

MATSCIENCE

NINETEENTH ANNIVERSARY

1980



THE INSTITUTE OF MATHEMATICAL SCIENCES

MADRAS - 600 020 (INDIA)

**The Institute of Mathematical Sciences
Madras**

“The pursuit of science is at its best
when it is a part of a way of life”

Annual Report

1980

Patron :

Mr. C. Subramaniam

Chairman of the Board of Governors :

Mr. C. Aranganayakam

Minister for Education, Government of Tamil Nadu

Director :

Professor Alladi Ramakrishnan

Board of Governors

Chairman : Hon'ble Mr. C. Aranganayakam
Minister for Education
Government of Tamil Nadu.

Members : Mr. C. Ramdas, I.A.S.
Commissioner and Secretary (Education)
Government of Tamil Nadu.

Mr. J. G. Kanga
Joint Secretary to Government of India
Department of Atomic Energy, Bombay.

Dr. P. K. Iyengar
Director, Nuclear Physics Division,
Bhabha Atomic Research Centre, Bombay.

Professor Alladi Ramakrishnan
Director, Matscience.

Professor N. R. Ranganathan
Matscience.

Finance Committee

Chairman : Mr. C. Ramdas, I.A.S.
Commissioner and Secretary (Education)
Government of Tamil Nadu.

Members : Mr. K. J. M. Shetty, I.A.S.,
Commissioner and Secretary (Finance)
Government of Tamil Nadu.

Mr. J. G. Kanga
Joint Secretary to Government of India
Department of Atomic Energy, Bombay.

Professor Alladi Ramakrishnan
Director, Matscience.

Academic Staff

Director

Professor Alladi Ramakrishnan

Professors

Dr. R. Vasudevan

Dr. N. R. Ranganathan

Dr. K. R. Unni

Dr. T. S. Santhanam

Associate Professors

Dr. V. Radhakrishnan

Dr. R. Sridhar

Dr. K. H. Mariwalla

Dr. R. Parthasarathy

Dr. K. Srinivasa Rao

Assistant Professors

Dr. R. P. Agarwal

Dr. R. Jagannathan

Junior Research Fellows

Mr. V. N. Sridhar

Mr. S. Madivanane

Mr. J. S. Prakash

Mr. Premkumar Yesudian

Mr. E. Thandapani*

Miss. S. N. Uma

Mr. M. Venkatasatyanarayana

Miss. A. Shanthi

Mr. M. Murali

U.G.C. Teacher Fellow

Mr. P. R. Vittal*

Academic Council

Chairman

Professor Alladi Ramakrishnan

Director

Members

Professor R. Vasudevan

Dr. K. H. Mariwalla

Professor K. R. Unni

Dr. K. Srinivasa Rao

Professor N. R. Ranganathan

Dr. R. Sridhar

Professor T. S. Santhanam

Dr. R. Parthasarathy

Dr. V. Radhakrishnan

* Persons who have completed their tenure at the Institute

General Information

Aims and Objectives

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 of 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 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.

Academic Activities

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 academic staff of the Institute are held.

To commemorate the inauguration of the Institute an Anniversary Symposium is held in January for which scientists from India and abroad are invited to deliver one hour addresses summarising their original work on recent advances in various branches of Mathematical Sciences.

Academic Staff

The Academic Staff consists of Senior Professors, Professors, Associate Professors, Assistant Professors, Visiting Professors, Visiting Scientists, and Research Fellows.

Ph.D. Programme

Facilities are available for postgraduate students to work for 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.

The Standing Committee of the Inter-University Board of India and Ceylon at its meeting held in February 28, 1967 adopted a resolution recognising the Institute 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 the doctorate degree in Theoretical Physics and Mathematics.

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. 10/-within India or U.S. \$ 2-00 outside). PROCEEDINGS OF THE SEMINARS AND CONFERENCES conducted by the Institute are also published as special Matscience Reports.

News of the Institute

(1980)

Eighteenth Anniversary

The Eighteenth Anniversary of the Institute was celebrated on the 21st January 1980. His Excellency Sri Prabhudas Patwari, Governor of Tamil Nadu inaugurated the anniversary symposium and unveiled the portraits of Abdus Salam, David Hilbert and Isaac Newton.

