Matscience

ANNUAL REPORT 1966

INSTITUTE OF MATHEMATICAL SCIENCES,
MADRAS, INDIA

THE INSTITUTE OF MATHEMATICAL SCIENCES,

MADRAS

"THE PURSUIT OF SCIENCE IS AT ITS BEST WHEN IT IS PART OF A WAY OF LIFE"

ANNUAL REPORT 1966

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Minister for Industries, Government of Madras.

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Professor Alladi Ramakrishnan.

HONORARY PROFESSOR OF ASTROPHYSICS:

Professor S. Chandrasekhar, F.R.S.

Distinguished Service Professor, Enrico Fermi Institute of Nuclear Studies,

University of Chicago, Chicago, Illinois, U.S.A.

Board of Governors

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4. Professor Alladi Ramakrishnan,
   Director,
   The Institute of Mathematical Sciences,
   Madras.

5. Dr. R. Vasudevan,
   Permanent Member,
   The Institute of Mathematical Sciences,
   Madras.

6. Professor P. M. Mathews,
   Department of Physics,
   University of Madras,
   Madras.

Finance Committee

1.	Mr. S. Krishnaswami, I.A.S., Secretary to Government, Education and Public Health Department, Government of Madras. Madras.	Chairman
2.	Mr. G. Ramachandran, I.A.S., Secretary to Government, Finance Department, Government of Madras, Madras.	Member
3.	Professor Alladi Ramakrishnan, Director, The Institute of Mathematical Sciences, Madras.	"
4.	Dr. R. Vasudevan, Permanent Member, The Institute of Mathematical Sciences, Madras.	"

Academic Council

1.	Professor Alladi Ramakrishnan, Director, The Institute of Mathematical Sciences, Madras.	Chairman
2.	Dr. R. Vasudevan, Permanent Member, The Institute of Mathematical Sciences, Madras.	Member
3.	Dr. K. R. Unni, Permanent Member, The Institute of Mathematical Sciences, Madras.	"
4.	Dr. N. R. Ranganathan, Associate Member, The Institute of Mathematical Sciences, Madras.	"

General Information

Aims and Objects

The aims and objects of the Institute are :

1. To create and provide an atmosphere and environment suitable for creative work and the pursuit of knowledge and advanced learning in the Mathematical Sciences for their own sake,
2. To promote and conduct research and original investigation on fundamental sciences in general, with particular emphasis on Mathematics, Applied Mathematics, Theoretical Physics and Astrophysics.
3. To foster a rigorous mathematical discipline, to stimulate a zest for creative work and cultivate a spirit of intellectual collaboration among academic workers in pure and applied branches of science.
4. To arrange lectures, meetings, seminars and symposia in pursuance of its academic work and for the diffusion of scientific knowledge.
5. To invite scientists in India and abroad actively engaged in creative work to deliver lectures and participate in academic activity.

The primary activity of the Institute is creative research in the mathematical sciences. In pursuit of the objectives of the Institute, weekly seminars as well as series of lectures on various topics of interest, both by visiting scientists and the academic staff of the Institute are held.

Academic activities

The Institute organises a Summer School in Theoretical Physics in the month of August in which lectures range from introductory to advanced levels, the aim being to introduce the participants to new developments.

To commemorate the inauguration of the Institute an Anniversary Symposium is held in the first of week of January in which scientists from India and abroad are invited to deliver one hour addresses summarizing their original work or recent advances in various branches of mathematical sciences.

Academic staff

The academic group consists of Professors, Permanent Members and Associate Members of the various faculties, visiting scientists, temporary members, research fellows and research trainees.

Facilities are available for post-graduate students to work for the Ph. D. degree under the guidance of the academic staff of the Institute in various faculties. Senior and junior research fellowships of value Rs. 500/- per mensem and Rs. 300/- per mensem are awarded by the Institute. Besides these, fellowships tenable at the Institute are awarded by the Department of Atomic Energy and Council of Scientific and Industrial Research.

Mode of admission

Memberships (temporary and permanent) of the Institute are made available on invitation or by application to the Director.

Students intending to become research trainees and research ellows of the Institute are expected to apply on prescribed forms which are available on request.

Visiting scientists programme

Facilities are available for visiting scientists to spend a considerable time in the Institute and work in collaboration with the academic staff of the Institute.

Distinguished scientists of established reputation are invited by the Director on behalf of the Board of Governors as Visiting Professors of the Institute. They are expected to stay for six weeks or more and the Institute will pay their travel expenses by air (round trip tourist) from the place of their residence to Madras. An allowance of Rs. 75/- per day will be made available to them during their stay at the Institute.

