework for further planning and development of land use and productivity in these areas.

Title : Problems of resource utilization in human settlement of Murree Kahuta region:

Murree Kahuta region is a very important part of the country on account of its scenic beauty that attracts thousands of tourists every year. It also serves as a tributary for the supply of manpower, vegetables and fruit to Islamabad - the capital of Pakistan. Moreover, it is the main source of wood supply to the country. Unfortunately, this part of the country is yet undeveloped and its resources are not being utilized properly.

The project aims at surveying the Murree and Kahuta Tehsils which include 68 Potwar circles and 385 villages and represent a sizeable cross-section of the whole tract. The survey will provide useful data on resources of the area which would be of immense value in planning and development of the region under a total approach. The existing records on resources of the following departments would be checked up for extracting meaningful data which in turn would be supplemented by the actual ground surveys :-

- i) Village Revenue Offices
- ii) Departments of Geological Survey of Pakistan
- iii) Soil Survey Department
- iv) WAPDA
- v) Forest Department
- vi) Mineral Development Corporation
- vii) Unpublished records/report of other relevant department.

5. ENGINEERING SCIENCES:

P-CTT/ENG(14)

Title : Dyeing problems in blended fabrics ; study on Pakistan textile industry :

Pakistan has made phenomenal progress in cotton textile industry and has come to occupy a position of eminence in the export of some of textile products. Nevertheless, development and improvement of the technology relating to processing of cotton man-made fibre blends is extremely important for diversification of the quality textile products in Pakistan. Cotton man-made fibre blends are already being processed on a small scale and there is a concentration of such plants around Lyallpur where more or less 30 factories are now working. Their products, however, are lacking in homogeneity of dyeing, uniformity of finish and standardization of export specifications. The methods employed are wasteful and inefficient and require adaption to the new processing techniques.

The proposed investigation aims at studying the processing techniques of cotton man-made fibre blends in the spinning of yarn, preparation of loom state cloth, dyeing and finishing behaviour of grey cloth and packaged dyed yarn with a view to determining and standardizing optimum conditions of processing at each stage. An interdisciplinary approach is considered necessary which will include a survey of the existing raw materials, grey yarn, grey cloth and finished cloth. This will be followed by pilot scale preparation of products under controlled conditions in order to establish sound and economical methods. Guidance and advice shall also be provided to the industry on specific problems relevant to the adaptation of new techniques and improvement of existing equipment for processing cotton man-made fibre blends.

6. ENVIRONMENTAL SCIENCES:

F-PU/ENVR(2)

Title : Testing for mitotic gene conversion in yeast by food colours and other chemicals

In recent years there has been an increasing concern about the genetic hazard of a wide variety of chemical. A large number of these chemicals are administered to human body in form of food or other food additives. Some of these food colours and additives are reported having slight mutagenic effect. It has, therefore, been felt that compounds with wide-spread use and little mutagenic effect may be of more concern than the strong mutagenic compounds with limited use.

The project aims at investigating the genetic activity of the food colour and other additives. The results of this study would help developing food safety standards in our country.

C-IU/ENVR(3)

Title : Ecological studies on fresh water Hypomycetes

The increasing concern for quality and availability of fresh water as a human resource, and the possible relevance of fungal activity as a biological indicator of self cleansing processes, emphasizes the importance of mycological studies of water habitat. There is a wide spread use of fertilizers and pesticides by farmers these days which are washed down into the streams from the fields and may disturb the fresh water flora otherwise of immense value as water cleansers.

The project aims at studying the effects of hydrocarbons and other pollutants on the growth and sporulation of freshwater Hypomycetes.

The result would help establishing a correlation between the fungi and the degree of pollution caused by various pollutants.

F-PU/ENVR(9)

Title : Atmospheric and water pollution studies of the urban and industrial areas of Peshawar & Nowshera

The rivers serve as a source of water for many cities and act as receptacles of their sewage and industrial wastes. Hence, if the purification of the river water is not done or sufficient time is not allowed to nature to do the job, the rivers become progressively more polluted and dangerous to human health.

This research project envisages the study of the extent of water pollution in the urban and industrial areas of Peshawar and Nowshera to provide scientific and technical data to the various industries about their waste effluents which are continuously discharged into the waters of the Kabul river and to suggest control measures for the effluent before releasing them into the river.

P-GCR/ENVR(15)

Title : Study of pollution and aquatic organisms of Leh stream, Rawalpindi.

There is an acute shortage of drinking water in many parts of Pakistan. So it is necessary to take all possible steps to conserve water and to purify the polluted water by cheaper methods such as biological progresses. Even in places where there is no shortage of water, pollution endangers human and animal health.

The project aims at (i) studying the different kinds and degrees of pollution in Leh stream which passes through Rawalpindi and receives industrial and sewage wastes etc. (ii) identifying the biological organisms which are pollution indicators and (iii) controlling water pollution by biological means. The findings will help public health Engineering Department in adopting measures for the treatment of polluted water at the point where Leh stream falls in Soan river.

C-IU/ENVR(16)

Title : Behavioural and ecological studies of rhesus monkey with special reference to their communication:

The project envisages behavioural studies on Rhesus Monkey (Macaca mulata) in its natural environment with special reference to mother-infant relationship, group integration aggressiveness, communication etc.

The result of these studies would not only further man's knowledge of bio-medics and bio-psychiatrics problems but would also help in better management and preservation of rhesus monkeys, which are decreasing in number due to deforestation and rapid rural/urban development.

C-IU/ENVR(11)

Title : Limnological survey of the Rawal Lake of Islamabad

For the development of fisheries, the water must have some productive potential. This wholly depends on the

physical, chemical and biological factors operation therein. Since different species of fishes are specific in their tolerance of these factors, no fish-culturing programme could be launched without a prior knowledge of these parameters.

The project aims at studying the limnology (physical biological and geographical characteristic) of the Rawal Lake at Islamabad.

The results of the proposed study would enable us to have an understanding of the ecology of this biotope and its correlation with local fish fauna and would help introducing exotic and economically important fishes of similar habitats from foreign countries.

#### 7. MEDICAL SCIENCES:

S-AEMC/MED(6)

Title : Determination of human placental lactogen level as guide to foetal well-being during pregnancy:

Most laboratory tests of foetal well-being and placental functions depend on the measurement in the maternal circulation or urine, of substances produced by the foeto-placental unit. These substances include steroid hormones (oestrogen and progesterone), peptide hormones (human chorionic gonadotrophin) and enzymes (oxytocinase). The production of these substances during pregnancy depends on both the placenta and the foetus, thus their values do not truly represent the function of the placenta alone, abnormalities of which constitute threats to foetal well-being.

The synthesis and release of HPL (human placental lactogen) by the placenta appears to be autonomous, hence, circulating level of HPL should reflect, primarily, the functional mass of placenta, which is known to be altered in various complications of pregnancy.

The project aims at investigating placental function by serial estimation of HPL in late state of pregnancy and threatened-abortions and co-relating these with the results of pregnancy e.g. normal delivery, still birth, foetal distress, intra-uterine exphyxia, foetal size, etc., in order to reduce foetal morbidity and mortality which is very high in our country.

S-JPMC/MED(28)

Title : Ultrastructural study of the human liver disease

Liver disease in Pakistan has some peculiar features which differ from the general pattern of liver

diseases in the advanced countries where research on liver disease is mostly being carried out. A thorough research locally on liver disease is, therefore, needed.

The project envisages to (i) correlate change in the ultrastructure of liver with the clinical and biochemical findings (ii) define ultrastructural criteria for the detection of liver disease at the early stages of its incidence, minimal abnormal changes in the liver which are not detectable with the light microscope or by clinical and biochemical tests and (iii) train personnel in electron-microscope techniques as a by-product of this project.

C-NHL/MED(35)

Title : Study of enteroviruses in drinking water of Islamabad

Enteroviruses cause a large variety of illnesses in animal as well as in human. The degree of severity varies from mild upper respiratory maladies to more fatal paralytic diseases. These viruses usually spread through the agency of water and cause wastage of thousands of working hours in all parts of world. Little attention, however, has been paid to the viral investigation in this country although strikingly high isolation of viruses has been reported by some earlier workers.

The project aims at culturing various enteroviruses isolated from the drinking water supplies of Islamabad and Rawalpindi. The results would help in developing virological standards of drinking water.

C-PC/MED(36)

Title : Frequency and Natural History of rheumatic fever in Islamabad and identification of diagnostic criteria for acute rheumatic fever.

Cardiovascular diseases are responsible for high incidence of mortality and morbidity. The etiology of Ischaemic heart disease is a very complex subject. However, it is partly due to the aging process and as such little can be done to prevent this type of heart disease. On the other hand rheumatic fever and the subsequent rheumatic heart disease which forms 30-40% of the total cardiovascular diseases can be prevented as it is an established fact that it is caused by the streptococcal group A infection. If infection with streptococcal group A is prevented, the rheumatic fever and its complications could be warded off.

The project aims at studying the frequency and the natural history of rheumatic fever in Islamabad and to develop simple diagnostic criteria for undertaking preventive measures.

S-JPMC/MED(38)

Title : Bio-chemical studies on the cataractous human lenses:

The most commonly occurring cataracts are senile type. Previous work done shows that hyperglycemia has a potentiating effect. In diabetic cataracts, sorbitol accumulation has been considered as the cause of the lens opacification but in senile cataracts no definite factor has yet been ascertained. Available data however, indicates that the enzymes impeding carbohydrate metabolism affect the transparency of the lens.

The project aims at studying the effects of enzymes such as aldose, reductase, sorbitol dehydrogenase, hexokinase, glucose-6-phosphates, phosphofructokinase, 6-phosphogluconate-dehydrogenase and fructokinase on human lenses.