Conference on "Mathematics in Economics, Engineering and Life Sciences"

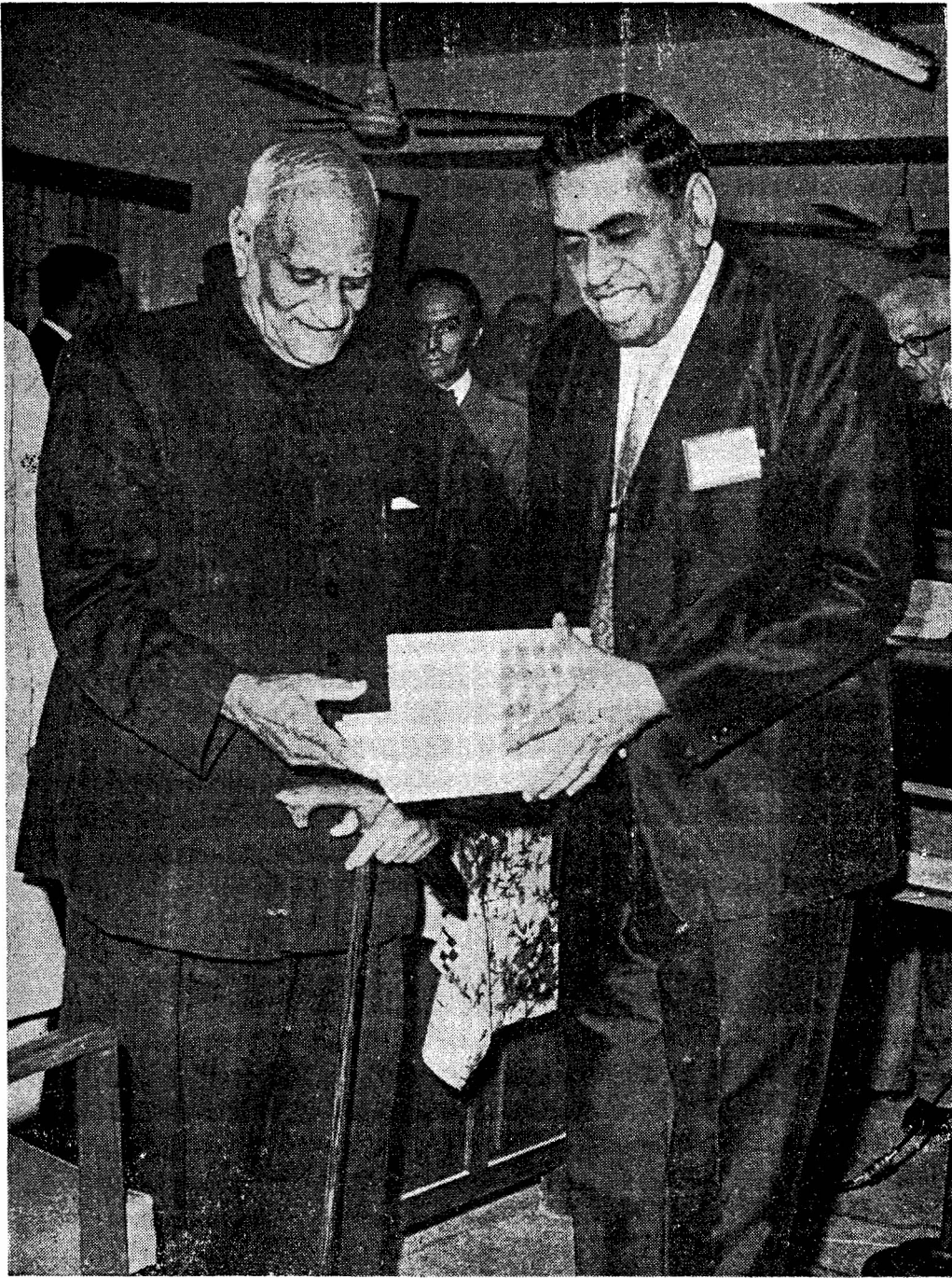
The Institute conducted a conference on Mathematics in Economics, Engineering and Life Sciences at Mysore during 19th to 23rd February 1980. Inaugurating the conference Dr. B. Ramamurthy, the eminent neurosurgeon explained the complicated structure and functions of the human brain and outlined the advance made so far in understanding the mysteries of the brain. About thirty scientists from all over the country took part in this conference.