The Visiting membership programme of the Institute is designed to enable young, active and promising scientists to pursue research and take part in various academic activities of the Institute. Such memberships are available on invitation or by request for such periods as may be fixed in consultation with the visiting members. A living allowance of Rs. 50/- per day and travel expenses by air (round trip tourist) from the place of the residence to Madras are made available to residents outside India and salaries of Rs. 600/- to Rs. 1,500/- to research workers in India. Scientists intending to be admitted under this scheme can contact the Director of the Institute giving particulars of their academic career and indicating the probable period of their stay.

Besides the above, scientists from various institutions may be invited to deliver lectures and seminars for which suitable honorarium will be offered.

Publications

1. **Research papers** (Preprints and reprints are available by request).
2. **Seminar lecture notes** (available by request).
3. **Matscience reports** based on the lecture courses delivered at the Institute both by visiting scientists and academic staff. (Price Rs. 5/- or U. S. $ 1.00 outside India).
4. Proceedings of the Summer School and the Anniversary Symposium published as a series entitled **"Symposia on theoretical Physics"** by the **Plenum Press,** New York.

1966—A New Phase

A new phase

In the fifth year of its existence the Institute has entered a new phase in its growth and development, the significance of which can be estimated only in the years to come.

The origin

The activities of the first four years were naturally determined by the particular circumstances in which the Institute was brought into being. As is well known, the nucleus of the Institute was just a small fraternity of young aspirants to research careers who gathered together in "goodly friendship and indulged in the impertinence of discussing current problems in theoretical physics in the leisured comfort of a family home." Our work was therefore circumscribed by our own special interests in elementary particle physics. But we were quite conscious of our inadequacies and well aware of the all pervasive nature of mathematical discipline. The preamble to the Constitution of our Institute puts unambiguous emphasis on the development of mathematical sciences in the widest possible range.

A significant beginning

In January 1966, a significant beginning was made in pure mathematics with the visit of Professor Hayman from England. It was with his active guidance that we started the Faculty of Mathematics under Professor Unni and his new group of students. It is very gratifying that the co-operation of the international community of mathematicians seems to be as generous and spontaneous as we are having from theoretical physicists. The presence of Professor Williamson from Cambridge is a clear example of this gesture.

Astrophysics

The success in initiating research in pure mathematics has encouraged us to make a similar effort in the field of astrophysics. There could be no better incentive for such an attempt than the affiliation with the Institute of Professor S. Chandrasekhar, one of the greatest astrophysicists of our time, as an honorary professor of our faculty. He would naturally feel very happy that Professor Dallaporta is our first visiting professor in astrophysics lecturing on stellar evolution to a group whose interests hitherto were confined only to elementary particle physics.

Visits of experimenters

While our Institute is devoted to the pursuit mainly of theoretical sciences, we need the presence of experimenters to acquaint us with the current research in the various laboratories of the world. In accordance with these aims, Dr. Charpak from one of the leading experimental groups in CERN is supporting the efforts of Professor Gourdin from Orsay in the lecture series on Unitary Symmetry.

Government support

The expansion in the activities of the Institute has been made possible due to the generous and continuing support from our State Government and the Department of Atomic Energy. This demonstrates their faith and confidence that the activities of our Institute are part of an international endeavour, ' the wholesome consequences of which stretch beyond the domain of science.'

Our benignant sponsor

It is with this spirit we remind ourselves each year at the anniversary celebrations, of the tasks before us as a tribute to our benignant sponsor the late Jawaharlal Nehru. We are grateful to our present Prime Minister for having so graciously consented to naming one of the visiting professorships in honour of her great father.

The year of hope

We greet the new year with the hope and confidence that the rising generation of scientists in India can make increasingly effective contributions to the swelling tide of mathematical thought and physical knowledge in the world today.

ALLADI RAMAKRISHNAN.

News of the Institute

Anniversary Symposium

The Fourth Anniversary Symposium of the Institute, was inaugurated by the late Dr. C. P. Ramaswamy Ayyer, the then Chairman, Inter-University Board on 3rd January 1966.

Among the scientists who participated in the symposium were, Professors Y. Takahashi, Ireland; G. Kallen, Sweden; J. Rzewuski, Poland; W. K. Hayman, England; A. Mercier, Switzerland; and T. Kotani, Japan; Drs. H. Ruegg, Switzerland; B. Gruber, Italy; L. Picman, Finland and J. V. Narlikar, England. Professors R. R. Daniel, Tata Institute of Fundamental Research, Bombay and P. M. Mathews, University of Madras.

Summer School

The Third Matscience Summer School on 'Recent Trends in Theoretical Physics and Mathematics' was held at Bangalore from 27th September to 15th October 1966. Approximately sixty lectures were delivered by the invited lecturers.

Lecturers from the educational institutions in Madras, Bangalore and other institutions in India availed themselves of this opportunity to attend the summer school.

