Sir K. S. Krishnan

THE TATA INSTITUTE OF FUNDAMENTAL RESEARCH BOMBAY

ANNUAL REPORT

1946–47

THE
TATA INSTITUTE OF FUNDAMENTAL RESEARCH BOMBAY

COUNCIL.

The following gentlemen constituted the Council at the beginning of the financial year 1946-47.

Sir Sorab Saklatvala (*Chairman*)
Mr. S. N. Moos, C.I.E., I.E.S.
Dr. John Matthai, D.Sc., C.I.E.
Dr. H. J. Bhabha, Ph.D., F.R.S.

Dr. John Matthai resigned his membership of the Council on joining the Interim Government, Government of India, on 2nd September, 1946. The Council wishes to place on record its sense of appreciation of the great services rendered by Hon'ble Dr. John Matthai to the Tata Institute of Fundamental Research during his membership of the Council. It is hoped that Dr. Matthai will continue to take interest in the progress of the Institute. The Trustees of the Sir Dorabji Tata Trust nominated Sir Ardeshir Dalal to the Council in place of Hon'ble Dr. John Matthai.

The Council of Scientific and Industrial Research when sanctioning an annual block grant of Rs. 75,000/- to the Institute had requested for representation on the Council of the Tata Institute. This suggestion was accepted by the Government of Bombay and the Trustees of the Sir Dorabji Tata Trust and it was decided to give representation to the Central Government on the Council of the Institute. The Honourable Member, Department of Industries and Supplies, Government of India, has been pleased to appoint Sir S. S. Bhatnagar, Director, Scientific and Industrial Research, as a representative of the Central Government on the Council of the Institute. At the end of the financial

year 1946-47 the Council consisted of the following members.

Sir Sorab Saklatvala (*Chairman*)
Mr. S. N. Moos, C.I.E., I.E.S.
Sir Ardeshir Dalal, K.C.I.E.
Sir Shanti Swarup Bhatnagar, O.B.E., D.Sc., F.R.S.
Dr. H. J. Bhabha, Ph.D., F.R.S.

STUDENTS:

At present there are six students reading in the Institute. Four of them are working on theoretical physics and two are engaged in experimental work on Cosmic Radiation. All these are under the direct guidance of the Director. Out of these six students, two are at present in receipt of the Institute's scholarships.

COLLOQUIA:

The following colloquia were held during the year.

Date	*Principal Speaker*	*Subject*
19-1-47.	Dr. H. J. Bhabha	*Classical Theory of Point Particles*
20-1-47.	Dr. R. C. Majumdar	*Radiation Damping*
21-1-47.	Dr. S. K. Chakrabarty	*Production of Bursts by Mesons*
4-3-47.	Mr. A. B. Sahiar	*Knock-On Showers*
11-3-47.	do.	*Penetrating Cosmic Ray Showers*
13-3-47.	do.	*Penetrating Cosmic Ray Showers*
19-3-47.	Mr. R. P. Thatte	*Disintegration of Mesons*
20-3-47.	do.	*Disintegration of Mesons*

All these colloquia were attended by the members of the Institute and others interested in these problems.

RESEARCH PAPERS:

The following short note was published by Dr. Bhabha during the year.

> "On the Expansibility of Solutions in Powers of the Interaction Constants". Physical Review 70, 759-760 (1946).

Dr. Bhabha contributed an article on the Theory of the Elementary Particles to the Reports on Progress in Physics, Vol. 10, pp. 253-271, published by the Physical Society, London, during this year.

Dr. Bhabha is also engaged in writing a book "The Theory of the Elementary Particles and their Interactions" to be published shortly in the International Series of Monographs on Physics by the Clarendon Press, Oxford University Press.

The following papers by Prof. Kosambi were published during the year.

(1) An Extension of the Least Square Method of Statistical Estimation (Annals of Eugenics) *in print*

(2) Parvasamgraha of the Mahabharata—Journal of the American Oriental Society—66, 110-117 (1946).

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The following papers were also published by Prof. Kosambi.

1. Southern Archetype of epigrams ascribed to Bhartrhari—Bharatiya Vidya Bhavan Series—1946.

2. Early stages of Caste System in Northern India—Journal of the Bombay Branch of the Royal Asiatic Society—1946.

LIBRARY:

During the year the Institute subscribed to 51 scientific journals published in India and abroad. In many cases it was possible to purchase sets of back numbers of the journals subscribed to. Up to now it has not been possible to get any journals from Germany, Italy, and Japan, but it is hoped that during the next year it would be possible to subscribe to the important scientific journals from those countries. Out of the journals subscribed to at present, 18 are from the U.S.A., 14 from the U.K., 1 from France, 2 from Switzerland, 2 from Sweden, 4 from the U.S.S.R., and 9 from India. It is proposed to complete the sets of back numbers of all journals next year. In all about 1,200 volumes of back numbers have been ordered so far.