Second Conference on "Number Theory"

Matscience conducted the second conference on "Number Theory" from 3rd to 7th August 1980 at the Hindustan Photo Films Guest House, Ooty. The conference was inaugurated by Mr. P. R. S. Rao, Managing Director, Hindustan Photo Films Ltd. Professor K. Ramachandra from the Tata Institute of Fundamental Research, Bombay and Dr. Krishnaswami Alladi, Hildebrandt Research Assistant Professor at the University of Michigan, Ann Arbor (USA) were the principal speakers at the conference besides twenty five number theorists from all over India who presented their original contributions relating to the theme of the conference.

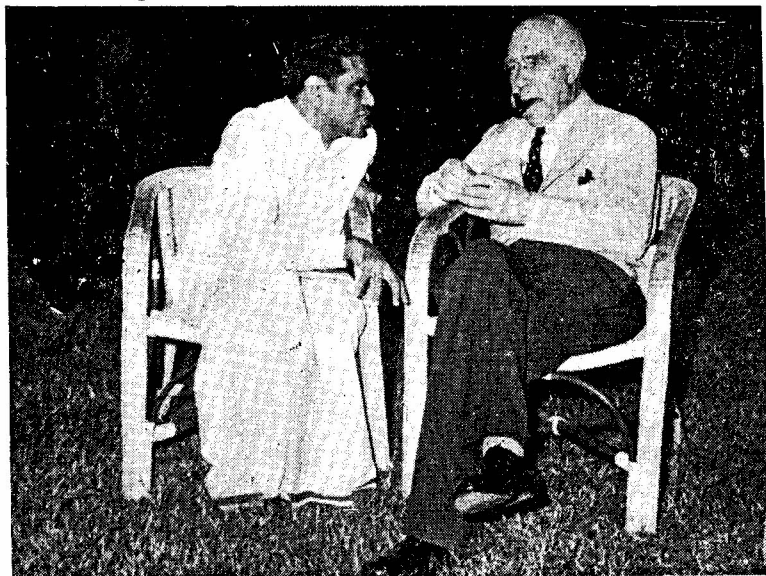
Conference on "Stochastic Processes and Applications"

The Institute conducted a conference on "Stochastic Processes and Applications", at the Hindustan Photo Films Guest House, Ooty from 11th to 14th Dec. 1980. Professor Alladi Ramakrishnan who inaugurated the conference also gave a series of lectures on some significant developments in the field, especially the recent concepts like 'activity', 'discrepancy' and 'duality' which deal with the 'direction' of a stochastic process. The conference focussed its attention on the development of stochastic processes in recent years strengthened by the work of Australian and Californian schools based on the theory of Professor Alladi Ramakrishnan. Twenty five scientists and mathematicians from several research institutes and Universities all over India participated in the conference.



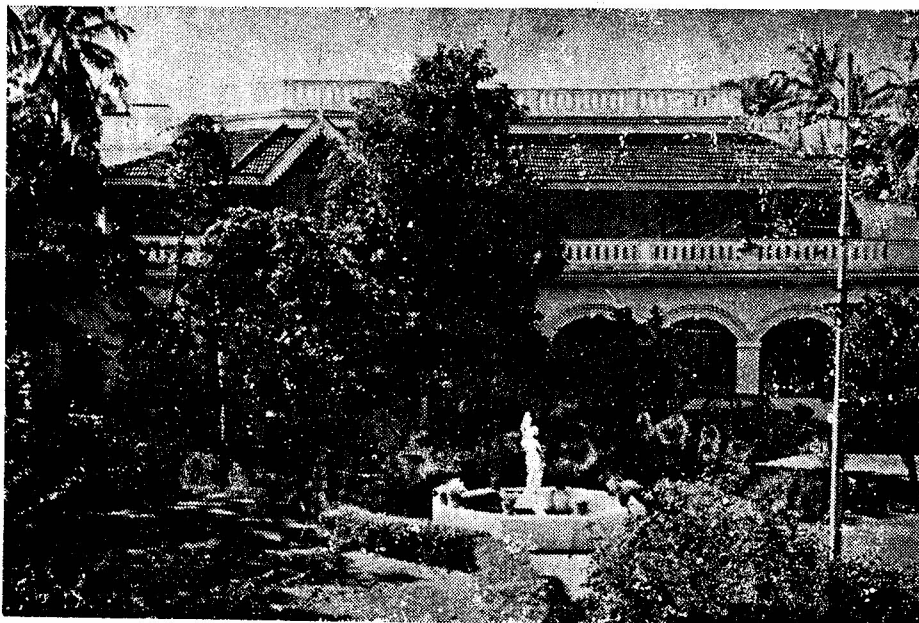
The President releasing the book "L-Matrix Theory or The Grammar of Dirac Matrices" by Prof. Alladi Ramakrishnan (December, 1972)