Visiting Scientists

As in the preceding years under the visiting scientists programme supported by the Government of Madras and the Department of Atomic Energy, Government of India, distinguished professors of established reputation as well as younger scientists of great promise have visited the Institute to deliver lectures, participate in seminars, symposium and the summer school and also to collaborate actively with the members of the Institute in their research work.

Matscience—I. I. T. Seminar

The Matscience—I. I. T. Seminars under the auspices of MATSCIENCE and the Department of Mathematics, Indian Institute of Technology, Madras, continued to be held during the year.

Publications

The publications of the Institute include research papers based on work carried out by members of our academic staff and the visiting scientists, MATSCIENCE Reports and seminar lectures. The monthly reports on recent experimental data are being published regularly.

The lectures in our Anniversary Symposia and Summer Schools are published as a series entitled 'Symposia on Theoretical Physics' by the Plenum Press, New York. Volumes I and II have been published and Volumes III to VII are in print or under preparation.

Third Matscience Summer School

The Third Matscience Summer School on Theoretical Physics and Mathematics was held in Bangalore for three weeks from 27th September 1966. The Department of Atomic Energy extended financial support through a generous grant. Professor Alladi Ramakrishnan was the Director of the Summer School and the entire organisation as well as academic matters were left in the hands of the authorities of MATSCIENCE.

The scientists from foreign institutions who participated in the Summer School were: Professor G. Rickayzen, England, Dr. F. Pham, Geneva and Professor Shreeram Abhyankar, U.S.A. Lectures were also delivered by Professor P. M. Mathews, Dr. S. K. Srinivasan, Professor S. Dutta Mazumdar, Professor S. K. Singh, Dr. Pl. Kannappan, Dr. K. M. Khanna, Professor Alladi Ramakrishnan, Dr. R. Vasudevan, Dr. K. R. Unni, Dr. N. R. Ranganathan. Dr. S. R. Roy, Dr. K. Venkatesan, Dr. I. V. V. Raghavacharyulu, Dr. S. C. K. Nair, Mr. T. S. Santhanam, and Mr. Y. Sitaraman. Besides the regular lecture courses, there were also seminars by Professor S. D. Nigam, Professor Shreeram Abhyankar, Professor B. M. Udgaonkar, Professor J. C. Pati and Professor A. N. Mitra.

The other participants at the summer School comprised mainly of the research students and lecturers from educational institutions in Madras, Waltair, Tiruchi and Roorkee.

The proceedings of the summer school are being edited and will be published by Plenum Press, New York, U. S. A. as volume VII of the 'Symposia on Theoretical Physics.'

Delegations

Professor Alladi Ramakrishnan and Professor T. Kotani participated in the Seminar on 'Relativistic Cosmology and Gravitation Theories' organised by the Council of Scientific and Industrial Research on 21st and 22nd February 1966, at Delhi

The Director delivered, on the invitation of the Indian Institute of Science, under the scheme for the exchange of teachers sponsored by the University Grants Commission, four lectures on 'Survey of Recent Developments in Elementary Particle Physics' on 7th, 8th and 9th March, 1966.

Dr. R. Vasudevan, Permanent Member, arrived in Madras on 20th March 1966, after a stay for a period of about nine months at Berkeley, California. During his stay he completed work on some problems in Superconductivity.

Dr. N. R. Ranganathan, Associate Member, resumed duty at the Institute on 3rd March 1966, after a period of three months' stay at Paris and a month at Naples. During his stay abroad he carried out some investigation on Renormalization in Quantum Electrodynamics using Caianiello's approach.

The Director was invited to participate in the International Conference on High Energy Physics at Berkeley from August 31 to September 7, 1966. He was also invited by Professor L. I. Schiff, Department of Physics, Stanford University and Professor E. C. G. Sudarshan, Department of Physics, Syracuse University, U. S. A. He addressed seminars in various centres of research (at the U. S. Naval Research Centre in Washington, New York, Boston, Wisconsin and Los Angeles) on his recent work. He was in the U. S. A. from 9th July and returned to India in the middle of September, 1966.

Faculty of Theoretical Physics

Academic Group

Permanent Staff :

1. Professor Alladi Ramakrishnan — Director
2. Dr. R. Vasudevan — Permanent Member

Associate Members :

1. Dr. N. R. Ranganathan
2. Dr. Radha Gourishankar (On leave)

Temporary Members :

1. Dr. K. Venkatesan
2. Dr. I. V. V. Raghavacharyulu
3. Mr. T. S. Santhanam
4. Dr. S. C. K. Nair * †
5. Dr. K. Ananthanarayanan †
6. Dr. K. S. Viswanathan †
7. Dr. K. Banerjee †
8. Dr. H. S. Mani †
9. Dr. J. G. Kuriyan †
10. Dr. S. R. Roy †

Predoctoral Research Fellows :