8. PHYSICAL SCIENCES

S-KU/PHY(13)

Title : i) Isotope fractionation studies of stable isotopes and  
ii) Diffusion of gases in solids

Isotope fractionation studies of stable isotopes find their application in studying terrestrial variation, determining the evolutionary sequence of the continental crust in Petroleum Industry and in many other physical, chemical and biological phenomenon.

The present scheme aims at determining the isotopic abundance variations of stable isotopes of Sulphure, Oxygen, Carbon, Telluriun and Plumbium. A number of biological isotope fractionation studies will also be conducted.

Isotope fractionation studies of sulphur in petroleum and association sulphates and sulphides in the reservoir rock will be helpful in determining the source of petroleum sulphur and the fractions of the same in the formation and maturation of petroleum.

Studies on diffusion of gases in solids will be aimed at the determination of the factors affecting Ar<sup>40</sup> diffusion in K-bearing minerals.

S-SU/PHY(15)

Title : Parametric and self-parametric effects in complex non-linear electronic system:

Nonlinear electronic systems with either inherent non-linear characteristics or non-linearities deliberately

introduced into the system to improve their dynamic characteristics, have found wide application in diverse fields of engineering. The modulation of active or reactive parameters of different types of the self oscillatory systems may give rise to parametric or self parametric effects.

The aim of the present project is to obtain a comprehensive picture quantitatively, if possible, but at least qualitative of what happens in the system if the variables are allowed or forced to move far away from the operating points.

P-PU/PHY(19)

Title : Impact of ions on Solids:

In recent years attention has been focussed the world over, on developing efficient ion sources and on the study of the interaction of ions on solids, including metals, semi-conductors and insulators as well as on biological specimens. Some of the very important applications of ion beams which have led to the development of modern technologies are :-

- i) IBSCA Technology (ion Beam Spectroscopy for Chemical Analysis)
- ii) Ion Beam Etching - A promising Technology
- iii) Ion Implantation, and
- iv) Sputtering.

The main objective of the research project is primarily to promote advanced experimental scientific research in the field of physics relating to ion matter collision.

The results obtained will prove extremely valuable for the study of surface physical and chemical phenomena and are likely to prove very valuable to our metallurgical industries, particularly those of steel and ship building.

B) Institutional Support:

Details of the grants sanctioned during 1976-77 to build up the institutional research capabilities of various academic institutions are as follows :-

- i) A grant of Rs.4,00,000/- in foreign exchange was sanctioned to the recently established Mehran University of Engineering and Technology, Nawabshah for the purchase of research equipment.
- ii) An amount of Rs.20,000/- was provided to the Sind Agriculture University, Tandojam for undertaking a comprehensive survey of the Agricultural Universities/Institutes in the country with a view to identifying priority areas for scientific R&D work and requirement of physical facilities, literature, staff, etc.
- iii) A grant of Rs.4.00 lac was sanctioned to the Centre of Excellence (Solid State Physics) at the Punjab University, Lahore, for the purchase of Monochromater, which is a very sophisticated equipment used in solid state physics and is not yet available with any institution in the country.

Item III : UTILIZATION OF RESEARCH RESULTS:

The utilization of 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:

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The projects sanctioned during 1976-77 by the Foundation under this head are as follows :-

F-PU/UTZ(16)

Title : Design and construction of solar grain dryer:

Crop and grain drying is one of the oldest and largest uses of direct solar energy application wherein no capital outlay for equipment is involved but considerable labour is required. Today, however, the labour costs have tremendously increased. Moreover, a high quality product is not often obtained because of over-drying, contamination by dirt and insects, damage by granivorous birds and degradation due to long periods of exposure, rainfall, hailstorms, etc.

The main object of this study is to devise an economical and scientifically feasible method to utilize solar heat by designing and constructing a drying unit for rapid grain drying to avoid losses. The apparatus is expected to be greatly helpful to the peasants in the country.

F-CSIR/UTZ(28)

Title : Utilization of pine needles for textile and paper manufacture:

Accumulation of the pine needles in the forest presents a big problem for the Forest Department as it hinders the growth of grass and prevents the germination of seeds. Moreover, this material can easily catch fire. The Forest Department has to spend considerable amount to destroy these needles annually. The very removal of these needles will be a great service to the Forest Department.

In order to utilize the pine needles, sufficient work on the extraction of fibre from pine needles of Pinus longifolia has been carried out. The fibre extracted is brown in colour and the length of the fibre depends upon the length of the needles. In the case of Pinus longifolia the length is 6 inches and the yield of fibre extracted is about 80%. The fibre can be bleached and dyed. Chemical analysis has shown that the pine needles contain about 60% of cellulose.

Preliminary studies indicate that the fibre is stiff and as such it cannot be used as a textile fibre. For any textile fibre it is essential that the fibres should have certain extensibility and elasticity so that in the course of processing it does not break. An extensive work on the softening of pine fibre has to be undertaken to enable pine fibre to be used as a substitute for jute. Another important field for which the pine needles may be used is the paper industry.

The results of this research would help in an economic utilization of this raw material, being wastefully destroyed at present, for the development of textile and paper industry based on pine needles.

C-ATDO/UTZ(32)

Title : Under Soil Irrigation:

"Under soil irrigation" consists of delivering water at the roots under the soil, instead of on the surface of the plant by following means :-

- a) In case of trees, baked earthen pichers, which are widely available and very cheap in developing countries, with minute holes drilled at the sides, are buried to the necks in the soil and filled with clean water. Irrigation water is poured in these once a day as a result of which enough water soaks through the porous picher into the root zone to maintain plant growth.
- b) In case of crops, a network of PVC pipe (perforated with minute holes is laid under the ground. Water is delivered at one end, which gradually percolates through the soil providing all the advantages mentioned above.

This technology has the following advantages :-

- i) Almost every drop of water is utilized, instead of a large proportion being lost by evaporation. As such, a mere fraction of the quantity previously used can support a plant.
- ii. Greater extent of cultivation can be carried on with the same available water resources.
- iii. Due to reduced quantity required by each plant or tree, the water delivery system becomes profoundly easier and less expensive e.g., even a child can carry one gallon of water whereas if

40 gallons are to be transported, it is necessary to have animal or mechanical transport, or a pipe system which involves not only much expense but also a wasteful use of water.

- iv) The drip root system ensures that the soil around the roots remains moist thus resulting in optimum plant growth.
- v) As the surface of the soil remains dry, weed growth is minimised. Further caking and crackin. of the soil are eliminated.

By bringing, some area under cultivation, with the "Under-Soil" technique of irrigation, working data such as how much area can be cultivated with how much quantity of water and the rate of growth of plant with this sort of irrigation etc., would become available to determine the feasibility of adopting the technology on large scale.

P-AU/UTZ(34)

Title : Design and fabrication of self propelled universal type reaper:

Next to wheat threshing, harvesting of wheat has also become a problem in rural areas due to shortage of labour. The conventional methods not only result in delay in wheat harvesting but also increase harvest losses. At present an acre of wheat can be harvested by one man in four days which is really a long period taking into consideration 15 million acres of wheat which have to be harvested within 10 to 15 days throughout the country.

The project aims at designing and fabricating a cheap multipurpose self propelled harvester which may be used for harvesting of wheat, rice and forage crops. It will also be possible to plant cereals and spread fertilizer in the field by attaching some additional accessories to the machine.

S-EU/UTZ(35)

Title : Development of small Agricultural Implements:

Pakistan is predominantly an agricultural country with a very small industrial base. The agricultural farms of the country are mostly non-mechanized mainly due to the lack of agricultural equipment which has to be imported. This problem is acute especially in the rural areas, where the farmers are relatively poor and cannot afford the expensive agricultural equipment. Also, the availability of the mechanisation power such as electricity is scarce in the rural areas.

A need has, therefore, been felt for the following simpler agricultural implements, requiring very little or no mechanization power, which are relatively simple in design to be manufactured locally :-

- i) a manually operated diaphragm pump which can lift water a few feet.
- ii) an axial flow thresher.

Item 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) Natural History Museum:

As reported previously a nucleus of the National Natural History Museum was set up in a rented building at Islamabad pending approval of the main scheme by ECNEC. During the year under report, the vertebrate fossil collections were transferred from Geological Survey of Pakistan, to form the core of the vertebrate palaeontology section of the proposed museum.

In the meanwhile the Planning Division examined the scheme and made certain observations which inter-alia suggested that (i) a survey of the facilities already available in the country be carried out and (ii) an interministerial meeting of representatives of the Ministries of Education, Agriculture, Planning and Science and Technology be called by the S&T R Division to revise the programme envisaged in the PC-1 of the scheme. Accordingly, the survey was arranged by the PSF and the report submitted to the inter-ministerial committee. The committee decided that there was need to establish a National Natural History Museum as a separate entity and there was no duplication involved. However, the scheme needed revision to reduce the capital cost as desired by the Planning Division. The project was revised and re-submitted for consideration of the Planning Division. Advice of international experts on museums such as Dr. Bilbishop, Dr. Bonner and Dr. Pilbeam was also sought at the time of revising the project.

b) Establishment of National Science Centre:

The need to develop initially a Model Science Centre which would be functional and modest in cost was felt for which

purpose a Science Centre was established at Islamabad in rented premises with the following objectives :-

- i) To create public awareness among people of the role of science in national progress.
- ii) To popularise science in the people by taking the benefits accruing from scientific and technological research to their door steps.
- iii) To generate general interest and understanding among the farm and factory workers, intellectuals, industrialists, etc., of scientific and technological advances and their mass application to social needs in the country.

The science centre arranged, during 1976-77, a number of talks, seminars, symposia, exhibitions, films shows etc., at Islamabad and other places for achieving the above objectives. A special scientific committee in connection with Allama Iqbal's Centenary celebrations was also constituted which held several functions in this connection introducing to the public the place of science in Allama's philosophy and poetry.