Prof. Niels Bohr, Nobel Laureate, with Prof. Alladi Ramakrishnan
(January, 1961)



“His benign interest in the work of our group was the immediate stimulus for the creation of the institute”

Ekamra Nivas



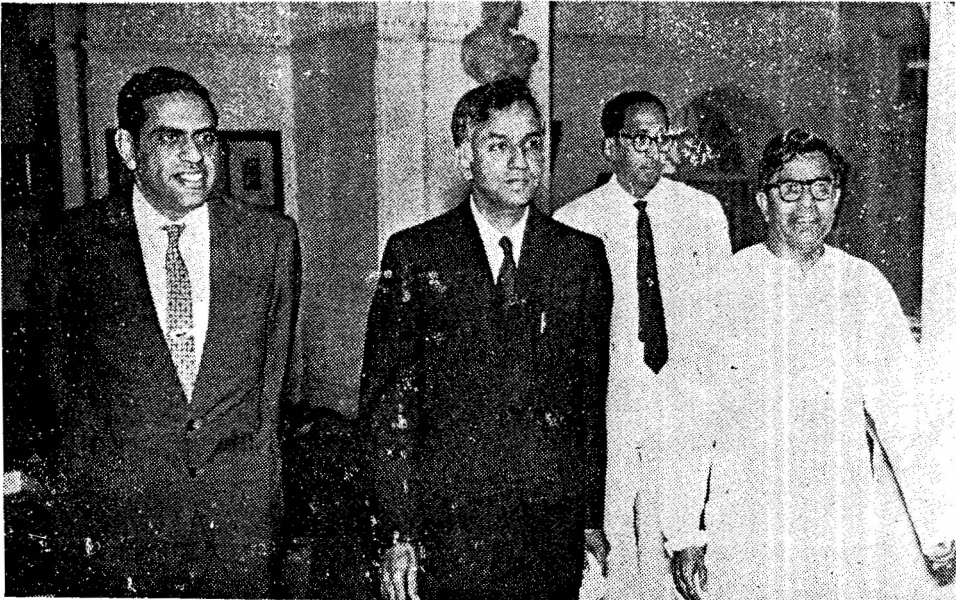
“The origins of Matscience may be traced to the informal discussions held in my family home almost twenty years ago by the Theoretical Physics Seminar”
(1959-61)

Prof. Abdus Salam



The Nobel Laureate at Ekamra Nivas in 1960

Prof. S. Chandrasekhar



‘The spirit in which I approached Prof. S. Chandrasekhar was animated by that in the greatest of legends when Arjuna approached Lord Krishna for support’ (January, 1962)

Prof. Homi J. Bhabha



at a Matscience dinner (1962)

Prof. M. H. Stone



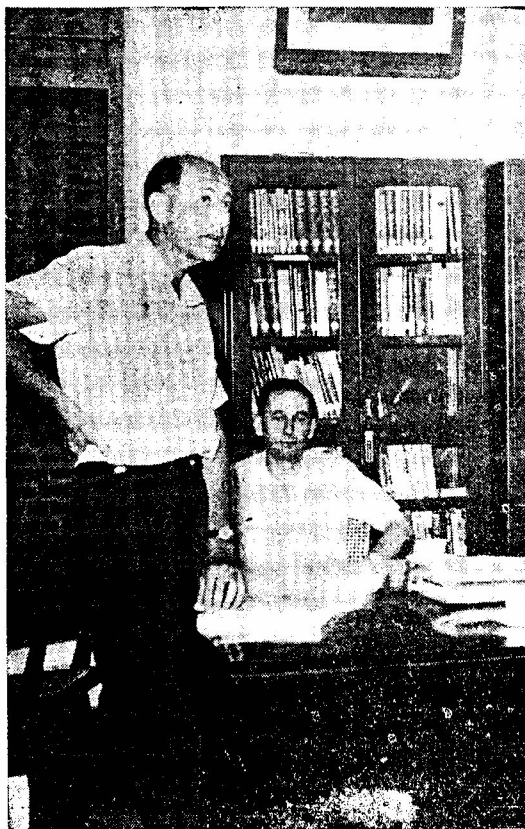
discussing the current trends in mathematical research (January, 1963)

