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 1969

Patron :

Mr. C. Subramaniam

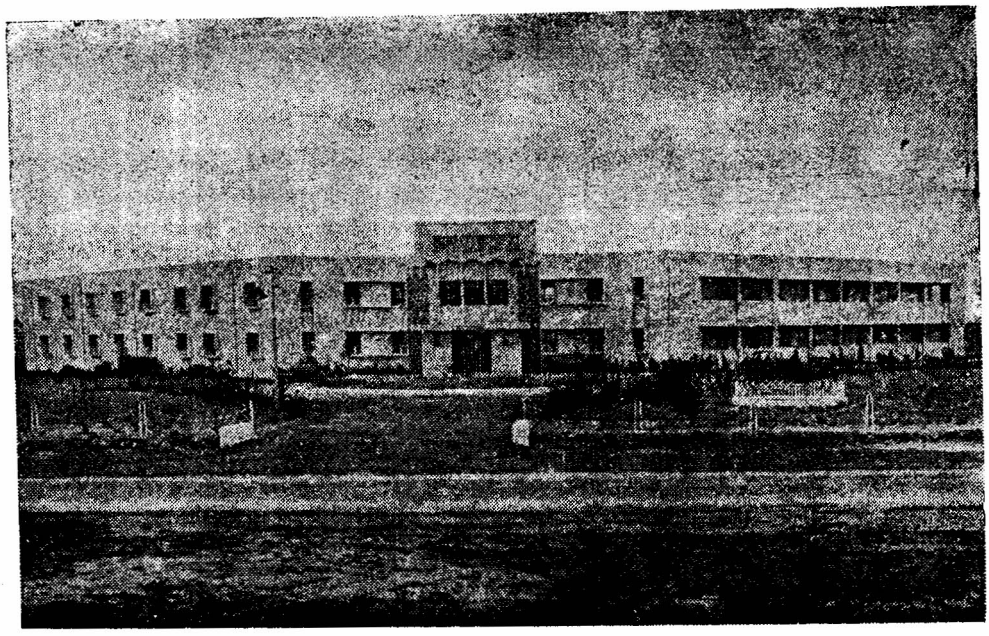
Chairman of the Board of Governors :

Mr. V. R. Nedunchezhiyan

Minister for Education, Government of Tamil Nadu

Director :

Professor Alladi Ramakrishnan



The new premises of the institute.

Hon'ble Mr. V. R. Nedunchezhiyan, cutting the tape,
at the opening ceremony of the new building

1969 - IN RETROSPECT

Grateful pride

We greet the President of India with grateful pride and unconcealed emotion as we enter the ninth year of our career, feeling conscious, almost of an established tradition on the one hand and the excitement of an uncharted future on the other.

Most momentous year

How else could it be, for the year 1969 stands out as the most momentous year in human history when man transcended his earthly domain to mingle with the universe around him. All of us must be thankful to Providence just to be alive to wonder at the marvel of hearing a human voice from the 'moist star,' an opportunity denied to Copernicus, Kepler, Galileo, Newton and Einstein who read the laws of the universe and interpreted the ways of planets to earthbound man.

Quarks to Quasars

In a deeper sense, they were not denied the thrill, for such creative minds experience an exaltation as intense as that of the astronauts who landed on the Elysian, windless, wilderness of the lunar surface. By sheer power of mathematical reasoning and farsighted perception they deduced and discovered the nature of the entire ranged universe, from quarks to quasars.

A haven of learning

Is it not a rightful ambition to participate in this great adventure of the human mind? Our intellectual heritage, dating back to the time when mankind elsewhere was emerging from its swaddling clothes, is particularly suited for the passionate experience of deep contemplation. Amidst the fitful fever for technological advancement we dreamed of a haven of learning with intellects palpitating in realms of thought and creative minds seeking the thrills of innovation and discovery. This became a reality when the Government of Tamil Nadu took the bold and imaginative step of creating such an institute on that memorable day, 3rd January, 1962, an act hailed with acclamation by over a hundred centres of advanced learning and research all over the world. The high responsibility for the enterprise was assumed by the late Prime Minister Nehru and Mr. C. Subramaniam, then Finance and Education Minister of our State. It is very gratifying that the Tamil Nadu Government continues to support us with undiminished enthusiasm and generosity, thanks to the present Chairman of the Board of Governors Mr. V. R. Nedunchezhiyan.

Gell-Mann era

The period of eight years has coincided with what can be called the Gell-Mannic era of modern physics when the most gifted minds have been struggling to understand the proliferation of elementary particles and reach for the fundamental constituents of matter. The exciting phase in modern physics started with the formulation of the famous Gell-Mann—Nishijima relation which, in the words of a Noble Laureate of Berkeley, inspired a sense of awe, reminiscent of Champillon's success in deciphering the hieroglyphics on the Rosetta Stone.

New mathematical methods

During the last decade thousands of scientists in universities and laboratories have been ceaselessly striving to comprehend the significance of the new quantum number in the Gell-Mann—Nishijima relation. It was again given to Gell-Mann to incorporate the new quantum number into an algebraic structure known to mathematicians long ago as the Lie group but now applied with shattering power to dispel the puzzling mysteries of modern physics. By a series of fortuitious circumstances, we seem to be directly involved in this pursuit, albeit by the use of purely mathematical methods. Our investigations have led us to the belief that a better understanding of modern physics may be achieved by new extensions of another old mathematical structure known as the Clifford algebra discovered in the last century. Our efforts have led us to a hitherto unknown generalisation of the Gell-Mann—Nishijima relation in which additional quantum numbers could be included in a logical, self-consistent manner. We await the judgement of the scientific community following the inviolable law of the scientific world that one has not really made a contribution until he has convinced his peers that he has done so.

Our Niels Bohr professor

We therefore thought that it was appropriate to choose as the subject of this symposium "the pageant of modern physics from Planck to Gell-Mann" spanning the seven decades of this century. It is our proud privilege to have Professor Hans Bethe with us as the Niels Bohr visiting professor at our Institute presiding over the eighth anniversary symposium in which distinguished scientists from various countries are participating.

Promise of future

Our Institute has to be judged not only by its present achievements but by the promise of future opportunities to the rising generation of scientists in India seeking an honoured place in the competitive arena of international effort. With an institution like this, supported by generous sponsors and by the enthusiasm of its alumni, we are confident that a future Ramanujan can seek his Hardy within the geographical domains of his native land. While we are aware of the universality of knowledge and the internationalism of science, we believe that Indian talent should be nourished on its own soil and seek fulfilment in the land of its birth.