1. Mr. T. S. Shankara
2. Mr. J. Krishna Rao †
3. Mr. K. Srinivasa Rao
4. Mr. A. Sundaram
5. Mr. R. Sridhar
6. Mr. S. K. Singh †
7. Mr. A. M. Raval †
8. Mr. J. V. Subramanyan
9. Mr. A. R. Prasanna †
10. Mr. S. N. Siva
11. Mr. D. Radhakrishnan
12. Mr. B. K. Pal ‡ †

* *Pool Officer, C. S. I. R.*

† *Indicates persons who have completed their tenure at the Institute.*

‡ *On deputation from National Physical Laboratory, New Delhi.*

Visiting Scientists :

Prof. G. Kallen (*Sweden*)
Prof. Andre Mercier (*Switzerland*)
Prof. Y. Takahashi (*Ireland*)
Prof. J. Rzewuski (*Poland*)
Prof. T. Kotani (*Japan*)
Prof. B. Vitale (*Italy*)
Prof. B. Moyer (*U. S. A.*)
Prof. P. L. Jain (*U. S. A.*)
Prof. E. C. G. Sudarshan (*U. S. A.*)
Prof. A. M. Sessler (*U. S. A.*)
Prof. G. Rickayzen (*U. K.*)
Prof. D. G. Ravenhall (*U. S. A.*)
Prof. M. Gourdin (*France*)
Prof. N. Dallaporta (*Italy*)
Prof. M. Moshinsky (*U. S. A.*)
Dr. L. Picman (*Finland*)
Dr. B. Gruber (*Italy*)
Dr. M. E. Arons (*U. S. A.*)
Dr. M. Scadron (*U. S. A.*)
Dr. F. Pham (*Switzerland*)
Dr. G. Charpak (*Switzerland*)
Prof. I. Horvath (*Hungary*)

Lecture Courses by Visiting Scientists :

Visiting Scientists	*Period of Visit*	*Title*
Professor Y. Takahashi, Institute for Advanced Study, Dublin, Ireland.	December 1965,– February, 1966	'Introduction to field quantization.'
Professor J. Rzewuski, University of Wroclaw, Poland.	December 1965,– March, 1966	1. 'Lecturers on functional methods.' 2. 'Causality conditions on the mass shell.' 3. 'Spectral representations for the retarded functions.'
Professor G. Kallen, University of Lund, Lund, Sweden.	December 1965,– January 1966	'Discussion with members of the Institute on various aspects of elementary particle physics.'

Lecture Courses by Visiting Scientists—(Cont.)

Visiting Scientists	*Period of Visit*	*Title*
Dr. L. Picman, Institute for Nuclear Research, 'Y-Stefan,' Ljubljana, Yugoslavia.	December 1965,– February, 1966	'Bethe-Salpeter equation and linearised Kinetic equation.'
Professor T. Kotani, Tokyo Metropolitan University, Tokyo, Japan.	December 1965,– March, 1966	1. 'Introduction to Helicity Formalism.' 2. 'The Impact parameter formalism and some applications.'
Professor B. Vitale, Institute of Theoretical Physics, University of Naples, Naples, Italy.	February 1966,– April, 1966	1. 'Clebsch-Gordan series for Semi-simple Lie algebras.' 2. 'Invariance and Non-invariance dynamical symmetries.'
Dr. B. Gruber, University of Naples, Naples, Italy.	December 1965,– February, 1966	'Topological Groups'
Professor E. C. G. Sudarshan, Department of Physics, Syracuse University, Syracuse, N. Y., U.S.A.	May, 1966	'Current algebras and symmetries.'
Dr. M. E. Arons, Courant Institute of Mathematical Sciences, N. Y., U.S.A.	June—July, 1966	1. 'A finite model for quantum electrodynamics.' 2. 'Electromagnetic quantization in Landau gauge.' 3. 'Mass renormalization by Taylor series.'
Dr. M. Scadron, Lawrence Radiation Lab. University of California, Berkeley, U.S.A.	July, 1966	1. 'Formal aspects of potential Theory.' 2. 'Non-dynamics and high-spin.'

Lecture Courses by Visiting Scientists—(contd.)

Visiting Scientists	*Period of Visit*	*Title*
Professor G. Rickayzen, University Physics, Lab., University of Kent, Canterbury, KENT, England.	September— November, 1966	'Theory of Superconductivity.'
Dr. F. Pham, CERN, Geneva, Switzerland.	September, 1966	1. 'Singularities of differential mappings with application to the Landau singularities of the S-matrix.'
Professor N. Dallaporta, University of Padua, Padua, Italy.	December, 1966	'Stellar Evolution.'
Professor M. Gourdin ORSAY, France.	December, 1966	'Unitary Symmetries in Elementary particle physics.'
Professor G. Charpak, CERN, Geneva, Switzerland.	December, 1966	'The recent experimental situation.'