Dr. M. M. Shapiro of U. S. and Prof. E. L. Feinberg of U.S.S.R. (1963)

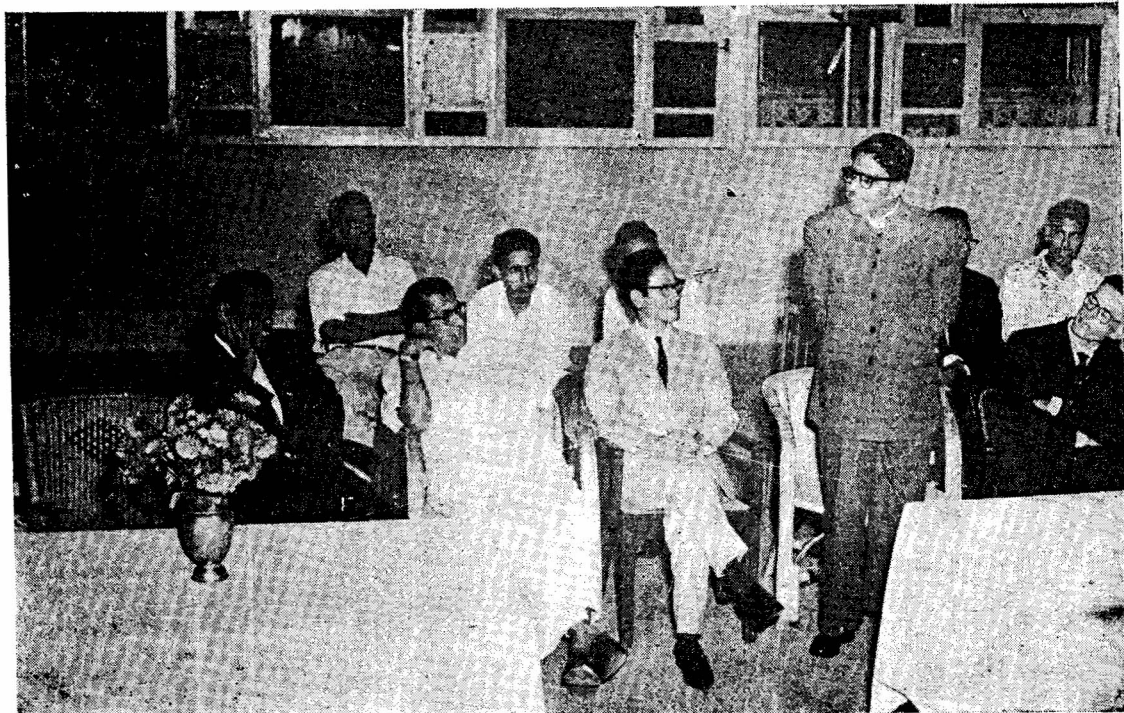


“The steady influx of visiting scientists transmits to us the strong and vital impulses from the main stream of scientific thought in the physical sciences to day.”