High endeavour

We shall not be content with basking in an island of excellence. We desire to play a significant role in the economic regeneration of our country. Our Institute is interested in mathematical sciences in all their ramifications and we are anxious to promote creative technology by providing mathematical talent that will be needed for advanced projects in the years to come. In this high endeavour, we need all the goodwill in the world, the sympathetic concern of the discerning citizen and the creative effort of the academic community. We seek the benediction of our President and the unqualified support of the Government of India and the State of Tamil Nadu.

ALLADI RAMAKRISHNAN

General Information

Aims and Objects

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 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

To commemorate the inauguration of the Institute an Anniversary Symposium is held in the first 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. The Institute organises a Seminar in Analysis in December - January in which lectures range from introductory to advanced levels.

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.

Ph.D. Programme

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 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.

The Standing Committee of Inter-University Board of India and Ceylon at its meeting held on February 28, 1967 adopted a resolution recognising the Institute of Mathematical Sciences as a suitable centre for research work. In view of the above resolution the Institute is now recognised by the various Indian universities as a centre for research for a doctorate degree in Theoretical Physics and Mathematics.

Mode of Admission

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

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

Visiting Scientists Programme

Facilities are offered to visiting scientists to spend a considerable time in the Institute and work in collaboration with the academic staff of 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. Scientists intending to be invited 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 on request)

2. 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 outside India)

3. PROCEEDINGS OF THE SEMINAR IN ANALYSIS (based on lecture courses delivered at the Institute by Visiting Scientists or members of the Institute during the Annual Seminar in Analysis. 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 AND MATHEMATICS' by the PLENUM PRESS, New York.

News of the Institute

Opening of the New Building

On 20th January, 1969, the Institute moved into its own premises which was opened by Hon'ble Mr. V. R. Nedunchezhiyan, Minister for Education, Government of Tamil Nadu Mr. C. Subramaniam, Patron of the Institute and Dr. Atma Ram, Director General; CSIR were also present at the function.

Anniversary Symposium

The Anniversary Symposium in January 1969 was as successful as the previous meetings due to active participation of scientists from various countries. The symposium, seventh in the series, was inaugurated by Dr. Atma Ram, Director-General, CSIR on 20th January. Among the scientists who participated in the symposium were: Marshall H. Stone (USA), O. Lehto (Finland), J. Krzyz (Poland), T. H. Ganelius (Sweden), S. R. Valluri (Bangalore), S. N. Roy Chaudhury (Bangalore), R. Narasimha (Bangalore), Kameswara Rao (Bangalore), R. Sankaranarayanan (Bangalore), V. M. Ghatage (Bangalore), M. V. Arunachalam (Madras), Alladi Prabhakar (Hyderabad), S. K. Srinivasan (Madras), Raj Mahendra (Bangalore), (Late) T. Muthian (Madras), C. R. Narayana Rao (Madras), Y. S. N. Murthy (Hyderabad). B. Ramamoorthy (Madras).

Visiting Scientists

As in the previous years, under the visiting scientists programme supported by the Government of Tamil Nadu 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, symposia and also to collaborate actively with the members of the Institute in their research work.

One day Symposium

A one day symposium on "Computers in science and industry" intended to focus the attention on the uses made of computers now available in Madras and at TIFR, Bombay for solving problems in Nuclear Physics and Fluid dynamics, was held on March 28, 1969. The symposium was inaugurated by

Professor Alladi Ramakrishnan and was presided over by Mr. A. P. Jambulingam, Principal, Technical Teachers Training Institute, Madras. Among the participants were : Dr. S. Nagarajan (Madras), Mr. M. S. Jayaraman (Madras), Mr. S. Sivaraman (Madras), Dr. V. Devanathan (Madras).

Colloquium series

A weekly colloquium on topics of current interest was started this year. As many as 80 lectures were given in this series.

Publications

The publications of the Institute include research papers based on work carried out by members of our academic staff and the visiting scientists, and MATSCIENCE Reports.

The lectures in our Anniversary symposium and Winter seminars are published as a series "Symposia on Theoretical Physics and Mathematics" by the Plenum Press, New York. Volumes I to IX have been published and Volume X is under preparation.

Professor Carl Friedrich von Weizsacker, Director. Max Planck Institute of Futurology, Germany with the Director

■ Academic Staff

Faculty of Theoretical Physics

Permanent Staff

Professor Alladi Ramakrishnan — *Director*
Dr. R. Vasudevan — *Permanent Member*

Associate Member

Dr. N. R. Ranganathan

Members

Mr. T. S. Santhanam
Dr. R. Pratap
Dr. Ramesh Chand
Dr. K. H. Mariwalla §
Dr. K. Ananthanarayanan §
Professor V. V. L. Rao ‡

Senior Research Fellows

Mr. K. Srinivasa Rao
Mr. A. Sundaram *
Mr. S. Nagarajan
Mr. R. Sridhar *

Junior Research Fellows

Miss Nalini B. Menon *
Mr. P. S. Chandrasekharan
Mr. K. Murari §

Faculty of Mathematics

Permanent Staff

Dr. K. R. Unni — *Permanent Member*

Junior Research Fellows

Mr. N. R. Nandakumar
Mr. M. R. Subrahmanya
Mr. G. N. Keshava Murthy
Miss P. K. Geetha*
Miss Vimala Walter ‡

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§ Indicates persons who have completed their tenure at the Institute
‡ Working under the C.S.I.R. Scheme
* C.S.I.R. Fellowships

Staff of the Institute

PROF. ALLADI RAMAKRISHNAN
Director of the Institute
Professor of Theoretical Physics

B.Sc. (Hons.) (Madras) 1943; Ph.D. (Manchester) 1951; Elected Fellow of the Indian Academy of Sciences, 1955: Visiting member at the Institute for Advanced Study, Princeton 1957–58; Visiting Prof. at the University of Sydney 1954; at the University of Berne 1960, at the International Centre for Theoretical Physics, Trieste 1965, 1967, 1968; Professor of Theoretical Physics at the University of Madras till January 1962. Mathematical consultant to the Rand Corporation, California.

Editor of the series 'Symposia on Theoretical Physics and Mathematics,' Plenum Press, New York, U.S.A.

Associate Editor of the 'Journal of Mathematical Analysis and Applications,' Academic Press (New York and London).

Executive Editor of the 'I.I.T. Journal of Mathematical and Physical Sciences' (Madras) India.