Item 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.4,00,000/- were released this year to various non-governmental scientific societies and learned bodies for the achievement of their approved objectives (Annexure - III).

Special grants totalling Rs.2,39,000/- were sanctioned to various scientific societies/institutions for their publication programmes (Annexure - IV).

Item VI : SCIENCE CONFERENCES:

The organization of periodical science conferences, symposia, seminars etc.

During the year under report, grants totalling of Rs.38,000/- were given to various scientific organizations and institutions for holding seminars, symposia and conferences (Annexure-V). These included the Science Policy Workshop held at Peshawar, wherein proposals for the National Science and Technology policy were translated into an action plan to be reflected in the national socio-economic development plan. The workshop was attended by sixty eminent Pakistani scientists and eleven U.S. scientists representing a wide range of scientific and technological disciplines.

Item VII: EXCHANGE OF VISITS:

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

Travel grant totalling Rs.10,350/- was sanctioned to a scientist for his participation in the 17th International machine tool design and research conference held at the University of Birmingham, U.K.

At the nomination of the Secretary General, Dr. Z.A. Hashmi, was elected as a member of the United Nations advisory committee on the application of Science & Technology to development (UN-ACAST) for a period of three years. This membership to the said Committee was approved by the Government of Pakistan. UN-ACAST is the apex committee of scientists and experts with a formal consultative status with the United Nations and comprises men of international standing. Its main task is to advise on the application of Science and Technology for development of less developed countries.

Dr. Z.A. Hashmi, attended the 22nd session of the committee held at Geneva for two weeks from 22nd November, to 3rd December, 1976. In the 21st session of the advisory committee attended by Dr. Hashmi, various sub-Committees and working groups on energy, recycling and conservation of resources etc., were formed. The reports of these working groups were considered in the 22nd session culminating in the formulation of specific programmes of action in the stated areas.

Item VIII: AWARDS AND FELLOWSHIPS

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

The Pakistan Academy of Sciences has been requested to arrange for awards and fellowships out of the grant in aid given by the Pakistan Science Foundation to the Academy. The Academy has instituted the award of gold medals to be given to persons who have made outstanding contributions in the field of science. The first medal will be awarded in the ensuing year i.e. 1978.

Item IX: SURVEYS AND STATISTICS:

During the year, the major programme sanctioned by the PSF, falling in this category, is the review of research work done so far as well as of current research in major fields such as agriculture, medicine, irrigation, housing and works, industry. The review shall basically aim at measuring the national scientific and technological potential and would include survey of physical facilities of land, equipment, library holdings, buildings and scientific and technological manpower availability in various fields. The project will be taken up in phases so that meaningful review results become available in the shortest possible time to provide information basic to realistic planning and programming of scientific research, effective utilization of results of research and establishing links with production processes. The data expected to be yielded by the project would go a long way in removing serious shortcomings in the current state of science in the country such as lack of relevance of the scientific effort to national needs, unnecessary overlapping and wasteful duplication of R&D effort, lack of co-ordination and lack of optimum utilization of physical and manpower resources etc. The National Science Council, which is the most appropriate body for undertaking such tasks, has been sanctioned a grant of Rs.12 lacs by the PSF for undertaking the work on top-priority basis.

Item X : RESEARCH EVALUATION:

The proformae developed for initial review of project proposals and evaluation of research progress as reported in the annual report of 1975-76 were put into practice. The information which is now based on new formats is more comprehensive and better indicative of the actual situation of the research projects. In addition general evaluation with a view to monitoring cumulative progress on PSF supported programmes/schemes since their inception has also been undertaken by circulating a simple questionnaire to all the Principal Investigators. The reports are being received and analysed.

Item XI : PSF SCIENTISTS' POOL

The Scientists' Pool established in the Pakistan Science Foundation in 1973-74 was a step to utilize high level trained manpower. 35 persons with advanced training abroad and high qualifications were provided with a modest maintenance allowance until PSF could secure for them appropriate jobs and they were absorbed in the universities and research establishments of the country.

A Placement Office was established in the PSF to assist the Scientists and Technologists, specially those coming from abroad and find for them employment in the country suited to their talent.

In view of the fact that fewer and fewer highly trained men were returning to the country as well the fact that interest was shown by a few leading research and development institutions in country an initiative was taken by PSF to advertise our requirement in U.K/U.S.A. to attract Pakistani Scientists working abroad. As a result about 190 Pakistani Scientists/Technologists working or living abroad responded. Out of these 170 applications have so far been processed with appropriate agencies.

PSF Board of Governors in its meeting held in June, 1977 decided to seek cooperation of the University Grants Commission in inviting a few outstanding Scientists/Technologists of Pakistani origin who are working abroad and are willing to contribute to Pakistan's development as visiting Scientists/Professors for one or two years. This decision will be actively pursued during the next year.

Item XII: INTERNATIONAL LIAISON:

In order to establish active collaboration with international bodies, the PSF finalized a memorandum of understanding with the U.S. National Science Foundation of cooperation in the field of scientific research and education in Science and Technology, in the holdings of seminar, workshops, exchange of scientific information and data, international travel and participation in the international meetings, Government of Pakistan has approved the draft and has sent it to the U.S. National Science Foundation.

Under this memorandum of understanding the PSF will seek maximum possible assistance against detailed project costing approximately 210 million which have already been drawn on the basis of the recommendations of the joint Pak-American Science Review Team which visited Pakistan in May, 1974 and August, 1974 (as had already been reported in the previous reports).

After this memorandum comes into force, wide opportunities will be opened up for the Scientific Community in Pakistan to collaborate with their counterparts in U.S.A. and greatly benefit from the exchange of information on scientific matters.

CHAPTER - 2PROGRESS OF THE PSF SUPPORTED PROJECTS

In the fiscal year 1976-77, 108 PSF Supported Projects were in operation at various Universities and other Research Organizations of the country. Periodical reports thereon were regularly invited by the Foundation. The details of such progress reports as received during the report period are given below :-

a) Final Reports:

During the year under review, seven PSF supported projects were successfully completed and final reports thereon submitted to the Foundation. Particulars of the schemes and brief summaries of the achievements made in these projects are as under :-

<u>Project No.</u>	:	P-PU/BIO(50)
<u>Project Title</u>	:	A survey of the diseases of Silk worm ( <u>Bombyx mori</u> ) in Punjab, N.W.F.P., and Azad Kashmir.
<u>Project particulars</u>	:	
Date of commencement	:	Ist February, 1975
Duration of project	:	Two years
Date of completion	:	14th February, 1977
Total expenditure	:	Rs.1,37,160/-
Location of Scheme	:	Zoology Department, University of Punjab, Lahore
<u>Main Objectives</u>	:	To make a detailed survey of various Silk-work diseases, their seasonal incidence and the extent of damage caused in Silk-worm rearing areas Punjab and Azad Kashmir.

Summary of the work done:

Sericulture is a cottage industry in Pakistan and Azad Kashmir. During the past twenty years, however, this industry has suffered tremendous economic loss due the diseases of Silk-worm alone. Thus keeping in view the importance of Sericulture in the country a survey was got conducted for the purpose under the Pakistan Science Foundation research grant. The findings of this survey are as under :-

It was observed that in Punjab, diseases of silk-worm appear during the first week of March and continue to cause a high mortality of silk-worm larvae, upto month of May. In N.W.F.P. diseases appear in the last week of April and the out-break continues upto the middle of June. In Azad Kashmir, however, diseases appear in last week of April and the epedemic continues upto the middle of September. In three regions surveyed, the silk-worm diseases namely : Pebrine, Grasserie, acute Flacherie, Chronic Flacherie and Septicemia were responsible for the death of millions of larvae of the silk-worm. The causative agents of these diseases were identified as Nosema bombycis, Nuclear polyherosis virus, Bacillus thuringiensis, Porteus vulgaris, Entamoeba coli, Streptococci and Staphylococci aureus respectively.

The symptoms of the above mentioned diseases at various developmental stages of silk-worm were studied and techniques for their quick pathological analysis and histopathology were developed, primitive rearing conditions were found to be responsible for outbreak of diseases whereas the house-flies served as the transmittor of pathogens.

The susceptibility of various races of the Silk-worm (*Bombyx mori*) to various diseases was investigated and it was found that Chinese, Korean, Italian races and their hybrids had also become susceptible to diseases in due course of time.

The economic aspect of sericulture was worked out and it was observed that in 1975-76 alone, the total economic loss due to silk worm diseases ranged from 30 to 70% in Punjab, N.W.F.P., and Azad Kashmir.

From the above findings it was evident that there was an urgent need of controlling silk-worm diseases. The Foundation has, therefore, granted two years extension to investigate measures for the control of silk-worm diseases in order to save and further promote the sericulture industry in Pakistan.

Project No. : P-PU/BIO(56)  
Project Title : Annotated Bibliography of fresh water food and other fishes.

Project particulars

Date of commencement : 4th April, 1975

Duration of Project : One year

Date of completion : 3rd July, 1976

Total expenditure : Rs.23,802/-

Location of the Scheme : LAHORE

Main Objectives : To consult literature on all aspects of fresh water fishes and fisheries of the sub-continent and prepare an upto date annotated bibliography of food and other fishes of Pakistan to avoid duplication of research efforts and provide requisite background information for conducting research along more profitable lines.

Summary of work done

The fresh water fishes of Pakistan, having fairly wide distribution are reported from other Asian Countries. The results of scientific studies thereon are being published in a few local and large number of foreign journals on the subject. As the foreign journals are not easily available to the local scientific workers they are, therefore, greatly handicapped in preparing sound and meaningful research scheme in this field. An effort has been made by PSF to compile a bibliography of the food and other fresh water fishes which will provide necessary information for fisheries research to the local workers. In all 1125 references have been listed with a detailed abstract/annotation in author's own words.