Prof. R. E. Marshak



The first Niels Bohr Visiting Professor with



Mr. C. Subramaniam, Patron, Matscience addressing the first Matscience Summer School, (1964)



Sir C. P. Ramaswamy Aiyar with Mr. R. Venkataraman, Prof. Alladi Ramakrishnan and Prof. Gunnar Kallen of Sweden (1966)

Prof. Linus Pauling



The Nobel Laureate at Matscience (1967)

Prime Minister at Matscience



“One of the most exhilarating experiences we had in recent years-the visit of the Prime Minister of India” (January, 1967)



The Director with Mr. C. Subramaniam and Mr. Thomas M. Recknagel on the occasion of the release of the ninth volume of "Symposia on Theoretical Physics and Mathematics" (1969)



Sir A. Lakshmanaswamy Mudaliar unveiling the portrait of Dr. H. J. Bhabha (January, 1971)

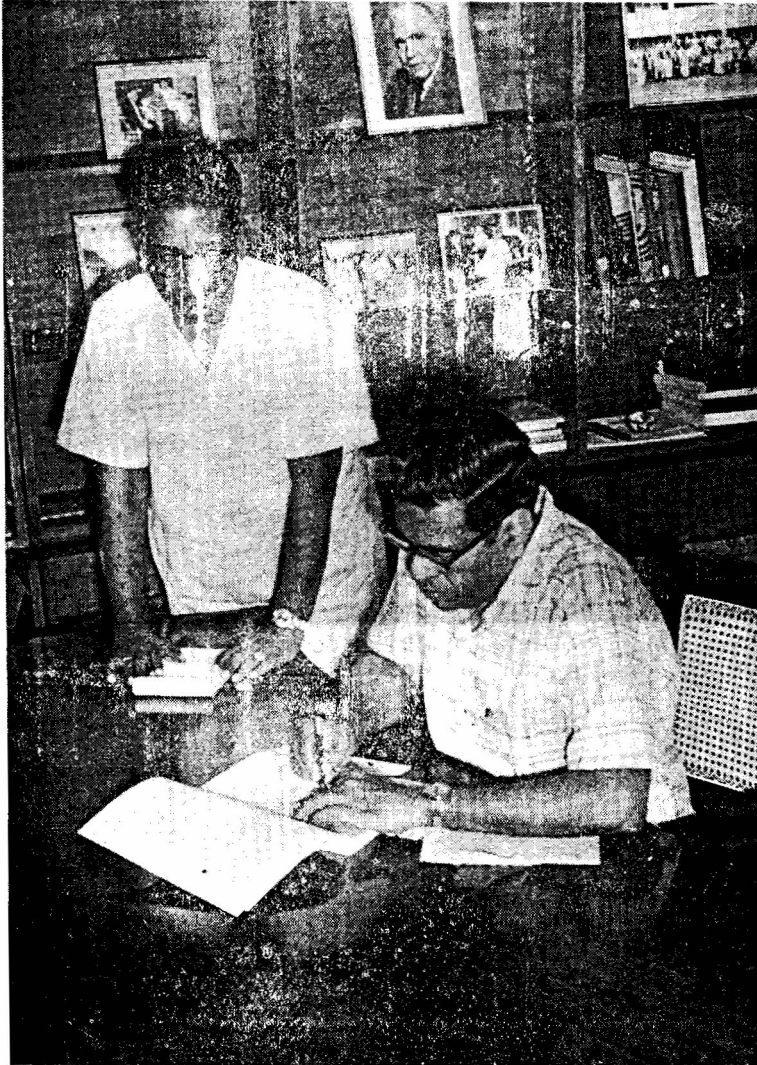


Prof. Yamazaki and Prof. Nono (Japan) participating in the conference on "Clifford Algebra, its Generalisation and Applications" held in Ooty (January, 1971)