Has published over a hundred papers on stochastic processes and elementary particle Physics.

Author of

1. Elementary Particles and Cosmic Rays, Pergamon Press, 1962

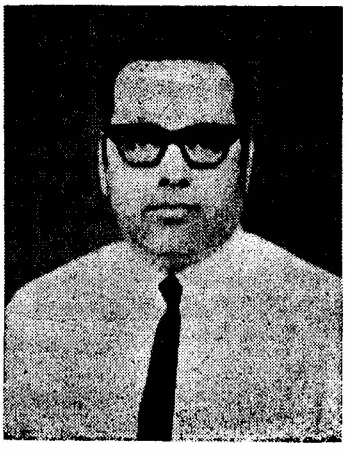
2. The article entitled 'Probabitity and Stochastic processes' appeared in Vol. III of Handbuch der Physik, Springer Verlag (1954)

In addition participated at more than twenty international conferences and lectured at various centres of mathematical sciences in US., Canada, Europe, Japan and Australia, as for example Massachusetts Institute of Technology,

Case Institute, Illinois Institute, Naval Research Laboratory, The Boeing and Douglas Research Laboratories and National Bureau of Standards, Washington, the Universities of California at Los Angeles, Berkeley and Irvine; Stanford, Boston, Chicago, Brandeis, Maryland, Rochester, Honolulu, Seattle, St. Louis, Buffallo, Milwaukee and Madison (U.S.A.); Oxford, Manchester, Atomic Energy Establishment Harwell and London (U.K.); Marburg, Stuttgart, Zurich, Bern, Rome, Naples, Padua, Trieste, Paris, Saclay, Geneva, CERN (Europe): Kyoto, and Tokyo (Japan), Melbourne Canberra and Sydney (Australia), Moscow and Leningrad (U.S.S.R.) and Ottawa, Toronto, Montreal and Vancouer (Canada).

Sixteen students have taken Ph.D. under his guidance during the period. 1952 – 1968. Among them are :—

Professor R. Vasudevan, Permanent Member, MATSCIENCE. Professor S. K. Srinivasan, Indian Institute of Technology, Madras. Professor P. M. Mathews, University of Madras, Madras.



DR. R. VASUDEVAN
Permanent Member
Faculty of Theoretical Physics

B.Sc. (Hons.) (Madras) 1947; M Sc. (Madras) 1955; Ph.D. (Madras) 1959; Lecturer in Physics in various Government Colleges in Madras. Government service upto 1956; Senior research physicist at University of California, La Jolla, 1959 - 61; University of California, Berkeley 1961-63; Consultant, Rand Corporation, California, 1961-64; Research Associate, University of California, Berkeley, 1965-66; Visiting Professor University of Naples, Italy, 1967-68.

Member of the Editorial Board of the I.I.T. Journal of the Mathematical and Physical Sciences, (Madras) India.

In addition: participated in international conferences, lectured at various Universities.

Dr. K. R. UNNI
Permanent Member
Faculty of Pure Mathematics

B.A. (Hons.) (Madras) 1955; M. S. (Utah State University) 1961; Ph,D. (Northwestern University) 1963; Lecturer in Annamalai University, 1955-1959; Assistant Professor, Utah State University, 1963-1964: C.S.I.R. Pool Officer MATSCIENCE 1965.

Invited participant at the sixth session of the Seminaire de Mathematiques superieures on "Complex Analysis," Universite de Montreal, Canada, 1967.

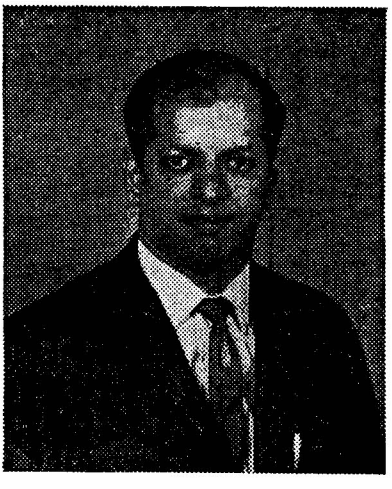
Reviewer for :

I. Mathematical reviews.

2. Zentralblatt for mathematik and ihere Grenzgebiete,

Member of the American Mathematical Society, Indian Mathematical Society and Pi Mu Epsilon

In addition: lectured at various international centers of Mathematics.



DR. N. R. RANGANATHAN

Associate Member

Faculty of Theoretical Physics

B.Sc. (Hons.) (Madras) 1954 ; M.Sc. (Madras) 1955 ; Ph.D. (Madras) 1961 ; Research Associate, Brandeis University, 1961 - 63 ; Visiting Scientist, University of Naples, Italy, 1965. Visiting Lecturer, University of Kashmir, 1969.

DR. RAMESH CHAND

Temporary Member

Faculty of Theoretical Physics

B.Sc. (Hons) (Delhi) 1954; M.Sc. (Delhi) 1956; Ph D. (Chicago) 1962; Instructor of Physics, Syracuse University, 1962-64; Assistant Professor of Physics, Wayne State University. 1964-67; Visiting Physicist, Syracuse University Summer 1967, Associate Professor of Physics, Wayne State University, 1967-69; Recepient of 964-1965 Wayne State University Research Recognition Award, Chairman of the International Conference on Symmetries and Quark Models, Wayne State University, June 18-20, 1969.

MR. T. S. SANTHANAM

Temporary Member

Feculty of Theoretical Physics

B.Sc. (Madras) 1960. distinction in Physics; M.Sc. (Madras) 1962, First Rank Dr. K. S. Krishnan Gold Medalist; Research degree from the National Institute of Nuclear Physics, Trieste (1966); Awarded for the review article written in colloboration with H. Ruegg and W. Ruhl in Helvetica Acta Physica; Lectured in various centres of research in Europe which include C.E.R.N., Geneva, Switzerland (1966)