Invited Lectures

Name	*Title*
Professor Andre Mercier, University of Berne, Switzerland.	'General relativity and gravitation'
Professor B. Moyer, University of California, Berkeley, U.S.A.	1. 'Pion nucleon interaction cross sections in elastic scattering' 2. 'The $I=\frac{1}{2}$ amplitudes in π-N scattering'
Dr. P. C. Jain, Department of Physics, State University of New York at Buffalo, Buffalo, New York, U.S.A.	1. 'Ultra high energy nuclear reactions' 2. 'Muon-nucleon interactions'

Invited Lectures—(contd.)

Name	*Title*
Professor P. C. Vaidya, Professor of Mathematics, University School of Sciences, Gujarat University, Ahmedabad.	'Theories of gravitation'
Professor A. M. Sessler, Lawrence Radiation Laboratory, University of California, U.S.A.	'Instabilities of relativistic particle beams'
Professor J. J. Horvoth, Head of the Department of Theoretical Physics, Szeged University, Hungary.	'Internal structure of physical fields'
Mr. P. Babu, Tata Institute of Fundamental Research, Bombay.	'Suzuki-Sugawara Theory of Non-leptonic hyperon decays'
Dr. K. Gopalan, Department of Physics, Indian Institute of Science, Bangalore.	'Measurement of geological time I and II'

Lectures and Seminars by the Members of the Institute:

Name	*Title*
Prof. Alladi Ramakrishnan,	'Physical properties of quarks'
Dr. R. Vasudevan,	1. 'Theory of Superconductivity' 2. 'Superconducting state of the electron gas in a homogeneous magnetic field'
Dr. N. R. Ranganathan,	'Symmetries and elementary particle Physics'
Dr. T. K. Radha,	'Current algebra'
Dr. K. Venkatesan,	1. 'Propagators for particles of higher spin' 2. 'Relativistic wave equations'

Lectures and Seminars by the Members of the Institute--(contd.)

Name	*Title*
Dr. N. G. Deshpande,	1. 'A review of the Adler - Weisberger Renormalization of the axial vector coupling constant'
	2. 'Spontaneous breakdown of symmetries in field theory'
	3. 'Spontaneous generation of symmetries and vanishing renormalization constants in quantum field theory'
Dr. I. V. V. Raghavacharyulu,	1. 'Some combinatorial problems associated with Feynman patterns'
	2. 'Some recent techniques in the representation theory of groups'
Dr. K. Ananthanarayanan,	'Elastic photo-production from nuclei'
Dr. S. C. K. Nair,	1. 'Observations based on CVC and PCAC hypothesis in theory of Nuclear Beta-decay'
	2. 'Group theory and many-body problem'
	3. 'Quadrupole moments and pairing force problems in nuclei'
Mr. T. S. Santhanam,	1. 'Configuration mixing symmetries and elementary particle physics'
	2. 'General invariants of semi-simple groups'
	3. 'Algebra of currents and their densities'
Dr. S. R. Roy,	'Mach's principle and the principle of equivalence'
Dr. Jacob Kuriyan,	'Some representations of non-compact groups'
Dr. H. S. Mani,	'Axial vector coupling in Beta-decay'

Research Papers:

Author	*Title*
Alladi Ramakrishnan	1. 'Some new topological features of Feynman graphs (to be published).'
	2. 'Graphical representation of C P T (to be published).'
	3. 'Some applications of an unfamiliar rule for matrix multiplication (to be published).'
Alladi Ramakrishnan, T. S. Santhanam and A. Sundaram	'Mixing of representations and Baryon-Meson coupling relations (unpublished).'
Alladi Ramakrishnan and I. V. V. Raghavacharyulu	'A new combinatorial feature of Feynman patterns.'
R. Vasudevan and C. C. Sung	'Thermal conductivity due to impurity scattering for super-conductors with overlapping bands.' Physical Review. Vol. 144, P. 237, (1966)
S. K. Srinivasan and R. Vasudevan	1. 'Fluctuation of photoelectrons and intensity correlation of light beams (to be published in Nuovo Cimento).'
	2. 'Stochastic kinetic equations and particle statistics.'
A. K. Rajagopal and R. Vasudevan	'Superconducting state of an electron gas in a homogeneous magnetic field (Physics Letters, Vol. 20, p. 585), (1966).'
N. G. Deshpande	'Vanishing renormalization constants and spontaneous generation of symmetries.'
R. J. Blin-Stoyle and S. C. K. Nair	'Fundamentals of Beta decay theory (A review to appear in Advances in Physics).'
T. S. Santhanam	'Some remarks on the construction of Invarients of local semi-simple Lie groups (to be published in Journal of Mathematical Physics).'
P. Narayanasamy and T. S. Santhanam	'Broken symmetryand Smushkevich principle (to be published in Nuovo Cimento).'

Research Papers—(Contd.)