Prof. P. M. S. Blackett

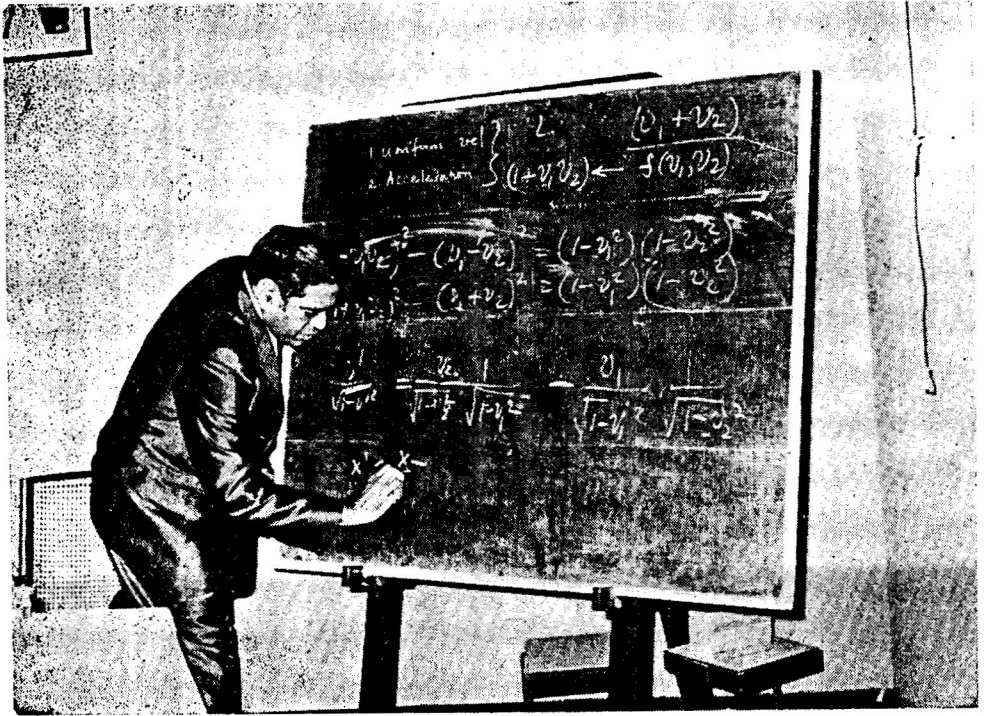


The Nobel Laureate, with Prof. Alladi Ramakrishnan and some members of the Institute (April, 1971)

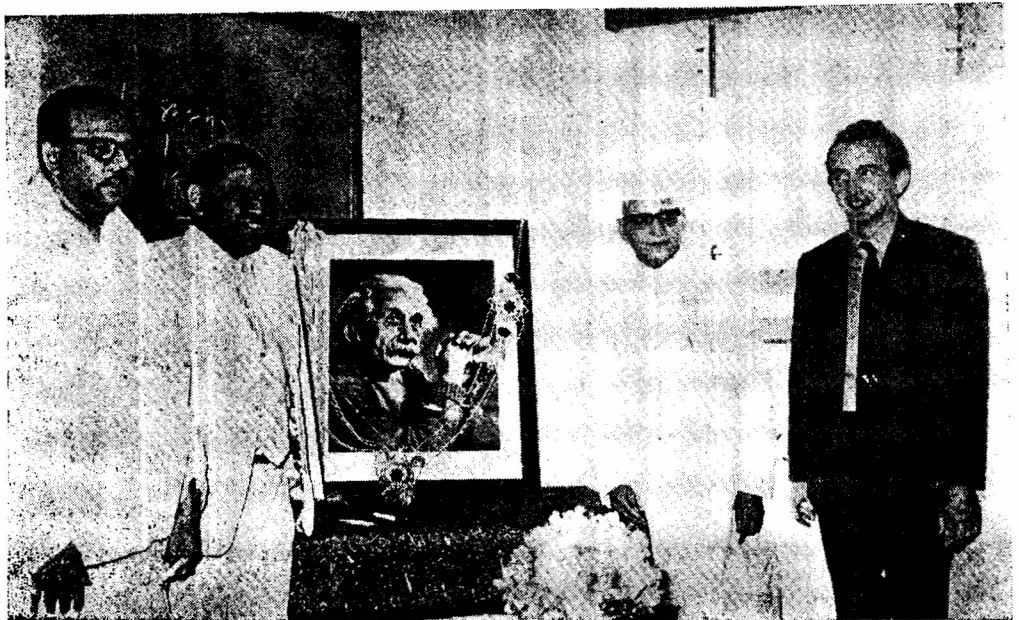


The Director with E. T. Nambi who participated in the conception, creation, evolution, growth and established prosperity of Matscience (1971)

Professor Alladi Ramakrishnan inaugurating the
Matscience Conference on "Cosmology and Gravitation" (1971)



"The Mansion of relativity has many entrances and the most suitable one for entering it from the Newtonian structure is the velocity transformation formula."