In addition to the fish and fishery of Pakistan, the abstracts of papers on research problems of other countries have been included in the 'Bibliography' for the guidance of workers. Titles are listed in alphabetical order of authors' names and in chronological order under each author. Under the author's name, the title of the paper is given, followed by the name of the publication (in abbreviated form), the volume, part number in parenthesis, column and page number. In the author's index the author's name is followed by the number of bibliograph. In the case of analytical index also, the number of bibliograph is given against each subject.

The bibliography is in no way complete, there are many important papers which were not available and so were not consulted. Efforts shall, therefore, be made to keep the bibliography upto-date by bringing out adenda after every two years.

<u>Project No.</u>	:	SU-PHY(3)
<u>Project Title</u>	:	Electronic Spectra of Metallic Hydrides.
<u>Project particulars</u>		
Date of commencement	:	Ist June, 1974
Duration of the Project	:	Three years
Date of completion	:	30th May, 1977
Total expenditure	:	Rs.94,054/-
Location of the Project	:	Physics Department, University of Karachi, Karachi.
<u>Main objectives</u>	:	To investigate the various features of the electronic spectra of the hydrides and deuterides of some elements of group I, II & III in emission and absorption; (ii) and interpretation of these spectra to describe the diatomic molecules.

Summary of the work done:

The investigation on the electronic spectra of metallic hydrides was undertaken to study various features of the Molecular states of the hydrides of group I,II and III Elements by observing the spectra of these molecules. The following procedure was adopted for analysing the spectrum in order to establish the molecular states.

The 3-4 M.Elbert Spectrograph was set up for making spectroscopic studies in absorption and emission. The mounting and calibration was carefully done.

In emission, the source, like high pressure and low pressure (water cooled)/arcs, hollow cathode sources and the proper electrical units were built. Spectra of ZnH, CGH and ALH were studied in emission.

To undertake absorption studies, a high temperature resistance furnace was built. A 450W Xe arc was set up for background source. The mounting of the arc and the power supply were constructed. Spectra of NaH and Na<sub>2</sub> molecules are being studied on this set up. The whole unit alongwith the external optics works very well.

Analysis of some of the important spectra of SrH, BaH and GaH formed an important part of this project. The spectra were found to consist of a number of difficult systems named as complexes. These systems were successfully analysed and a number of new molecular states not known before have been established. Hydrides of group II Elements gave similar spectra. In order to see the characteristics of the molecular states of these molecules, more potential curves were drawn of each state known to date. This work has given us the latest position of the known state in the hydrides of group II Elements and future plan thus can be adopted more rationally.

The determination of band constants of the bands of the systems of hydrides and deuterides thus established was a significant contribution during the tenure of this project. Six papers in all have been published as a result of these studies; two in Pakistan, three in Journal of Physics B, England and one in Nuove Ciment, Italy. Three or four more papers are expected to be published in near future.

Project No. : PC-PHY(9)  
Project Title : To investigate the momentum distribution of nucleus inside the nuclei of light elements of emulsion using nuclear emulsion techniques.

Project particulars:

Date of commencement : 1st November, 1974  
 Duration of Project : Two years  
 Date of completion : 31st October, 1976  
 Total expenditure : Rs.1,19,116/-  
 Location of the scheme : Talimul Islam College, Rabwah.

Main Objectives: To measure and analyse the recoil of nuclei of light elements in nuclear emulsion when a stopping antiproton annihilates on a proton of nucleus and to determine momentum distribution of nucleus inside the nuclei of light elements by the emulsion technique.

Summary of the work done:

This project relates to the ultimate structure of all matter. Just as the atom has a complex structure with tiny electrons going around its central part known as the nucleus. Similarly the nucleus of an atom is made up of neutrons and protons; two particles which are about 1,840 times more massive than the electrons and collectively they are spoken of as nucleons. Nucleons are not stationary but move with tremendous speed within the nuclei of the atoms. The project envisaged to find out the momenta (products of mass and velocity) of these moving nucleons.

The straight forward approach to studying the various properties of the nucleus was to shoot the probing particles at them and measure the effects produced. There was, however, one well known limitation in this endeavour i.e. the wave length of the probing particle should be of the order of the size of the nuclei being studied. Ordinary light for example, has a wave length about  $10^{-7}\text{m}$ , which in many orders of magnitude is larger than the nuclear size ( $10^{-14}\text{m}$ ), and thus not suitable for this study. It was, therefore, necessary to employ particles such as electrons, protons, antiprotons and neutrons as probes since their wave-lengths are much smaller. In the present study a very effective probe (the antiproton) was employed which goes inside the nucleus of an atom and interacts with the nucleons. These interactions, known as annihilations, revealed the behaviour of the inhabitants of the nucleus, that is, of protons and neutrons individually, as well as their collective behaviour. By studying large number of annihilations, the distribution of momenta would be determined. Once the momenta of the nucleons are known, many other properties of the nucleus and hence of any element can be known. The state of nuclei after annihilation would also throw light on nuclear energy levels and the whole science of nuclear spectroscopy.

The momentum distribution of nuclei of light elements was found by measuring the lengths of tracks of recoil of these nuclei and was compared with the distributions predicted for sand P-state nucleons of carbon given by Garron et al. It is found that the distribution closely corresponds with the S-state nucleons. It is, therefore, concluded that

annihilation takes place chiefly on the S-nucleons of the light elements emulsion. This result shows an inhibition of interactions with P-state nucleons that is, with nucleus possessing higher angular momenta. Similar inhibition has been reported by Gooding and Pugh for the (p,2p) quasi-elastic scattering. The experiment has also shown that the upper limit of nucleonic momentum extends upto 550 Mev/c.

The results obtained under the project are different from the earlier work done by the Durham group using the same technique, and have been submitted for publication as per details given below :-

- i) Sadiq.I and N.A. Khan: Pion multiplicity in antiproton nucleon annihilations at rest in the light elements of emulsion (under press)
- ii) Neutral pion multiplicity in antiproton nucleon annihilation at rest in light elements of nuclear emulsion (under press).
- iii) Momentum distribution of nucleons inside the nuclei of light elements of emulsion using nuclear emulsion techniques (under press).
- iv) Momentum distribution techniques of nucleon in the nuclei of light elements (presented as interval report at ICTP Trieste, Italy).

Project No. : C-IU/ENVR(10)  
Project Title : Ecological and Behavioural studies on the Rhesus Monkey (Macaca mulatta).

Project particulars:

Date of commencement : 27th December, 1975  
 Duration of project : Six months  
 Date of completion : 26th May, 1976  
 Total Expenditure : Rs.38,523/-  
 Location of the Scheme : Department of Biological Sciences, Quaid-i-Azam University, Islamabad.

Main Objectives : To study the ecology, behaviour and thermoregulatory patterns of the Rhesus monkey in their natural habitat.

Summary of the work done:

The investigations were conducted between January and June 1976, to study the ecology, behaviour and thermoregulatory patterns of the Rhesus monkey (Macaca mulatta) in its natural habitat. Studies were carried out in two different areas for the purpose of comparison.

In the ecological studies check-lists of the flora and fauna of the home ranges of the monkeys were made. Records of the precipitation, temperature and photoperiod were maintained. It was further observed that the ecology of an area influences the behavioural patterns and the composition of different rhesus groups inhabiting those areas. Population census and group compositions were thoroughly worked out.

Behavioural studies were made concerning their daily activity patterns viz. feeding and foraging activities, mother-infant relationships, grooming and allogamic behaviours, fear and submission responses and learning patterns. Special attention was given to their play repertoires and its role in the neuro-psychological development of the young ones.

The thermoregulatory characteristics of the rhesus monkey were studied under extremely low temperature. The functional aspects of certain factors like the deposition of fat and fur insulation were analysed. The behavioural adaptations of the rhesus monkey for the purpose of survival in cold climate were analysed.

Project No. : P-MH/MED(19)  
Project Title : Bacteriological studies of Tuberculosis

Project particulars:

Date of commencement : 1st October, 1975  
 Duration of the Project : One year  
 Date of completion : 30th September, 1976  
 Total Expenditure : Rs.20,000/-

Location of : Mayo Hospital, Lahore  
Scheme

Main Objectives : To investigate bacteriological aspects of tuberculosis with special reference to the Tubercle bacilli which are prevalent in Lahore region and causing tuberculosis infection of lungs and other sites.

Summary of the work done.

This study was carried out on patients reporting to Mayo Hospital. It was observed during this study that besides lung tuberculosis, tuberculosis of other parts of the body like bone, intestine, genito-urinary system, lymphocytes etc., is also common but not as much as the lung infection. It was revealed that the lungs infection due to atypical mycobacteria is rare but in extra pulmonary cases atypical mycobacteria are encountered more often.

The most significant finding of this study is the incidence of drug resistance in patients and its comparison with the patients history of antitubercular therapy. The tubercle bacilli develop resistance to a drug when they are repeatedly and irregularly exposed to small doses.

More than half of the pulmonary tuberculosis cases were found to be resistant to atleast one of the three primary drugs i.e. I.N.H., Streptomycine and PAS. This means that more than half of the drugs are wasted as they are ineffective due to the development of drug resistance. This is a colossal economic loss on the one hand and causes great harm to the patients. Since they get drugs, which are chronic and long treated, the problem is worse and more than two-third cases fail to respond to INH and Streptomycin, generally to both. Even among fresh untreated cases the drug resistance was found to be high.