About 800 books were bought for the library during the year, a portion of the purchases being German books published in the U.S.A. under the authority of the Custodian of Alien Property. 55 rare volumes were kindly donated by Mr. S. N. Moos, C.I.E., I.E.S., to the library and our warm thanks are due to him for the donation.

LABORATORY AND WORKSHOP:

As reported last year, it was decided to equip the workshop with the latest machines. This year a lathe and a drilling machine with all their accessories have been installed and a number of other small workshop appliances have been bought. It is proposed to add more precision machines like a milling machine, a shaping machine, a precision lathe etc. for precision work so that in the course of the next few years the Institute will have a workshop fitted up adequately for the fabrication of all apparatus it would need in the laboratory.

It was decided to speed up the preparation of G. M. counters for experiment on cosmic radiation. For this

purpose pumps creating a very high degree of vacuum have been purchased. The work of preparing counters is proceeding satisfactorily and we hope to have a large stock of efficient counters ready for the various investigations we propose to undertake. In addition various electrical circuits for scaling and calibrating counters have been re-designed and completed.

WILSON CHAMBER:

The chamber has been completely overhauled and its performance improved by the replacement of a solid metal piston by a diaphragm made of latex. Special arrangements for illumination have also been made to take photographs of tracks. Some photographs have already been taken. It is proposed to fabricate some more ionisation chambers of different designs in view of the additional investigations the Institute proposes to undertake.

VISITING PROFESSORS:

The Institute was fortunate in being able to invite the following distinguished scientists as the Visiting Professors to the Institute.

1. Prof. P. M. S. Blackett, F.R.S.—University of Manchester
2. Prof. J. Hadamard of Institute de France
3. Prof. S. S. Chern of the Tsing Hua University and the Academia Sinica.
4. Prof. L. J. Mordell, F.R.S.—Cambridge University.

Prof. Blackett delivered a series of 5 lectures on "Cosmic Radiation" and participated in the colloquia held at the Institute. He also gave valuable suggestions about the technique of Wilson Chambers.

Prof. Hadamard—the doyen of French mathematicians—gave a series of 8 lectures on ''Boundary Conditions in the Differential Equations of Mathematical Physics and the Problem of Cauchy''.

Prof. Chern delivered a series of 5 lectures on 'Topology'.

Prof. Mordell delivered a lecture on 'Geometry of Numbers'. All these lectures were delivered in the Royal Institute of Science, Bombay, and were open to the public. The attendance was extremely good. Our warm thanks are due to Dr. Mata Prasad, Principal, Royal Institute of Science, for his kind co-operation in allowing us the use of the Lecture Hall in the Royal Institute of Science.

CONFERENCES AND VISITS:

Dr. Bhabha attended the Royal Society Empire Scientific Conference held in London last July as a member of the Indian delegation. He opened the evening discussion on Cosmic Rays organised by this conference at Cambridge. Following the recommendations made at this meeting, the Official Empire Scientific Conference appointed a permanent committee for the coordination of cosmic ray research in the Empire. The Committee consists of representatives of the member nations of the Commonwealth and Dr. Bhabha is the representative of India. The Committee recommended that the co-operating nations of the commonwealth should undertake extensive investigations of the variation of intensity of cosmic rays over long periods of time, as well as their measurement over large ranges of altitude, latitude and longitude. With adequate financial assistance it is hoped that this Institute will be able to carry out a large part of the investigations assigned to India. In particular it is proposed to measure the intensity of cosmic rays at high altitudes as also at great depths. The Institute has already completed one investigation of intensity at high altitudes and it is proposed to undertake further experi-

ments of this nature as also experiments for measuring the intens[redacted] at great depths. Preliminary enquiries regarding facilities for these experiments have already been started.

Dr. Bhabha was also invited by the Physical Society, London, to participate in its International Physics Conference on "Fundamental Particles and Low Temperature Physics" held at Cambridge during July, 1946. Dr. Bhabha opened the discussions on high altitude meson experiments near the equator and on relativistic wave equations for the proton. He also attended the Newton Tercentenary celebrations organised in London by the Royal Society as one of the representatives of the National Institute of Sciences, India.