Reviewer for

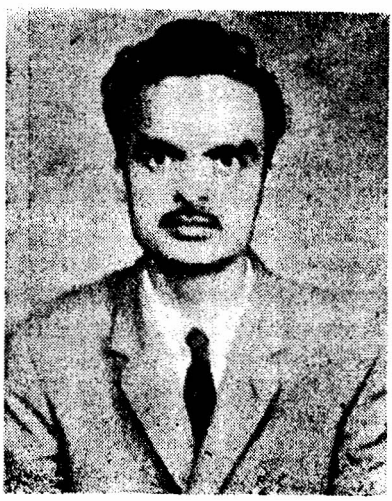
Zentralblatt for Physik

DR. I. V. V. RAGHAVACHARYULU

Temporary Member

Faculty of Theoretical Physics

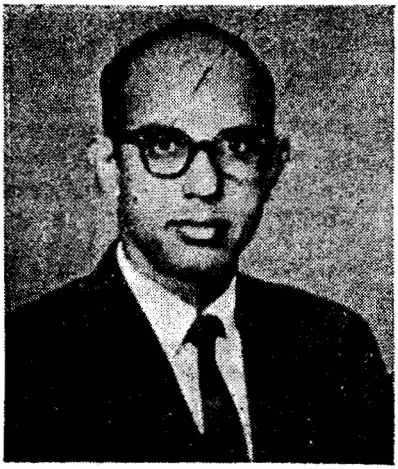
B.Sc. (Hons.) (Andhra) 1954; M.Sc. (Andhra) 1955; D.Sc. (Andhra) 1958; Reader, Annamalai University, 1959 - 62; Post doctorate Research Fellow, Uppasala University Sweden, 1962 - 64; Reader Annamalai University, 1964 - 65; Temporary Member, Matscience, 1965 - 66; Reader, Regional College of Education, Mysore, 1967. 1968;



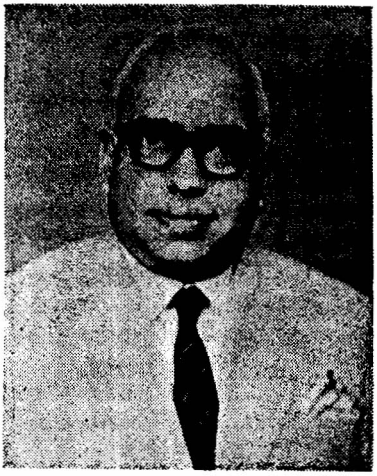
DR. R. PRATAP

Temporary Member

Faculty of Theoretical Physics



B.Sc. (Ernakulam) 1942; M,Sc. Bombay 1947, Ph.D. (Bombay) 1952; Lecturer in Physics, Siddharth College, 1946 - 55; A.E.C. Research Fellow, B.E. College, Howrah, 1955 - 56; N.R. C. Fellow, Domihion Observatory, Ottawa, Canada, 1956 - 58; Fellow, Tata Institute of Fundamental Research, Bombay, 1959 - 65; Bursie-at University Libre de Bruxelles, Belgium 1965-67; Research Scientist Associate, University of Texas, Austin, 1967 - 68.



PROFESSOR V. V. L. RAO

C. S. I. R. Scientist

Member, Matscience

B.Sc. (Elec.), D.I.C. (Lond.) D.M.S.W.C. (Chelmsford), M.I.E (India). Fellow IEEE, New York, 1965, Did post-graduate and research work at I.I.S., Bangalore, Author of over twenty technical papers and a number of books on Units, particularly, SI, Member of a number of professional Institutions in India, U.K., U.S.A.

Directed Refresher course on 'SI Units' for teachers in engineering colleges in the Southern zone at IIT, Madras, 1969.

Delegations

Professor Alladi Ramakrishnan, Director of the Institute made a global tour for three months in summer, to lecture at various research centres on his recent work in "Clifford algebra and Elementary Particle Physics." He had been invited to various universities in Japan, U.S.A., Canada and Europe. He lectured at about 25 research institutions including Tokyo University of Education, Tokyo, Japan; University of California, New York; Montreal, McGill, Edmonton (Canada), Cornell, Stanford, Washington, Syracuse, Detroit, etc. in U.S.A. and the Imperial College, London, the Atomic Energy Commission at Saclay, France and the University of Bern, Switzerland. He spent a couple of weeks at the Douglas Aircraft Research Centre at Los Angeles and the University of Syracuse at Syracuse. He also visited and lectured at the General Motors Research Laboratory, Detroit about application of stochastic theory to traffic flow. He was invited to give an expository lecture on his latest work at the International Conference on High Energy Physics at Detroit in the last week of June.

Dr. R. Vasudevan, Permanent Member was deputed to give a series of lectures at the Tata Institute of Fundamental Research, Bombay during March 1969.

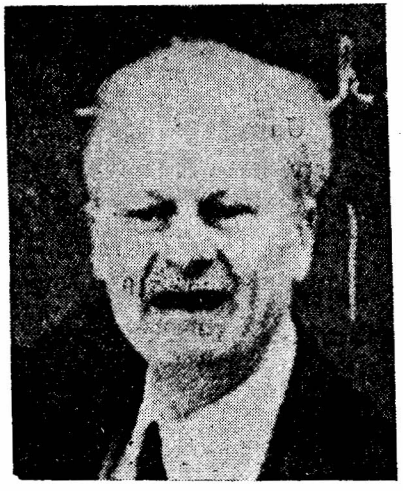
Dr. K. R. Unni, Permanent Member was invited to give a lecture at the Conference on "Functional Analysis" held at the Indian Institute of Technology, Kanpur during December 12—21, 1969.

Dr. N. R. Ranganathan was deputed to the University of Kashmir, Srinagar for six weeks to deliver a course of thirty lectures on advanced quantum mechanics and field theory for the M Sc. (Physics) class. He was also invited as a guest lecturer in the U.G.C. Summer Institute for college teachers conducted by University of Madurai, during June 1969, where he delivered three lectures on elementary quantum field theory.

Mr. T. S. Santhanam gave a series of lectures at the Saha Institute of Nuclear Physics, Calcutta. He was invited as a Visiting Scientist to the International Centre for Theoretical Physics, Trieste Italy for a period of three months, June–August, 1969.

"At inauguration of the Institute of Mathematical Sciences in Madras the whole group of the Copenhagen Institute for Theoretical Physics wants to send its heartiest felicitations. The community of physicists has been impressed by the vigour and zeal with which Professor Ramakrishnan has been able to educate and inspire his young pupils and collaborators. and the work in the new Institute will be followed with keen expectations. Indeed as an important asset to scientific research in India the creation of the Madras Institute is eagerly welcomed in that world-wide cooperation in science which offers so great opportunities for promoting the understanding between all peoples"

—Message by cable from Professor Niels Bohr at the Inauguration of the Institute



Hans A Bethe received the 1967 Noble prize for " his contributions to the theory of nuclear reactions especially, his discoveries concerning energy production of stars." His contributions to physics are of both importance and of great depth. He has three monumental review articles one with A. Sommerfeld. He has worked with Rutherford and Fermi. During world war II he was head of the theoretical physics division of the Los Alamos Scientific Laboratory. He was elected to the National Academy of sciences in 1944.