Author	*Title*
T. S. Santhanam	'P-wave non-leptonic decays of hyperons and representation mixing (Physics Letters **21**, 234 (1966]).'
T. S. Santhanam	'On the spin extension of unitary groups (unpublished).'
H. Ruegg, W. Ruhl and T. S. Santhanam	'The relativistic generalization of SU(6) and its applications (to be published).'
T. S. Santhanam	'Representation mixing in static SU(6) and the relation between 6_a and (D/F) Ax. (unpublished).'
B. Gruber and T. S. Santhanam	'On the Clebsh-Gordan problem in SU(3) (pre-print).'
Kalyan Banerjee	'Isotope effects of osillator strengths;' Comments on a recent paper (sent to Proceedings of Physical Society)
Alladi Ramakrishnan, R. Vasudevan and S. K. Srinivasan	'Scattering phase shift in stochastic fields' (Zeitschrift Fur Physik Vol. 196, No. 2, 1966)
K. Srinivasa Rao	'Elastic scattering of negative pions by Aluminium.'
K. Srinivasa Rao, S. K. Singh and S. C. K. Nair	'A shell model study of 42_{Ca} and 43_{Ca} energy levels.'

List of Matscience Reports (1965-66):

Report No.	*Author*	*Title*
44	H. Ruegg	'Relativistic generalization of SU_6'
46	Ph. Meyer	'Selected topics in Weak Interactions.'
47	J. Rzewuski	'Gauge transformations in quantum field theory.'
49	P. C. Vaidya	'Selected topics in Gravitation.'
50	K. Venkatesan	'Report on recent experimental data (1966).'

Faculty of Astrophysics

Permanent Staff:

1. Professor S. Chandrasekhar (Distinguished Service Professor, University of Chicago, U.S.A.)	Honorary Professor

Faculty of Mathematics

Research Group

Permanent Staff:

1. Dr. K. R. Unni — Permanent Member

Post-doctoral Researeh Fellow:

1. Mr. Y. Sitaraman

Pre-doctoral Research Fellows:

1. Mr. N. R. Nandakumar
2. Miss P. K. Geetha
3. Mr. Kumaran Kutty *
4. Mr. G. N. Keshava Murthy
5. Mr. M. R. Subrahmanya

Visiting Scientists

Prof. W. K. Hayman (*U. K.*)

Prof. Louis Sucheston (*U. S. A.*)

Prof. Ernst G. Straus (*U. S. A.*)

Prof. J. H. Williamson (*U. K.*)

Lecture Courses by Visiting Scientists

Visiting Scientists	*Period of Visit*	*Title*
Professor W. K. Hayman, F.R.S., Professor of Mathematics, Imperial College, London.	December 1965, January 1966	'Transfinite diameter and its applications.'
Professor J. H. Williamson, Departmemt of Mathematics, University of Cambridge, England.	December 1966, January 1967	'Representation theory for Banach Algebras and for locally compact groups.'

* Indicate persons who have completed their tenure at the Institute.

Invited Lectures

Name	*Title*
Dr. Katifi, Department of Mathematics, Battersea College of Advanced Study, London, England.	'On integral function bounded on certain tracts'
Dr. S. Swaminathan, Associate Professor, Indian Institute of Technology, Kanpur.	Recent work concerning spectral theorem'
Dr. Z. Govindarajulu, Case Institute of Technology, Ohio, U.S.A.	'On characterization of certain distributions using order statistics'
Professor Louis Sucheston, Ohio State University, Ohio, U.S.A.	'Ergodic theorem'
Professor Ernst G. Straus, University of California, Los Angales, U.S.A.	'Arithmetic of analytic functions and transcendentality proofs'
Professor L. D. Kudryavtsev, Steklov Mathematical Institute, U.S.S.R.	
Professor V. Krishnamurthy, Professor of Mathematics, Birla Institute of Technology and Sciences, Pilani, Rajasthan.	'Duality theory in locally convex spaces'
Dr. Pl. Kannappan, Reader in Mathematics, Annamalai University, Annamalainagar.	'Functional Equations'

Lectures and seminars by members of the Institute :

Name	*Title*
Dr. K. R. Unni,	1. 'Concepts in Modern Mathematics II' (Topology) (Series)
	2. 'Concepts in Modern Mathematics III' (Analysis) („)
Mr. Y. Sitaraman,	'Summability processes and Tauberian constants'
Mr. Kumaran Kutty	'Factor Analysis'

Research Papers :

Name	*Title*
Dr. K. R. Unni	1. 'Functions of exponetial type'
	2. 'Inequalities for weighted entire functions' (to appear in Tohoku Mathematical Journal.
Y. Sitaraman	1. 'Tauberian theorems for infinite logarithmic summability (L)' (to appear in Monatshete fur Mathematik).
	2. 'A High indices theorem for (A α, λ) Summability.' (Communicated to Mathematische Zeitschrift).