The Government of India had also requested Dr. Bhabha to visit the U.S.A. to acquaint himself at first hand with the latest developments in physics with special reference to cosmic rays and Nuclear Physics. During his stay in America, Dr. Bhabha gave a lecture, on his recent work, at the New York meeting of the American Physical Society and also attended the Bi-Centenary Celebrations of the Princeton University.

On the invitation of the National Research Council, Canada, Dr. Bhabha visited the Atomic Energy Plant at Chalk River near Ottawa. Later he visited the British Atomic Research Establishment at Harwell and the French plants being set up under the French Atomic Energy Commission. Dr. Bhabha's observations on the design, maintenance, and administration of university laboratories and research institutes abroad will be of invaluable help to the sponsors of the Tata Institute of Fundamental Research in making it one of the premier research institutes of India.

The Government of India nominated Dr. Bhabha as one of the Indian delegates to the UNESCO conference held in

November-December 1946 at Paris. He was elected the President of the UNESCO Sub-Commission on Natural Sciences.

Prof. Kosambi was elected the President of the Section of Mathematics of the session of the Indian Science Congress held at Delhi in January, 1947. He has also been elected

(1) Fellow of the National Institute of Sciences, India.

(2) Member of the American Mathematical Society.

He has also been requested to accept the membership of the Executive Council of the Indian Society of Agricultural and Animal Husbandry Statistics.

Dr. Bhabha and Prof. Kosambi have been appointed Honorary Professors of the Research Institute, Osmania University. Dr. Bhabha has also been appointed Honorary Professor of Physics at the Royal Institute of Science, Bombay.

NEW PROJECTS:

As reported last year the Atomic Research Committee had recommended that this Institute should be the centre of all large-scale research in nuclear physics in India. The Council of Scientific and Industrial Research has accepted this recommendation and has sanctioned a scheme for training a team of scientists to maintain and work with a high-energy accelerator capable of producing particles of energies up to 200 m.e.v., to be established at the Tata Institute of Fundamental Research. Pending the final choice of the type of the high-energy accelerator it has been decided to start the training of the team in the technique of the problems of nuclear physics immediately. The personnel of the team will be selected and the training will start before the end of May, 1947. It may be necessary to depute some members

of the team to the U.S.A. where the proposed accelerator will be manufactured in order to have trained personnal in readiness for the maintenance and upkeep of this valuable instrument. It is also proposed that the heavy parts of this instrument, consisting of iron magnets, should be fabricated in India so as to reduce the costs—and what is much more important, so as to provide varied technical experience to the Indian technicians. The G. E. C. at Schenectady have agreed that should the accelerator be ordered from them, they will supply complete working drawings for the manufacture of the magnet in India. The problems of housing this instrument and of power supply for it will also have to be carefully tackled and these problems are being considered carefully by the Institute. It is proposed to undertake various experiments to implement India's share in the programme of collaborative research planned by the cosmic radiation committee of the Commonwealth Scientific Conference. In view of these projects, it is absolutely essential to have the Institute properly housed as soon as possible. It is expected to commence construction of the permanent buildings of the Institute which will be of the latest design, within the next few months.

It is a pleasure to record that I had the loyal co-operation of the staff throughout the year under report.

H. J. BHABHA,

Director.

STAFF OF THE TATA INSTITUTE OF FUNDAMENTAL RESEARCH AS ON 31ST JULY, 1947.

ACADEMIC STAFF:

Dr. H. J. Bhabha, F.R.S.
Prof. D. D. Kosambi
Prof. R. C. Majumdar
Prof. P. S. Gill
Mr. R. P. Thatte
Mr. A. B. Sahiar
Mr. G. H. Vaze
Mr. P. C. Vaidya
Mr. R. R. Daniel
Mr. G. S. Gokhale

ADMINISTRATIVE STAFF:

Mr. N. D. Godbole
Mr. A. E. Ribeiro
Mr. N. R. Puthran
Mr. K. G. K. Menon
Mr. D. N. Nadkarni
Mr. F. R. Bulsara

MAINTENANCE STAFF:

Mr. H. L. N. Murthy
Mr. N. K. Hardikar
Mr. G. V. Vasudevachar
Mr. B. B. Panchakshari

List of Students as on 31st July, 1947.

Dr. Pritam Sen
Mr. A. S. Apte
Mr. G. Abraham
Mr. K. K. Gupta
Mr. Surya Prakash
Mr. Alladi Ramakrishnan

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