His first piece of theoretical physics was concerned with the motion of electrons in solids. In the early thirties he made a monumental contribution (with Heitler) by calculating the electrodynamics of electron-positron pair production. Bethe was one of the first to make calculations with the meson field as a means of mediating nuclear interactions. His outstanding contributions of course are in the field of nuclear reactions responsible for the output of stellar energy. His conclusions are : Stars have a life cycle much like animals. They get born, they grow, they go through a definite internal development and finally they die to give the material of which they are made so that new stars may live."

Distinguished Visiting Professorships

Niels Bohr Visiting Professorship:

The Niels Bohr Visiting Professorship was established as a tribute to the memory of the creator of modern physics and the founder of quantum theory whose life has been a glorious example of the universality of science and the eternal quest for the laws of nature. His benign interest in the advancement of Indian science and in particular the work of the group of theoretical physicists at Madras was the immediate stimulus for the creation of our Institute.

Visiting Professors:

Professor R. E. Marshak, U.S.A. 1963

Professor L. Rosenfeld, Natherlands 1964

Professor Hans A. Bethe, U.S.A. 1969

Ramanujan Visiting Professorship:

The Second Visiting Professorship, "Ramanujan Visiting Professorship" is to honour the greatest mathematician India has produced.

Visiting Professor:

Professor Marshall H. Stone, U.S.A. 1963

Jawaharlal Nehru Visiting Professorship:

As a tribute to our benignant sponsor, the late Mr. Jawaharlal Nehru, a visiting professorship was created in his name in 1966.

Matscience Symposia

Anniversary Symposium

The Eighth Anniversary Symposium on Mathematical Analysis and Applications was held for a week from January 20, 1969, and was inaugurated by Dr. Atma Ram, Director-General, C.S.I.R. New Delhi, and the opening lecture was given by Professor Marshall H. Stone.

Among the scientists who participated in the Symposium were:

Professor F. Riahi, Aria-Mehr Technical University, Iran

Professor O. Lehto, University of Helsinki Finland

Professor J. Krzyz, Marie Curie Sklodowska University, Poland

Professor T. H. Ganelius, University of Gothenburg, Swedan

Dr. S. R. Valluri, N.A.L., Bangalore

Dr. S. N. Roy Chaudhury, G.T.R.E., Bangalore

Professor R. Narasimha, I.I.Sc., Bangalore

Professor Kameswara Rao, I.I.Sc., Bangalore

Dr. R. Sankaranarayanan, H.A.L., Bangalore

Dr. Raj Mahendra, H.A.L., Bangalore

Dr. V. M. Ghatage, H.A.L., Bangalore

Mr. M. V. Arunachalam, Industrialist, Madras

Late Mr. T. Muthian, Director of Technical Education, Madras

Mr. C. R. Narayana Rao, Architect, Madras

Professor Alladi Prabhakar, Osmania University, Hyderabad

Dr. Y. S. N. Murthy, Defence Electronics Res. Lab. Hyderabad

Professor S. K. Srinivasan, I.I.T., Madras

Dr. B. Ramamoorthy, Madras Medical College, Madras

Seminar in Analysis

The Second Seminar in Analysis was conducted by the Faculty of Mathematics for a period of 3 weeks in December - January, supported by a special grant from the Department of Atomic Energy, Government of India. This seminar was intended for mathematicians and students engaged in study and research at Pre-doctoral and Post-doctoral levels. Second in the series, the seminar was inaugurated by Professor Alladi Ramakrishnan. There were 4 main lecturers, each giving a series of lectures on advanced topics, among whom Prof. J. Krzyz, Prof. T. H. Ganelius, Prof. O. Lehto were the visiting professors at MATSCIENCE.

The success of the seminar was indicated by the large number of participants from the different universities in India from Jammu and Kashmir down to Trivandrum.

Topics of the Lectures

Professor T. H, Ganelius	"Tauberian remainder theorems"
Professor J. Krzyz	"Extremal length and quasi-conformal mapping"
Professor O. Lehto	"Topics in quasi-conformal mapping"
Professor K. R. Unni	"Polynomials"

Visiting Lectures

THEORETICAL PHYSICS

Name	*Title of the Lecture*
Dr. J. V. Narlikar, Institute of Theoretical Astronomy, Univ. of Cambridge. England	Cosmology and quantum electrodynamics (3 lectures).
Dr. J. Gibson Winans, State Univ. of New York, Buffalo, U.S.A.	Fundamental concepts in Physics and Mathematics.
Dr. H. Banerjee, Saha Institute of Nuclear Physics, Calcutta	A new sum rule for Hadron scattering.
Dr. S. Ranganathan, Banaras Hindu Univ., Varanasi	Field ion microscopy.
Dr. F. Riahi, Aria Mehr Univ. of Technology, Tehran, Iran	1. Introduction to Axiomatic approach to quantum Field theory. 2. Non-relativistic many-body scattering theory (2 lectures).
Dr. V. Devanathan, A. C. College of Technology, Madras	Nuclear distribution effect on the emitted pion in photo pion reaction.
Professor D. Ivanenko, Mascow State Univ., USSR	Actual problems of Gravitation (2 lectures).
Professor Anthony C. Hearn, Stanford Univ., Calif., USA	1. Current tests of quantum Electrodynamics. 2. The Stanford Linear accelerator centre.
Professor N. P. Klepikov, Moscow Univ., USSR.	Centre of Mass states of three particles and the priority of reaction S-matrix elements.

Name	*Title of the Lecture*
Dr. N. N. Bogoliubov, Jr., Steclov Mathematical Inst., Moscow, USSR	1. Calculation of free energy for a model system with four-fermion pairwise repulsive interactions.
	2. On model dynamical systems in statistical mechanics.
Dr. B. Sadovnikov, State Univ., Moscow, USSR	1. Retarted and advanced two-time temperature Green functions in statistical mechanics.
	2. Bogoliubov's inequality for investigation of crystalline ordering.
Dr. M. S. Subbaraman, TIFR, Bombay	Background radiation and cosmology.
Dr. T. S. Sankar, Sir George Williams Univ., Canada	Dynamic snap-through under stochastic loads.
Dr. A. K. Rajagopal, TIFR, Bombay	Positronium formation in metals (7 lectures).
Dr. S. K. Rangarajan, Central Electrochemical Research Inst., Karaikudi	Special functions & theoretical electrochemistry (2 lectures).
Dr. T. K. Menon, Institute for Astronomy, Univ. of Hawaii, Honolulu	Yalta (USSR) (1969) conference on Cosmical Gas Dynamics.
Dr. R. Sankaranarayanan, Hindustan Aeronautics Ltd., Bangalore.	Calculation of potential flow around bodies of arbitrary shape.