This is something which ought to be given importance and measures should be taken to control emergence of the drug resistance. Some of the patients are at such a stage that they have developed resistance to secondary drugs including some of the recently introduced and highly potent drugs like Rifampicin. Actually what happens is that patients first report to a private doctor or a TB clinic, take the medicine and after a short treatment feel better and leave the medication. The disease gets temporarily suppressed since in tuberculosis at least 1-1/2 to two years treatment is essential to cure the disease. After sometime the patient gets symptoms again, comes back to the doctor or clinic, takes medication for few days and leaves it again. This process continues for years and causes emergence of drug resistance. Unfortunate

part is that this is a common practice in almost every case and thus tuberculosis is considered to be uncurable disease in Pakistan because a very small fraction of the tuberculosis patient ever gets rid of this disease.

The responsibility lies not only on the patient but on the health planning and tuberculosis control programme. There is complete lack of health education and follow-up of the patient which makes the patient not only drug resistant but also keeps the patient sputum positive, i.e he keeps spitting tubercle germ, and a resistant strain, giving this disease to his close contacts.

On the basis of data collected during this study it is concluded that this kind of study should be carried out in other parts of the country and after analysing the data immediate measures should be adopted at least, to control the drug resistance which is spreading unchecked.

<u>Project No.</u>	:	S-BIO(68)
<u>Project Title</u>	:	Annotated Bibliography of marine fishes and fisheries of Pakistan
<u>Project particulars</u>	:	
Date of commencement	:	1st February, 1976
Duration of the Project	:	Fourteen Months
Date of completion	:	31st March, 1977
Total expenditure	:	Rs. 20,933/-
Location of Scheme	:	Karachi
<u>Main Objectives</u>	:	To prepare a comprehensive bibliography of marine fishes and fisheries of Pakistan by critically studying the extensive published material on the subject and be contacting the others within the country as well as abroad.

Summary of the work done:

The annotated bibliography on marine fishes and fisheries of Pakistan compiled under this project includes references on following items :-

- a) Fish including shrimp, crab and marine womes.
- b) Fisheries inclusive of different fishery methods.
- c) Marine biology
  - i) Oceanography
  - ii) Phyto and Zooplanktons
  - iii) Fishes inclusive of fish larvae
  - iv) Marine invertebrates
  - v) Sea weeds
- d) Fish (food) Technology comprising Fish-Protein Concentrate (FPC), fish liver - oil and food value of fishes.
- e) Parasites of marine fishes

The annotated bibliography of marine fisheries lacks information due to the non-availability of local publications in the libraries and which were not furnished by the authors inspite of repeated reminders. Moreover several reports on fisheries were held back due to the reason that they were for official use only. It is recommended that such reports should be made available for the information of fisheries workers.

The Foundation shall take the necessary steps to keep the bibliography upto-date by adding the list of latest publication after every two years.

b) Second Annual Reports:

The second annual (Research and fiscal) reports of the following projects were received and evaluated by the Foundation during the report period. Their progress was found to be satisfactory hence these projects were allowed to be continued :-

<u>Project No.</u>	<u>Title of the Project</u>
PU/AGR(16)	Synthesis of improved wheat genotypes based on the development of criteria involving physiological analysis.

- P-NIAB/AGR(17) Biological control of soil salinity and fertility.
- S-SC/AGR(18) Survey, collection and study of plant mites attacking different crops in Sind, and their control.
- PU-BIO(5) Morpho-physiological effects of gamma irradiation on growth and yield of agriculture crops.
- S-KU/BIO(16) Systematics, Biology and seasonal abundance of plankton in the Karachi Coastal Waters.
- SU/BIO(35) Palynological studies of plants growing in Sind.
- S-KU/BIO(36) Survey of trace elements in the soils of Sind province and their effects on the productivity of wheat, paddy and cotton.
- S-KU/BIO(61) Studies on glycoprotein hormones.
- a) Bio-chemical, Bio-physical, & Immuno-biological characterization of gonadotropines and their sub-units.
  - b) Mechanism of action of luteinising hormone (LH) and lutrotrophic hormones (LTH).
- S-SC/CHEM(13) Chemical investigations on the plant materials of Sind.
- CU-CHEM(14) Studies in thermodynamics of interactions of solid catalysts with gases, liquids and vapours.
- FU-CHEM(22) Studies on the interaction of organic phosphates with metalions and relations of the molecular structure to biological activity.
- S-KU/CHEM(26) Interaction of amino acids with riboflavin and its neuro-chemical applications.
- FU-CHEM(38) Influence of ligand structure on the coordination properties and reactivity of transition elements.

- S-CSIR/CHEM(40) Effects of germination on the nutritive value and digestibility of proteins and carbohydrates of gram and pea.
- S-KU/EARTH(4) Terrain analysis and its application to urbanization.

c) First Annual Reports:

The first annual (research and fiscal) reports of the following projects were received and processed further by the Foundation. Their progress was found to be satisfactory hence these projects were allowed to be continued :-

<u>Project No.</u>	<u>Title of the Project</u>
RES/35(3)	Veterinary Disease Investigation in Northern Areas.
P-PU/BIO(6)	i) Palynological studies on plants growing in Punjab. ii) Seasonal variations in the frequencies of air-borne-pollen and spores which cause allergies, with special reference to central Punjab.
P-PU/BIO(9)	Investigation into the occurrence, biology and histo-chemistry of larval trematodes in Pakistan.
S-KU/BIO(13)	Utilization of brakish water for growing plants on sandy belt of Pakistan.
S-KU/BIO(47)	Culturing of micro-algae strains to produce animal feeds for commercial exploitation.
S-SU/BIO(57)	The culture collection of algae of Pakistan at Sind University.
S-SU/CHEM(13)	Chemical Investigations on the plant materials of Sind.
C-IU/CHEM(41)	Infra-red studies of organic compounds.

- F-PU/EARTH(15) Land forms and soil parent materials of the Khattak Foot Hills, Peshawar Valley.
- C-IU/ENVR(5) Biological Control of termites with pheromones and pathogenic Fungi.
- S-KU/PHY(5) Fundamental and applied Research in Experimental solid state physics at and below room temperature.
- PU-AGR(16) Synthesis of improved wheat genotypes based on the development of criteria involving physiological analysis.
- S-KU/BIO(20) Taxonomic studies of some marine invertebrates of the Northern Arabian Sea (Decapoda, Crustacea, Mollusca and Echinodermata).

CHAPTER - 3ORGANIZATION AND ADMINISTRATION

The ultimate organizational and administrative structure of the Foundation is the same as given in the previous report for the year 1975-76. However, during the year under report, only a small component remained in position as follows :-

OFFICERS:

<u>S.No.</u>	<u>DESIGNATION</u>	<u>NUMBER</u>
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.	Supporting Clerical Staff	16

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.

CHAPTER - 4

The report of the Auditors Messers Riaz Ahmad & Co., Chartered Accountants, appointed by the Foundation in consultation with the Auditor General of Pakistan, is reproduced below :-

AUDITORS' REPORT TO THE CHAIRMAN AND BOARD  
OF TRUSTEES OF PAKISTAN SCIENCE FOUNDATION

We have examined the annexed Balance Sheet of Pakistan Science Foundation as at June 30, 1977 and the Income and Expenditure Account for the year then ended and subject to our separate report addressed to the Board of Trustees, we report that :-

- a) we have obtained all the information and explanations we required; and
- b) such balance sheet exhibits a true and correct view of the state of the Foundation's affairs, according to the best of our information and explanations given to us and as shown by the books of the Foundation.

Sd/-  
(RIAZ AHMAD AND CO.)  
CHARTERED ACCOUNTANTS

RAWALPINDI 9-3-1978

PAKISTAN SCIENCE FOUNDATION ISLAMABAD

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED JUNE 30, 1977

EXPENDITURE	NOTE	1977 Rs.	1976 Rs
Grants	11	53,76,495	52,36,075
Administrative and others	12	8,79,613	10,44,355
Travel grants for Scientific Surveys, Science Conferences and Seminars	13	40,279	1,19,392
Scientists' Pool	14	15,461	43,064
		<u>63,11,848</u>	<u>64,42,886</u>
 INCOME			
Interest received		102	-
Miscellaneous income		581	-
		<u>683</u>	<u>-</u>
NET EXPENDITURE FOR THE YEAR		63,11,165	64,42,886
Less : Adjustments in respect of previous years		-	29,695
EXPENDITURE CARRIED FORWARD		<u>63,11,165</u>	<u>64,13,191</u>

The above income and expenditure account should be read in conjunction with the annexed notes on accounts set out from pages 4 to 5.

AUDITORS' REPORT

(See annexed report of date)

RAWALPINDI 9-3- 1978

Sd/-  
(RIAZ AHMAD & CO)  
CHARTERED ACCOUNTANTS

PAKISTAN SCIENCE FOUNDATION ISLAMABAD

NOTE ON ACCOUNTS - JUNE 30, 1977

ACCOUNTING POLICIES

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

GRANTS RECEIVED

1.1 Grants from the Government of Pakistan have been accounted for on receipt basis, which is consistent with the previous year's practice.

RESEARCH SUPPORT GRANTS

1.2 Research support grants have been accounted for on payment basis. This is in conformity with the previous year's practice.

FIXED ASSETS

1.3 Fixed assets have been valued at cost less accumulated depreciation except lease hold land, which is valued at cost. This is in conformity with the previous year's practice.

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

GENERAL FUND

	1977 Rs	1976 Rs
2. This is made up of:		
Balance as at July 1, 1976	39,01,684	53,41,893
Add : Grants sanctioned & received during the year	54,21,100	49,72,982
	<u>93,22,784</u>	<u>1,03,14,875</u>
Less : Expenditure during the year	63,11,165	64,13,191
Amount granted to Museum	1,00,000	-
	<u>64,11,165</u>	<u>64,13,191</u>
Balance as at June 30, 1977	29,11,619	39,01,684

## MUSEUM FUND

3. Museum fund sanctioned by the Government of Pakistan has been transferred to Museum Project.

## RESEARCH SUPPORT GRANTS

4. In accordance with the principles outlined in the charter grants totalling Rs.41,13,917 have been paid by the Foundation during the year for the conduct of various approved scientific research projects. The movement in this account is given below :-

Balance as at July 1,1976	Rs.94,12,729
Add : Grants paid during the year for fina- lised agreements.	Rs.41,13,917
Balance as at June,30,1977 :	<u>1,35,26,646</u>

The grantees have undertaken to incur the grants as per the provision of the agreement and for the performance and execution of the research project for which the grant has been paid. Accordingly these grants are being carried forward in the accounts of the Foundation and shall be written off or reduced as and when the expenditure is incurred and the proper account thereof is rendered to the Foundation on the conclusion of the projects.