Matscience Reports :

45	W. K. Hayman	'Transfinite diameter and its applications'
48	P. L. Kannappan	'Theory of functional equations' (under preparation)
51	K. R. Unni	'Concepts of modern mathematics II' (Topology)
52	K. R. Unni	' „ III' (Analysis)
53	V. Krishnamurthy	'Duality Theory in locally convex spaces'
54	J. H. Williamson	'Representation theory for Banach algebras and locally compact groups'

The supplementary lectures in Mathematics given at the symposium and the summer school are included in the "Symposia on Theoretical Physics" published by Plenum Press.

Collaboration with Universities

With its permanent staff, its steady influx of visiting scientists and a well-equipped library the Institute is able to offer facilities for post-graduate students to work in pursuance of the Ph. D. degree of their respective Universities.

It is gratifying that the Mysore University is the first to take advantage of these facilities and agree to the registration of the M.Sc. graduates for the Ph. D. degree. Mr. T. S. Shankara a research scholar at the Institute is the first candidate for such registration.

The list of persons who have worked under Professor Ramakrishnan before and after the inception of the Institute and obtained their Ph. D. degrees are given below:—

Before the inception of the Institute:

Dr. P. M. Mathews	1956	Dr. R. Vasudevan	1960
Dr. S. K. Srinivasan	1957	Dr. N. R. Ranganathan	1961

After the inception of the Institute:

Dr. K. Venkatesan	1963	Dr. S. Indumathi	1963
Dr. V. Devanathan	1963	Dr. G. Ramachandran	1964
Dr. T. K. Radha	1963	Dr. K. Raman	1965
Dr. Thunga Satyapal	1963	Dr. R. K. Umerjee	1965
Dr. A. P. Balachandran	1963	Dr. K. Ananthanarayanan	1965
Dr. G. Bhamathi	1963		

Matscience—I. I. T. Seminar

Professor A. Ramakrishnan	'CPT in the Feynman formalism of quantum electrodynamics.'
,,	'Present status of SU (3).'
Dr. S. K. Srinivasan	'Product densities and the Kinetic theory of gases and liquids.'
,,	'A Novel approach to Kinetic theory.'
Dr. N. R. Ranganathan	'Schwinger terms in current commutation relations.'
Dr. P. Gopichand	'Particle motion in fluid beds.'

Library

During the period under report (January-December 1966) 1400 new books (including bound periodicals) were added to the library, bringing the total number of volumes to 6,200. These include many of the recent publications in Mathematics and Physics.

The following back numbers of periodicals were added to the library.

Pacific Journal of Mathematics. Vol. 2 (1952)—Vol. 8 (1958).
Helvetica Physica Acta. Vol. 1 (1928)—Vol. 34 (1961).
Annual Review of Nuclear Science. Vol. 1 (1952)—Vol. 13 (1963).
Reports on Progress in Physics. Vol. 1 (1934)—Vol. 26 (1963).
Zeitschrift Fur Physik. Vol. 150 (1958)—Vol. 165 (1961).
Proceedings of the Physical Society. Vol. 66 (1953)—Vol. 78 (1961).
Acta Mathematica. Vol. 100 (1958)—Vol. 110 (1963).
Physical Review. Vol. 75 (1949)—Vol. 93 (1954).
Illinois Journal of Mathematics. Vol. 1 (1957)—Vol. 7 (1963).
Proceedings of the Cambridge Philosophical Society.
Vol. 50 (1954)—Vol. 57 (1961).

JOURNALS:

Fifty one new journals (see list) were subscribed to, during the period, bringing the total number of periodicals received on subscription basis to one hundred and seventeen (117). Periodicals received on exchange basis from institutions all over the world are being received regularly.

List of New Journals:

Archiv der Mathematik.
Archive for Rational Mechanics and analysis.
Canadian Journal of Mathematics.
Communications in Mathematical Physics.
Journal of Acoustical Society of America.
JETP letters.
Proceedings of the American Mathematical Society.
Proceedings of the National Academy of Sciences. U. S. A.
Review of Scientific Instruments.
Journal of Optical Society of America.
Soviet Physics—Acoustics.
Soviet Physics—Solid state.
Optics and spectroscopy.

List of New Journals:

Proceedings of London Mathematical Society.

Quarterly Journal of Mathematics (Oxford series).

Topology.

Solid State Communications.

Optica Acta.

Transactions of American Mathematical Society.

Acta Mathematica Sinica.

Zeitschrift Fur Angewandte Mathematik and Physik.

Matrix and tensor quarterly.

Journal of Australian Mathematical Society.

Russian Mathematical Surveys.

Zeitschrift Fur Astrophysik.

SIAM Journal of Applied Mathematics.

SIAM Journal of Control.

SIAM Journal of Numerical analysis.

Zentralblatt Fur Mathematik und ihre Grenzgebiete.