MATHEMATICS

Lecture Courses

Professor A. L. Brown, University of Newscastle-upon-Tyne, England.	Compact linear operators and the Volterra integration operators.

Name	*Title of the Lecture*
Visiting Lecturers	
Professor B. S. Nagy, Hungarian Academy of Sciences, University of Szeged, Hungary	Some recent advances in functional analysis.
Professor J. Krzyz, Marie-Curie Sklodowska University of Poland	On closed – to – convex functions.
Professor Marshall H. Stone, George David Birkhoff Professor of Mathematics at the Univ. of Mass., formerly Distinguished Service Professor at the Univ. of Chicago, U.S.A.	The real number system re-visited.
Professor K. A. Hirsch. University of London, Queen Mary College, London	Topics in group theory.
Professor M. R. Hestenes, University of California, Los Angeles, U.S.A.	Quadratic variational theory.
Invited Lecturers	
Dr. B. Ramamoorthy, Prof. of Neuro – surgery, Madras Medical College, Madras	The Physiological basis of the brain and its relation to Mathematics,

Research Papers

Theoretical Physics

Author(s)	*Title*
Alladi Ramakrishnan	Generalized Helicity Matrices (Jour. Math. Anal Appl., V. 26, p. 88–91, 1969)
Alladi Ramakrishnan, P. S. Chandrasekaran, T. S. Santhanam and A. Sundaram	Helicity Matrices for Generalised Clifford Algebra (Jour. Math. Anal. Appl., V. 26, p. 275–278, 1969)
Alladi Ramakrishnan, P. S. Chandrasekaran, N. R. Ranganathan, T. S. Santhanam and R. Vasudevan	The Generalized Clifford Algebra and the Unitary Group (Jour. Math. Anal. Appl., V. 27, p. 164–170, 1969)
	Idempotent Matrices from Generalized Clifford Algebra (Jour. Math. Anal. Appl., V. 27. p. 563–564, 1969)
Alladi Ramakrishnan, R. Vasudevan, P. S. Chandrasekaran and N. R. Ranganathan	Kemmer Algebra from Generalized Clifford elements (Jour. Math. Anal. Appl., V. 28, p. 108–111,1969)
Alladi Ramakrishnan and R. Vasudevan	A Hierarchy of Idempotent Matrices (V. 9 of Symposia in Theor. Phys. and Maths., p. 85–88, 1969)
Alladi Ramakrishnan	On the Algebra of L-matrices, (V. 9 of Symposia in Theor Phys. and Maths., p. 73–78,1969)
	L-matrices, and Propagators with Imaginary Parameters (V. 9 of Symposia in Theor. Phys. and Maths., p. 79–84, 1969)
	Should we Revise our Notions about Spin and Parity in Relativistic Quantum Theory? (Jour. Math. Phys. Sciences, V. 3, p. 213–219, 1969)

Author(s)	*Title*
Alladi Ramakrishnan, R. Vasudevan and P. S. Chandrasekaran	Representation of Para-Fermi Rings and Generalized Clifford Algebra (Jour. Math. Anal. Appl., in press)
Alladi Ramakrishnan	On the Composition of Generalized Helicity Matrices (Jour. Math. Anal. Appl., in press)
	Symmetries Associated with the Roots of the Unit Matrix (Jour. Math. Phys. Sciences, in press)
Alladi Ramakrishnan	A Hierarchy of Helicity Operators in L-matrix Theory (Jour. Math. Phys. Sciences, in press)
Alladi Ramakrishnan, T. S. Santhanam and P. S. Chandrasekaran	On the Representations of Generalized Clifford Algebra (Jour. Math. Phys. Sciences, in press)
	L-matrices and the Fundamental Theorem of Spinor Theory (V. 10 of Symposia in Theor. Phys. and Maths., Plenum, in press)
Alladi Ramakrishnan and I. V. V. Raghavacharyulu	Generalised Clifford Basis and Infinitesimal Generators of Unitary Groups (V. 10 Symposia in Theor. Phys. and Maths., Plenum, in press)
Alladi Ramakrishnan, R. Vasudevan and P. S. Chandrasekaran	Para - Fermi Operators and Special Unitary Algebras (Jour. Math. Anal. Appl.. in press)
	Algebras Derived from Polynomial Conditions (Jour. Math. Anal. Appl., in press)
Alladi Ramakrishnan and R. Vasudevan	On Generalized Idempotent Matrices (Jour. Math. Anal. Appl. in press)
Alladi Ramakrishnan	Mathematical Logic as a Guide to Physical Thought (Talk given at the Seminar on 'Science for the Citizens' organized under the joint auspices of the CSIR and All-India Newspapers Editors Conf., 27–30, November, 1969)

Author(s)	*Title*
R. Vasudevan (with S. K. Srinivasan and N. V. Koteswara Rao)	Sequent Correlations in Stochastic Point Processes (Nuo. Cim. V. 60-B, p. 189, 1969)
R. Vasudevan, R. Sridhar and N. R. Ranganathan	Study of Interacting Bose Gas with Currents an Densities as Co-ordinates (Phys. Lett. V. 29-A, p. 138–139, 1969)
R. Vasudevan	Photon Statistics and Coherence in Light Beams (V. 9, of Symposia in Theo. Phys. and Maths. p. 89–108, 1969)
R. Vasudevan (with S. K. Srinivasan)	Stochastic Kinetic Equations and Particle Statistics (Annals de Institute Henri Poincare, V., 10 p. 419-429, 1969)
R. Vasudevan and K. H. Mariwalla	On Uniform Acceleration in Special Relativity (To be published)
R. Vasudevan (with S. K. Srinivasan)	Response from Non-linear Switching Elements (Kybernetic Journal, in press)
R. Vasudevan (with T. S. Shankara)	Quantum Mechanical Operators and New Phase Space Distributions (To be published in Nuo. Cim.)
R. Vasudevan (with A. de Deluca and L. M. Riceiardi)	A Note on Relating Pfaffians, Haffians, with Determinants and Permanents (Jour. Math. Phys., in press)
R. Vasudevan (with A. Coniglio)	Generalised Condensation of an Interacting Bose Gas with Pair hamiltonian (Sub. to Nuo. Cim.)
R. Vasudevan (with S. K. Srinivasan and R. Subramaniam)	Some New Results in Queeing Theory (To be published)
R. Vasudevan (with M. Marinaro and G. Idonisi)	On the Possibility of Two Stages of Phase Transition in a Non-ideal Bose Gas (To be published)
R. Vasudevan (with A. de Deluca and L. M. Riceiardi)	Random Matrices of Neutral Networks (To be published in Kybernetic Journal)