## PASTIC

5. The movement in this account during the year has been as follows :

Balance as at July 1, 1976	Rs. 20,71,717
Add: (i) Grants received from the Govt. of Pakistan.	13,53,500
(ii) Development grants received from the Govt. of Pakistan	9,81,500
	<u>23,35,000</u>
	44,06,717
Less: (i)Expenses and advan- ces paid	18,12,333
(ii)UNESCO Coupons	<u>1,00,012</u>
	<u>19,12,345</u>
Balance as at June 30, 1977 :	24,94,372

## OTHER CREDITORS

6. These may be reclassified as under :

	1977 Rs	1976 Rs
Creditors for expenses	42,337	41,835
Creditors for other finance	23,223	30,349
	<u>65,560</u>	<u>72,104</u>

## RESEARCH PROJECTS IN PROGRESS

7. This represents the expenditure incurred on various research projects which are still in progress (Refer Note 4).

## ACCOUNTS RECEIVABLE

8. These consist of :

Punjab Barani Commission	-	3,204
Provident Fund	3,491	3,491
Others	425	64,077
Museum	62,181	-
	<u>66,097</u>	<u>70,772</u>

## ADVANCES DEPOSITS PREPAYMENTS

9. These are made up of :

Advances to staff	27,578	31,987
Deposits		
For Telephones	2,700	2,700
For Sui gas	1,000	1,000
	<u>3,700</u>	<u>3,700</u>
Prepayments	34,094	3,08,049
	<u>65,372</u>	<u>3,43,736</u>

## CASH AND BANK BALANCES

10. In hand	5,249	2,587
With bank	11,336	3,82,476
With Govt. Treasury	22,96,825	24,28,725
	<u>23,13,410</u>	<u>28,13,788</u>

## GRANTS

	1977 Rs	1976 Rs
11. Research Support	41,13,917	42,73,233
Scientific Societies and Professional bodies	5,35,191	5,02,200
Utilization	1,56,000	1,35,014
Others (Note 11.1)	4,61,910	43,598
Science Conferences and Seminars	1,09,477	2,82,030
	<u>53,76,495</u>	<u>52,36,075</u>
11.1 Others		
Man and Biosphere Programme	-	6,241
Science Centres & Herbaria	50,000	20,000
Information & Documentation	1,41,968	15,000
Awards and Prizes	-	2,357
Scientific Surveys and Collection of Statistics	2,59,176	-
International Liaison	10,766	-
	<u>4,61,910</u>	<u>43,598</u>

## ADMINISTRATIVE AND OTHERS

12. These comprise of :		
Salaries - Officers	2,09,410	2,93,651
Salaries - Staff	1,66,481	1,79,267
Honorarium	4,800	2,881
Overtime	2,700	3,392
Provident Fund, GP Fund	23,748	23,563
Leave salary and pension contribution	12,713	28,715
Medical	53,557	73,663
Rest & Recreation allowance	7,391	5,557
Travelling	16,971	11,733
Rent - Office	42,500	36,500
Water, electricity and gas	6,044	5,710
Rent - Residential	81,497	1,23,267
Postage, telephone & telegrams	75,452	1,13,257
Stationery and printing	36,297	25,499

	1977 Rs.	1976 Rs.
Vehicles running & maintenance	39,878	33,236
Nespapers and periodicals	3,561	4,573
Liveries and uniforms	4,796	2,347
Entertainment	12,895	7,316
Subscriptions	-	269
Insurance	2,476	5,484
Conveyance	2,388	2,515
Repair - Office equipment	2,586	3,159
Repair - buildings	2,285	4,642
Contingencies	-	5,008
Depreciation	53,376	42,495
Others	4,630	2,666
Group life insurance	412	-
	<u>8,68,844</u>	<u>1,40,365</u>
Other expenditure		
Audit fee	2,250	2,250
Advertisement	8,344	1,493
Bank charges	175	247
	<u>10,769</u>	<u>3,990</u>
	<u>8,79,613</u>	<u>10,44,355</u>

TRAVEL GRANTS FOR SCIENTIFIC SURVEY,  
SCIENCE CONFERENCES AND SEMINARS :

13. Local	-	11,686
Foreign	40,279	1,07,706
	<u>40,279</u>	<u>1,19,392</u>

SCIENTIFIC POOL

14. Salaries	15,461	39,614
Travelling	-	3,450
	<u>15,461</u>	<u>43,064</u>

FIGURES

.... of the previous year have been re-arranged where ever necessary for the purpose of comparison.

.... have been rounded off to the nearest rupee

PAKISTAN SCIENCE FOUNDATION ISLAMABAD  
SCHEDULE OF FIXED ASSETS AS AT JUNE 30, 1977

PARTICULARS	COST			DEPRECIATION			WRITTEN DOWN VALUE	RATE %
	As at July 1, 1976	Additions during the year	As at June, 30, 1977	As at July, 1, 1976	Provided during the year	As at June, 30, 1977		
Lease hold land	26,83,333	-	26,83,333	-	-	-	26,83,333	-
Furniture and Fixture	1,53,910	-	1,53,910	22,274	7,898	30,172	1,23,738	6
Office equip- ment	1,14,870	-	1,14,870	36,816	11,708	48,524	66,346	15
Air Conditioners	74,764	-	74,764	26,849	7,187	34,036	40,728	15
Motor Vehicles	1,07,167	75,733	1,82,900	52,237	26,133	78,370	1,04,530	20
Cycle	359	-	359	175	37	212	147	20
Library books	9,191	26	9,217	954	413	1,367	7,850	5
	Rs. 31,43,594	75,759	32,19,353	1,39,305	53,376	1,92,681	30,26,672	
1976	Rs. 31,06,322	37,272	31,43,594	96,810	42,495	1,39,305	30,04,289	

RIAZ AHMAD & CO.  
CHARTERED ACCOUNTANTS

PAKISTAN SCIENCE FOUNDATION ISLAMABAD  
BALANCE SHEET AS AT JUNE 30, 1977.

FUNDS AND LIABILITIES	NOTE	1977 Rs	1976 Rs	PROPERTY AND ASSETS	NOTE	1977 Rs	1976 Rs
<b>FUNDS</b>				<b>FIXED ASSETS - (As per Schedule annexed)</b>			
General	2	29,11,619	39,01,684			30,26,672	30,04,289
Museum	3	-	1,87,000				
RESEARCH SUPPORT GRANTS	4	135,26,646	94,12,729	RESEARCH PROJECTS IN PROGRESS	7	1,35,26,646	94,12,729
<b>CURRENT LIABILITIES</b>				<b>CURRENT ASSETS</b>			
PSTIC	5	24,94,372	20,71,717	Accounts receivable	8	66,097	70,772
Other creditors	6	65,560	72,184	Advances, deposits and prepayments	9	65,372	3,43,736
		25,59,932	21,43,901	CASH AND BANK BALANCES	10	23,13,410	28,13,788
		1,89,98,197	1,56,45,314			24,44,879	32,28,296
		1,89,98,197	1,56,45,314			1,89,98,197	156,45,314

The above balance sheet should be read in conjunction with the annexed notes on account set out from pages 1 to 3.

AUDITORS' REPORT  
(See annexed report of date)

Sd/-  
(RIAZ AHMAD & CO)  
CHARTERED ACCOUNTANTS

RAWALPINDI, 9-3-1978

PAKISTAN SCIENCE FOUNDATION ACT 1973

National Assembly of Pakistan

Islamabad, the 2nd February

1973

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

Act No. III of 1973

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

Whereas it is expedient to provide for the establishment of the Pakistan Science Foundation and for matters ancillary 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 societies, associations and academies engaged in spreading the cause of scientific knowledge in general or in the pursuit of a specific scientific discipline or technology in particular;
- (vi) the organization of periodical science conferences, symposia and seminars;
- (vii) the exchange of visits of scientists and technologists with other countries;
- (viii) the grant of awards, prizes and fellowships to individuals engaged in developing processes, products and inventions of consequence to the economy of the country; and
- (ix) special scientific surveys not undertaken by any other organization and collection of scientific statistics related to the scientific effort of the country.

(2)The Foundation shall also :-

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

- (ii) maintain a National Register of highly qualified and talented scientists of Pakistan, including engineers and doctors, in or outside the country and to assist them, in collaboration with the concerned agencies in finding appropriate employment; and
- (iii) establish liaison with similar bodies in other countries.

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

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

Whole-time members

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

to be appointed by the President;

Part-time members

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

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

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

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

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

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

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

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

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

12. AD-HOC 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 approved a statement of its receipts and expenditures 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 to the Auditor-General of Pakistan may determine in consultation with the Federal Government.

(3) The accounts of the Foundation shall be audited by one or more auditors who are chartered accountants 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 Science Foundation Ordinance, 1972 (LII of 1972), is hereby repealed.