Numerische Mathematik.

Proceedings of the Royal Society of Edinburgh.

Proceedings of the Edinburgh Mathematical Association.

Proceedings of the Glasgow Mathematical Society.

Scripta Mathematica.

Journal d'Analyse Mathematique (Jerusalem).

Acta Physica Hungarica.

Acta Physica Austriaca.

Journal of the Royal Astronomical Society.

Philosophical Transaction of the Royal Society.

Transactions of the Faraday Society.

Australian Journal of Physics.

Journal of LONDON Mathematical Society.

American Mathematical Monthly.

Journal of Atmospheric Sciences.

Mathematische Annalen.

Journal de Physique.

Radio Engineering & Electronic Physics (IEEE).

Mathematische Zeitschrift.

Journal of Mathematical Society of Japan.

Nuclear Data (Parts A & B).

Lists Published:

1. List of Preprints received in the library (issued fortnightly).
2. List of Periodicals (issued yearly).
3. List of Matscience reports (issued yearly).
4. List of Reprints (issued yearly).

Resolution passed at MATSCIENCE on the 11th January, 1966 mourning the passing away of our esteemed Prime Minister Lal Bahadur Shastri

We are shocked out of our senses by grief and anguish at the passing away of our dear and esteemed Prime Minister Lal Bahadur Shastri within a few hours after the Tashkent declaration. It looks as if he has been ordained by God to be the instrument for the restoration of peace and harmony in this troubled sub-continent and leave the scene at the appointed hour.

It was only sixteen months ago that the mantle of Nehru, the apostle of a resurgent and re-awakened Asia, fell on him. He bore it with courage and confidence and under his leadership, the country emerged with hope and success through one of the greatest ordeals it had ever faced in its almost ageless history. Conscious of his responsibilities to a nation threatened by the invasion of its time-honoured frontiers, he displayed great magnanimity in agreeing to discuss his country's problems at the instance of the Soviet Government. He has left us in the manner of a 'Krithakarya' with the message that it is now time to 'unarm, for the long day's work is done.' Thereby he has earned the gratitude of thousands of millions of our country who 'can now look forward to the satisfactions' of safety assured, of peace restored, honour preserved, of the comports of fruitful industry, of the home-coming of the soldiers,' of the smiles of their wives and children. With all these will be mingled the ache for him who, in his hour of greatest triumph, could not come home.

Resolution passed at MATSCIENCE, Institute of Mathematical Sciences, Madras (India) on 25th January 1966 at 11-30 A.M. mourning the passing away of Professor H. J. Bhabha, F.R.S., a member of the Board of Governors of the Institute of Mathematical Sciences (Secretary to the Department of Atomic Energy, Government of India and Chairman of the Atomic Energy Commission, India). The Hon'ble Mr. R. Venkataraman, Board of Governors of the Institute and Minister for Industries, Government of Madras, presided over the meeting.

It is impossible to express in words the shock and anguish at the death of Professor Bhabha in the most tragic circumstances one could ever imagine. He was the most legendary figure in Indian science, the striking feature of that legend being that every part of it was true.

He was born to be a theoretical physicist of worldwide reputation. He sought and grasped opportunities with undiminished vigour and uninterrupted success characteristic of a man destined to fame and fortune. A true product of this triumphant era of modern science, his early association was with the great masters — Pauli in Zurich, Dirac in Cambridge, Bohr at Copenhagen and Kramers in Holland. He entered the Indian scientific scene in his early thirties, fresh from his laurels after the formulation of the cascade theory and the award of the fellowship of the Royal Society. Every scientist in India who had the slightest contact with or feeling for modern physics, knew that something miraculous was going to happen from the small beginnings of the cosmic ray research unit under Dr. Bhabha in the Indian Institute of Science. They had not to wait too long to see the gigantic edifice of the Tata Instituie of Fundamemtal Research rise overlooking the lapping waters of the Arabian Sea. What is more, this ancient land where methods of agriculture have not changed since the dawn of civilisation, under his leadership joined the worldwide effort for harnessing atomic energy for peaceful purposes. This revolution in thought and in deed is bound to alter the course of the economic development of this country of teeming millions.

This movement has the specific consequence that the pursuit of science, instead of being confined to the ivory tower, has now become a profession, the achievements of which will affect the daily lives of our people.

The legacy of Bhabha is the desire for excellence in the Mathematical and physical sciences and more generally in the fascinating endeavour of understanding nature.

The Plenum Press Series

on

"Symposia on Theoretical Physics"

Edited by ALLADI RAMAKRISHNAN

The proceedings of the Summer Schools and Anniversary Symposia of the Institute are published in a series entitled "Symposia on Theoretical Physics" by the Plenum Press, New York, a division of the Consultants Bureau Enterprises Inc. Volumes I and II have been published and volumes III to VII are in the course of publication.