Author(s)	*Title*
R. Vasudevan (with V. Radhakrishnan)	A Model for Vortex Scattering in Type II. I : Thermal Conductivity (Sub. for publication)
	A Model for Vortex Scattering in Type II. II : Ultrasonic Attenuation (preprint)
K. H. Mariwalla	On Tachyon Lorentz Transformation (Amer. Jour. Phys., in press)
T. S. Santhanam and P. S. Chandrasekaran	Clifford Algebra and Massless Particles (Prog. Theor. Phys., V. 41, p. 264–268, 1969)
T. S. Santhanam	Generating Functions of Classical Groups and Evaluation of Partition Functions (Jour. Math. Phys., V. 10, p. 1704, 1969)
	Remarks on the Relativistic Wave Equation in Odd Space-Time and C. P. T. Invariance (Jour. Math. Phys. in press)
K. Srinivasa Rao, N. R. Ranganathan and A. Sundaram	Applications of Elementary Particle Treatment of Nuclei to Scattering of Pions by nuclei (Proc. of Nucl. Phys. and Solid State Phys. Symp., V. 2, p. 23–26, 1969)
S. Nagarajan	Turbulent Magnetic fields. II-Steady State Spectra (Phys. Fluids in press)
A. Sundaram	$\sigma - 3\pi$ Coupling Constant in the Veneziano model (Prog. Theor. Phys., in press)
A. Sundaram and K. Srinivasa Rao	Regge Pole Model and U (6, 6 Symmetry for $pp \to \wedge\wedge$ (Nuo. Cim. Series X, V. 61-A, p. 755–760, 1969)
Pure Mathematics	
P. K. Geetha	On Bernstein Approximation Problem (Jour. Math. Anal. Appl., V. 25, P. 450–469, 1968)
N. R. Nandakumar	A Note on Derivation Pairs (Proc. Amer. Math. Soc., V. 21, p. 535–539, 1969)
Others	
V. V. L. Rao and I. V. V. Raghavacharyulu	Education through SI units (ISI Bulletin V. 21, 1969)

Matscience Reports

Report No.	*Author*	*Title*
52	K. R. Unni	Concepts in Modern Mathematics - III Analysis
66	F. Riahi	On Non-relativistic Scattering Theory
67	K. Srinivasa Rao, Ed.	Proceedings of the one day Symposium on Computers in Science and Technology
68	K. Srinivasa Rao	On Elements of Fortran Programming

Lecture Notes in "Seminar in Analysis"

No.	*Author*	*Title*
1	K. R. Unni	On Bernstein Approximation Problem
2	Tord H. Ganelius	Tauberian Remainder Theorems

Matscience Symposia

On

Theoretical Physics and Mathematics

ALLADI RAMAKRISHNAN, EDITOR

(Published by Plenum Publishing Corporation, N.Y., U.S.A.)

The series incorporates the Proceedings of the Scientific meetings held every year at the Institute - the Anniversary Symposia in January and the Summer Schools in August. Stressing 'recent advances in theoretical physics and mathematics' these volumes cover topics in various branches of mathematical sciences and pure mathematics. Volumes 1 to 8 have been published till 1969. During this year volume 9 was published.

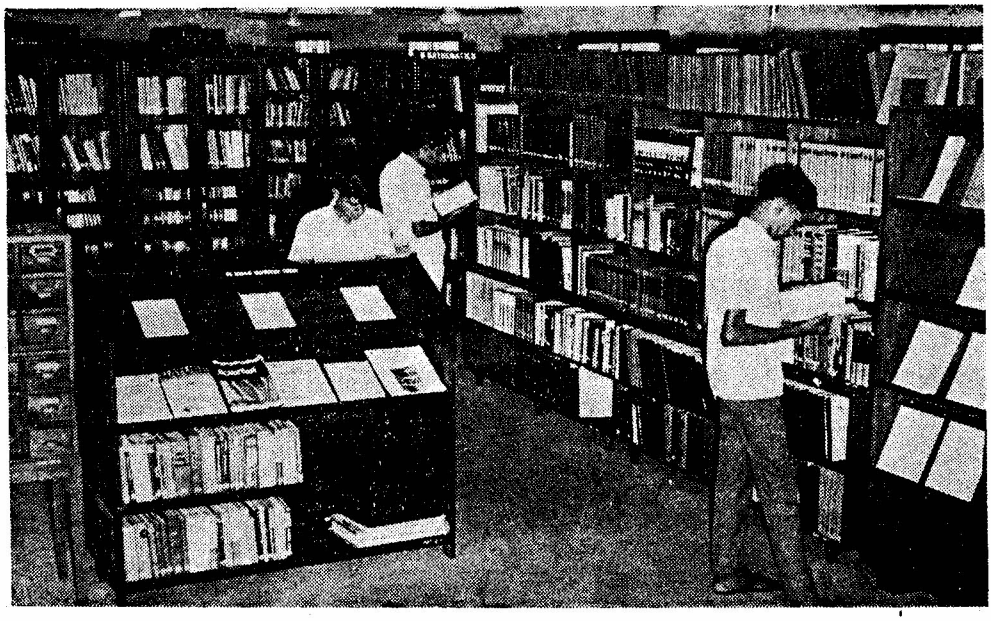
Volume 9 Proceedings of the Sixth Anniversary Symposium 1968

This volume represents the proceedings of the Sixth Anniversary Matscience Symposium on Theoretical Physics held in January 1968 as well as the 'Seminar in Analysis' held earlier in December 1967. A new feature of this volume is that it includes also contributions dealing with applications of mathematics to domains other than theoretical physics. Accordingly the volume is divided into three parts, Part I dealing with the theoretical physics, Part II with Applications of mathematical methods and Part III with pure mathematics.

Volume 10 Proceeding of the Fourth Matscience Summer School

(Under Preparation).

Director with Mr. C. Subramaniam and Mr. Thomas, M, Recknagel
on the occassion of the release of the V. 9 of "Symposia
on Theoretical Physics and Mathematics



LIBRARY

Library

At the beginning of this year the library was moved to a more spacious hall in the new building of the Institute.