ANNEXURE - IILIST OF SANCTIONED RESEARCH GRANTS 1976-77

<u>List of Scheme</u>	<u>Amount sanctioned</u>	<u>Name of Principal Investigator &amp; Organization supported</u>
<u>Agricultural Sciences</u>		
(i) Major crop weeds and their control. S-AC/AGR(19)	1,24,338.00	Mr. Ghulam Nabi Kalwar, Department of Agronomy, Sind Agriculture University, Tandojam.
(ii) Effect of NPK on the yield and chemical composition of Australian hybrid variety of grain sorghum (Pacific 007) F-PU/AGR(35)	1,80,500.00	Mr. Jehangir Khan Khattak, Department of Biological Sciences, Faculty of Agriculture, University of Peshawar.
(iii) Preliminary studies on the breeding biology of teddy goat. C-IU/AGR(40-1)	1,24,728.00	Dr. Mohammad Arsalan, Deptt. of Biological Sciences, Quaid-e-Azam University, Islamabad.
<u>Biological Sciences</u>		
(i) Investigation into the occurrence, biology & histochemistry of larval trematodes in Pakistan. (Extension project) P-PU/BIO(14)	42,575.00	Dr. Daler Khan, Deptt. of Zoology, University of Punjab, Lahore.
(ii) Investigation on wood anatomy of coniferous trees of Pakistan. S-KU/BIO(14)	1,72,536.00	Dr. Mohammad Ahmad, Botany Department, University of Karachi.
(iii) Phytoecological survey of Attock hills. F-PU/BIO(30)	1,29,995.00	Dr. Shahrukh M. Chughtai, Deptt., of Botany, Islamia College, Peshawar.

- |        |   |          |   |
|--------|---|----------|---|
| (iv)   | The control of Silkworm diseases in Pakistan and Azad Kashmir.<br>P-PU/BIO(50-1)  | 2,32,856 | Dr. Rafat Hussain Jafri, Deptt. of Zoology, University of Punjab, LAHORE            |
| (v)    | A survey of phytoplankton of Sind area and their utilization as food for animal/man.<br>S-KU/BIO(54)  | 92,786   | Dr. (Mrs) Phool B. Zahid, Deptt. of Botani, University of Karachi, KARACHI.         |
| (vi)   | Germination promotion of <u>Pinus halpensis</u> : <u>P. roxburghii</u> and <u>P. wallichana</u> seeds by stratification and chemical treatment.<br>F-PU/BIO(75) | 68,128   | Dr. Ihsan Ilahi, Deptt. of Botany, University of Peshawar, PESHAWAR.                |
| (vii)  | Heterotopic transplantation of entire muscles in mammals.<br>P-PU/BIO(75)   | 1,37,706 | Dr. Shahzad A. Mufti Deptt. of Zoology, University of Punjab, LAHORE.               |
| (viii) | Studies on wood preferences of termites<br>P-PU/BIO(79)   | 90,030   | Dr. M. Saeed Akhtar, Deptt. of Zoology, University of Punjab, LAHORE.               |
| (ix)   | Studies on the physiological role and regulation of pancreatic hormones.<br>C-QU/BIO(83)  | 33,230   | Dr. M. Maqbool Ahmad, Deptt. of Biology, Quaid-i-Azam University, ISLAMABAD.        |
| 3.     | <u>Chemical Sciences:</u>   |          |   |
| (i)    | Chemical investigation of the plants known to have significant pharmacological activities.<br>C-IU/CHEM(56)   | 1,09,140 | Dr. (Mrs) Mashooda Hasan, Deptt., of Chemistry, Quaid-i-Azam University, ISLAMABAD. |
| (ii)   | Development of steroid chemistry because of its pharmaceutical as well as socio-economic impact.<br>P-CSIR/CHEM(66)   | 2,99,166 | Dr. Karimullah, PCSIR Laboratories, LAHORE.   |

- |        |   |          |  |
|--------|---|----------|--|
| (iii)  | Kinetic, electrochemical and optical investigation of the herbicide; methylviologen (paraquat) and the related compounds.<br>C-IU/CHEM(73). | 1,49,080 | Dr.Mahboob<br>Mohammad, Deptt.<br>of Chemistry,<br>Quaid-i-Azam<br>University,<br>Islamabad. |
| (iv)   | Conversion of petroleum hydrocarbons into cheap and effective insecticides/pesticides.<br>S-SU/CHEM(74)                                     | 30,000   | Dr.Syed Nazrual<br>Hasnain, Biolo-<br>gical Research<br>Centre, Karachi<br>University, KYC.  |
| (v)    | Tumor inhibitor diterpenoids.<br>F-GU/CHEM(79)  | 42,000   | Dr.G.A. Miana,<br>Deptt. of Chem.<br>Gomal University,<br>D.I. Khan.                         |
| (vi)   | Fortification of human diet with leaf protein concentrates.<br>P-CSIR/CHEM(75)  | 49,928   | Dr.Abdus Salam,<br>Sr. Research<br>Officer, PCSIR<br>Laboratories,<br>Lahore - 16.           |
| (vii)  | Enzymes hydrolysis of raffinose for the improvement of sugar recovery in beet processing.<br>P-CSIR/CHEM(76)                                | 49,580   | Dr. Abdul Qadir,<br>PCSIR Laboratories,<br>Lahore - 16.                                      |
| (viii) | Analytical uses of chelating agents.<br>F-PU/CHEM(77)   | 49,980   | Dr.M.Sakhawat<br>Hussain, Deptt.,<br>of Chemistry,<br>Uni. of Peshawar                       |
| (ix)   | Removal of olefines, naphthenes and aromatics from various fractions of petroleum.<br>C-QU/CHEM(81)   | 3,37,471 | Dr.Muhammad Afzal,<br>Deptt. of Chemistry,<br>Quaid-i-Azam Uni-<br>versity, Islamabad.       |
| (x)    | Terpenes from <u>Cedrus deodara</u><br>C-QAU/CHEM(78)   | 49,240   | Dr.Naeema Khan<br>Deptt. of Chemistry,<br>Quaid-i-Azam Uni-<br>versity, Islamabad.           |
| (xi)   | Studies of catalytic activity of nickel in the production of vegetable ghee.<br>C-QU/CHEM(82)   | 1,53,111 | Dr.Mohammad Afzal,<br>Deptt. of Chemistry,<br>Quaid-i-Azam Uni-<br>versity, Islamabad.       |

4. Earth Sciences

- |       |   |          |  |
|-------|---|----------|--|
| (i)   | Economic evaluation of clay and mineral deposits of Sind. S-KU/EARTH(7)                     | 1,87,718 | Dr. K.A. Malik,<br>Deptt. of Geology,<br>University of<br>Karachi.               |
| (ii)  | Changing pattern of resource use in Punjab. P-PU/EARTH(12)                                  | 1,10,320 | Dr.M.K. Elahi,<br>Deptt. of Geology,<br>University of<br>Punjab, Lahore.         |
| (iii) | Problems of resource utilization in human settlement of Murree-Kahuta region F-GC/EARTH(23) | 41,080   | Mr.Abdul Hameed<br>Rathore, Deptt, of<br>Geography, Govt.<br>College, Rawalpindi |

5. Engineering Sciences

- |     |   |          |   |
|-----|---|----------|---|
| (i) | Dyeing problems in blended fabrics: study on Pakistan Textile Industry. P-CTT/ENG(14) | 2,67,325 | Dr. F.A. Bhatti,<br>National College of<br>Textile Technology,<br>Lyallpur. |
|-----|---|----------|---|

6. Environmental Sciences

- |       |  |          |   |
|-------|--|----------|---|
| (i)   | Testing for mitotic gene conversion in yeast by food colours and other chemicals F-PU/ENVR(2)    | 1,01,896 | Dr.Bashir Ahmad<br>Siddiqui, Department,<br>of Botany, University<br>of Peshawar, Peshawar        |
| (ii)  | Ecological studies on fresh water hypomyces. C-IU/ENVR(3)  | 1,72,930 | Dr. S.H. Iqbal<br>Deptt. of Botany,<br>University of Punjab,<br>Lahore.                           |
| (iii) | Water pollution studies of the urban and industrial areas of Peshawar and Nowshera. F-PU/ENVR(a) | 1,63,800 | Dr. Noor Ahmad,<br>Institute of Physical<br>Chemistry, University<br>of Peshawar, Peshawar        |
| (iv)  | Limnological survey of the Rawal Lake, Islamabad C-IU/ENVR(11)                                   | 10,040   | Dr.Maqbool Ahmad,<br>Deptt. of Biological<br>Sciences, Quaid-i-<br>Azam University,<br>Islamabad. |
| (v)   | Study of pollution and aquatic organisms of the Leh Stream in Rawalpindi. P-GCR/ENVR(15)         | 40,620   | Syed Rashid Ali,<br>Deptt. of Zoology,<br>Gordon College,<br>Rawalpindi.                          |

- |      |   |        |   |
|------|---|--------|---|
| (vi) | Behavioural and ecological studies of rhesus monkey with special reference to their communication.<br>C-IU/ENVR(16) | 40,620 | Dr. Qazi Javed Iqbal, Deptt., of Biological Sciences, Quaid-i-Azam University, Islamabad. |
|------|---|--------|---|

## 7. Medical Sciences

- |       |  |          |  |
|-------|--|----------|--|
| (i)   | Determination of human placental lactogen level as guide to foetal well-being during pregnancy.<br>S-AEMC/MED(6)                                   | 2,56,180 | Dr. Munir Ahmad Siddiqui, Atomic Energy Medical Centre, Liaquat Medical College, Jamshoro, Sind. |
| (ii)  | Ultrastructural study of the human liver diseases.<br>S-JPMC/MED(28)   | 75,700   | Dr. M. Younus Khan, JPMC, Karachi.   |
| (iii) | Study of Enteroviruses in drinking water of Islamabad.<br>C-NHL/MED(35)  | 12,500   | Brig. M. I. Burney, National Health Laboratories, Islamabad.                                     |
| (iv)  | Frequency and natural history of rheumatic fever in Islamabad and identification of diagnostic criteria for acute rheumatic fever.<br>C-PC/MED(36) | 26,624   | Dr. S. M. Malik, Central Govt. Poly-clinic, Islamabad.   |
| (v)   | Bio-chemical studies of the cataractous human lenses.<br>S-JPMC/MED(38)  | 72,500   | Professor M. Atha-u-Rehman, Deptt. of Bio-chemistry, JPMC, Karachi.                              |

## 8. Physical Sciences

- |        |   |          |   |
|--------|---|----------|---|
| (i)(a) | Isotope fractionation studies of stable Isotopes, and                           | 2,61,468 | Dr. S. A. Hussain, Department of Physics, University of Karachi.                  |
| (b)    | Diffusion of gases in solids<br>S-KU/PHY(13)                                    |          |   |
| (ii)   | Parametric and self parametric effects in complex non-linear electronic system. | 2,03,212 | Dr. Abdul Hussain Shah Bokhari, Deptt., of Physics, University of Sind, Jamshoro  |
| (iii)  | Impact of ions on solids<br>P-PU/PHY(19)  | 4,69,300 | Dr. M. Rafi Chaudhary, Centre for Solid State Physics, Punjab University, Lahore. |

## 9. Utilization of Research Results

- |       |  |        |   |
|-------|--|--------|---|
| (i)   | Design and construction of solar grain dryer.<br>P-FU/UTZ(16)                    | 20,000 | Dr.I.H. Shah,<br>Faculty of Engineering,<br>University of Peshawar,<br>Peshawar.        |
| (ii)  | Utilization of pine needles for textile and paper manufacture.<br>P-CSIR/UTZ(28) | 20,000 | Dr. Mumtaz A. Khan,<br>PCSIR Laboratories,<br>Peshawar.                                 |
| (iii) | Under soil irrigation<br>C-ATDO/UTZ(32)  | 25,000 | Mr. Shahid Ikram<br>Appropriate Technology<br>Development Organiza-<br>tion, Islamabad. |
| (iv)  | Design and fabrication of self propelled universal type reaper.<br>P-AU/UTZ(34)  | 25,000 | Dr. A.D. Chaudhry,<br>University of Agriculture,<br>Faisalabad.                         |
| (v)   | Development of small Agricultural implements.<br>S-EU/UTZ(35)                    | 50,000 | Dr. A.A. Junejo,<br>Mehran University of<br>Engg., and Technology,<br>Sind.             |

ANNEXURE - IIIPSF GRANTS SANCTIONED TO THE SCIENTIFIC SOCIETIES AND  
LEARNED BODIES FOR THE ACHIEVEMENT OF THEIR OBJECTIVESYEAR - 1976-77

<u>S.No.</u>	<u>NAME OF SOCIETY</u>	<u>GRANT IN RUPEES</u>
<b>A. <u>ALL PAKISTAN SCIENTIFIC SOCIETIES/LEARNED BODIES</u></b>		
1.	Pakistan Academy of Sciences	50,000
2.	Pakistan Association of Scientists and Scientific Professions	40,000
3.	Scientific Society of Pakistan	40,000
4.	Pakistan Association for the Advancement of Sciences.	40,000
5.	The Institute of Engineers, Pakistan	40,000
6.	Pakistan Association for the Promotion of Science and Appropriate Technologies (PAPSAT).	40,000
		2,50,000
<b>B. <u>DISCIPLINE SOCIETIES</u></b>		
1.	Pakistan Medical Association, Karachi	20,000
2.	Zoological Society of Pakistan	10,000
3.	Pakistan Society of Leather Technologies	10,000
4.	Pakistan Botanical Society	10,000
5.	Society for the Advancement of Agri- cultural Sciences.	10,000
6.	Pakistan Society of Public Health Engineers.	10,000
7.	Pakistan Institute of Chemical Engineers.	15,000
8.	Society for the Advancement of Animal Sciences.	10,000
9.	Geological Society of Pakistan	10,000
10.	Pakistan Statistical Association	10,000
11.	Pakistan Bio-chemical Society	10,000
		1,25,000
<b>C. <u>PROVINCIAL SOCIETY</u></b>		
1.	Sind Science Society	25,000

ANNEXURE - IVPSF GRANTS SANCTIONED TO VARIOUS AGENCIES  
FOR THEIR PUBLICATION PROGRAMMESYEAR - 1976-77

<u>Sl. No.</u>	<u>Agency</u>	<u>Publication</u>	<u>Grant in Rs.</u>
1.	Scientific Society of Pakistan	i) Science Bachon-ke-Liay ii) Jadeed Science	16,000 14,000
2.	Zoological Society of Pakistan	Pakistan Journal of Zoology	10,000
3.	Pakistan Botanical Society	Pakistan J. of Botany	10,000
4.	Biological Society of Pakistan.	Biologia	10,000
5.	Society for the Advancement of Agricultural Sciences	Pakistan J. of Agricultural Sciences	5,000
6.	Society for the Advancement of Animal Sciences	Pakistan J. of Animal Sciences	5,000
7.	Pakistan Bio-chemical Society	Pakistan J. of Bio-Chemistry.	5,000
8.	Man and Biosphere Committee	J. of Man and Biosphere	10,000
9.	National College of Textile Technology	J. of Textech	10,000
10.	Punjab Geological Society	J. of Geology	10,000
11.	University of Peshawar	The Alembic	1,000
12.	Pakistan Society for the Advancement of Sciences	i) Pakistan J. of Science ii) Pakistan J. of Scientific Research	10,000 10,000
13.	Pakistan Forest Institute	Journal of Forestry	10,000
14.	Gordon College Rawalpindi	Bulletin of Hydrobiological Research	3,000
15.	National Science Council	Publication Programme	<u>1,00000</u> <u>2,39,000</u>

PSF GRANTS GIVEN TO VARIOUS AGENCIES  
FOR HOLDING SYMPOSIA/SEMINARS WORKSHOPS

YEAR - 1976-77

<u>Sl. No.</u>	<u>Agency</u>	<u>Symposium/Seminars/ Workshops</u>	<u>Grant in Rs.</u>
1.	University of Karachi	Additional funds for hosting All Pakistan Science Conference.	20,000 *
2.	PCSIR Laboratories, LHR	Biological Conversion of Agr. Industrial wastes and By-products into Feed-stuff	10,000
3.	National Health Labs., Islamabad.	4th Annual Health Symposium	3,000
4.	Pakistan Association for the promotion of Science and Appropriate Technologies (PAPSAT)	Workshop on 'Zoonoses and the Public Health related aspects of Animal Industries	5,000
5.	University of Karachi	Seminar cum workshop on 'Problems of plant parasitic Nematodes in Pakistan'	20,000
			58,000

\* Not released due to change of venue of the Conference.

Annexure: VI

<u>Date</u>	<u>Foreign Visitors to PSF</u>
12.7.76	Dr. E.T Bullard, Agricultural Advisor, USAID
1.8.76	Dr. R. R. Ronkin, Staff Associate, National Science Foundation, Washington, D.C., USA.
19.8.76	Mr. Thomas Michael Martin, 1st Secretary, Embassy of United State of America, Islamabad.
31.8.76	Mr. Jacques Gaillard, Scientific Secretary, International Foundation for Science, Stokholm Sweden.
1.9.76	Dr. John Hurley, National Academy of Sciences, U.S.A
28.10.76	Mr. John C. Cool, Director, Ford Foundation, Islamabad.
11.11.76	Mr. Gustavus Simpson, CENTO Expert in the Field of Information Science
7.12.76	Mr. W. H. Gilbrich, Field Project Officer, UNESCO.
4.1.77	Dr. David Pilbeam, Yale University, USA.
24.1.77	Dr. Bilbishop, Director Designate of the Peabody Museum of Natural History, USA.

- 25.1.77 Dr. Warran Ilchman,  
National Science Foundation,  
USA.
- 1.3.77 V.G. Podoinitsin,  
Director,  
UNESCO Regional Office of  
Science and Technology for  
South and Central Asia,  
New Delhi.
- 4.3.77 Dr. Taseer Hussain,  
Howard University,  
USA.
- 9.3.77 Dr. Grant Mayer,  
Smithsonian Institute,  
Washington D.C,  
USA.
- 11.3.77 Mr. Terrance L. Lindemann,  
U.S Department of Economics.
- 1.4.77 Dr. Neal R. Carpenter,  
Chief Management Unit,  
F.A.O,  
Rome.  
  
Dr. Dirk Hockstra,  
Watershed Management,  
F.A.O.
- 6.4.77 Dr. Lave,  
Director,  
International Bureau,  
Karlsru. West Germany.
- 9.4.77 Mr. Raja Roy Singh,  
Director,  
UNESCO Regional Office for  
Education in Asia,  
  
Dr. Ansar Ali Khan,  
Specialist in out-of-School and  
Adult Education,  
UNESCO Regional Office,  
Bangkok.
- 13.4.77 Dr. Walter E. Hecox,  
Consultant, Ford Foundation,  
Pakistan.

- 2.4.77 Mr. Albert C. Trawkowski,  
Office of Research and Development,  
Environment Protection Agency (EPA)  
WASHINGTON, D.C.
- Mr. Victor F. Jelen,  
USEPA-Industrial and Environmental  
Research Lab.,  
CINCINNATI, OHIO, USA.
- Mr. Stasys V. Rastonis,  
USEPA-Office of International Activities,  
Washington D.C USA.
- Mr. Frank L. Trippett,  
Science Officer,  
US-Embassy,  
Islamabad.
- 3.5.77 Dr. P. M. Guldenaar,  
Ministry of Foreign Affairs,  
The Netherlands.
- 10.5.77 Sir Harrie Massey,  
Secretary,  
Physical Science Royal Society,  
London.
- 26.6.77 Dr. John A. Naegele,  
UDA Agriculture Research Service.
- 23.6.77 Mr. Henning Karcher,  
Programme Officer,  
UNDP. Islamabad.