During this year 1028 new books, including bound periodicals were added to the library, bringing the total number of volumes to 8862. These include many of the recent publications in Mathematics and Physics

The following new journals were added to the serials from this year:

1. Aequationes Mathematicae
2. Aeronautical Quarterly
3. Aircraft Engineering
4. Astronautics and Aeronautics
5. Astronomy and Astrophysics
6. Bulletin of the London Mathematical Society
7. Comments on Astrophysics and Space Physics
8. Comments on Atomic and Molecular Physics
9. Comments on Solid State Physics
10. Compositio Mathematica
11. International Journal of Theoretical Physics
12. Journal of Aeronautical Society
13. Journal of Aircraft
14. Journal of Approximation theory
15. Journal of Hydronautics
16. Journal of Low Temperature Physics
17. Journal of Spacecraft and Rockets
18. Journal of Statistical Physics
19. Manuscripta Mathematica
20. Physics Bulletin

On an average about 45 books and bound periodicals were referred in a day. More than 1000 scientists and research workers from outside have made use of the library during the year.

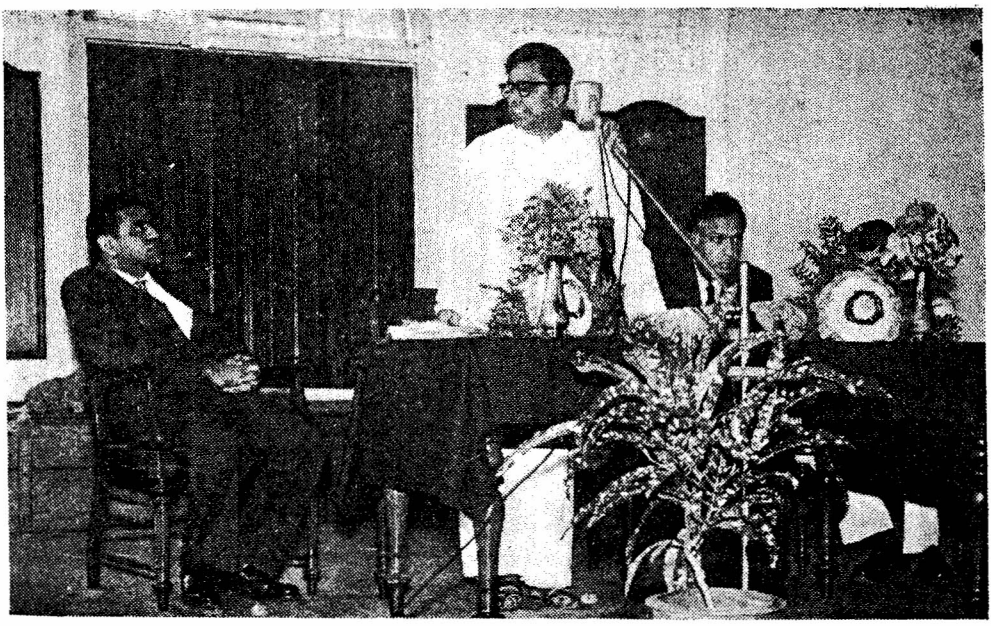
About 150 preprints in the fields of theoretical physics (papers to be published), are being received from various research centres throughout the world like CERN, Nordita, Berkeley, Princeton, Syracuse etc.

Lists Published:

1. List of Preprints received in the library (issued monthly)
2. List of Periodicals (issued yearly)
3. List of MATSCIENCE REPORTS (issued yearly)
4. List of Reprints (issued yearly)

".....of course, the name of Ramanujan comes to the mind of everyone. He is, in my opinion, without question the greatest man of science India has produced in recent years".

—Prof. S. Chandrasekar at the Inauguration of the Institute, 1962



"……I will say this is the beginning of the miracle. The justification for the Institute will be in the results achieved when the miracle will really happen..... I have no doubt that ere long this Institute will be one of the well recognised science institutions in the whole world. In the field of scientific research, we cannot anticipate — anything might happen or might not happen. The chances are there for great discoveries and work of international repute. Out of the young men and women, I hope a few will earn the Noble Prize of Physics."

—Mr. C. Subramaniam at the Inauguration of the Institute, 1962

".....Few lives in the history of Mankind have shown with such many splendoured lines...An individualist in thought, he loved people to an extent that every child looked to him as a father and every Indian felt his benign influence.....

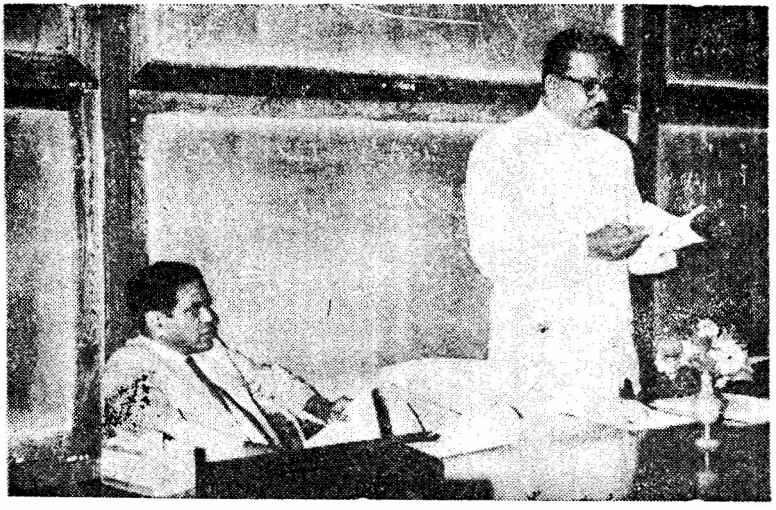
...His life was dedicated to improving the standard of life of the common man; but he remained a restless intellectual, a votary for the advancement of science in our country. Amidst the tumult of politics and the anxieties of administration, he found time to exhort scientists to greater achivement and the aspirant youth to the pursuit of knowledge"

—Alladi Ramakrishnan

"……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…… 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 purpose.

……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"

—Alladi Ramakrishnan



".....while mathematicians withdraw more and more from the masses, and develop apparently abstract theories, the application brings about changes and developments that affect every aspect of our living..... I feel, mathematics teaching should be given due importance at all stages of education... No one would recognise a second rate contribution simply because it comes from a developing nation"

—Mr. V. R. Nedunchezhiyan at the Inauguration of the First Seminar in Analysis, 1967