Hon'ble V. R. Nedunchezhiyan, unveiling the portrait of Albert Einstein.
(January, 1972)

Alan Bean, U. S. Astronaut



“What can I offer to a man who has walked the moon
and watched the earth therefrom.....” (1976)

Mr. R. Venkataraman

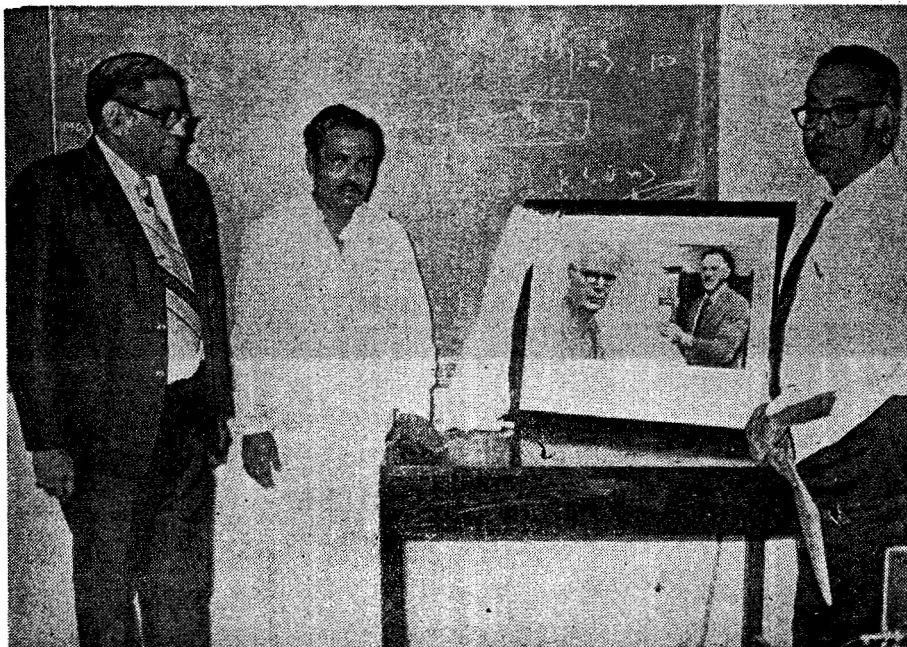


with Sridhar and Santhanam at Matscience (1974)

Prof. John Bardeen



who has the unique honour of getting the Nobel Prize in Physics twice.
(January, 1977)

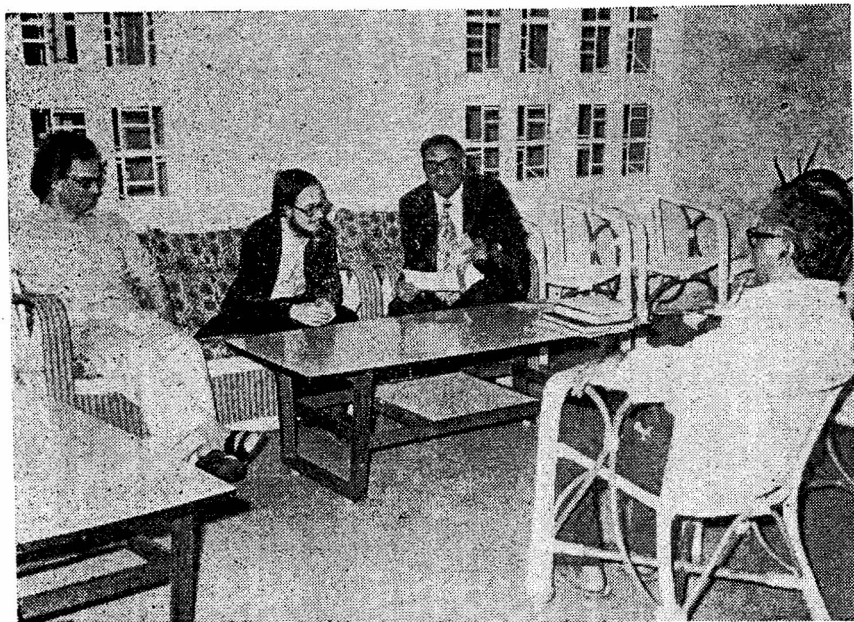


Unveiling the portrait of Professors M. S. Bartlett and R. Bellman
(January, 1978)

Prof. Harry Messel



on a visit to Matscience (1978)

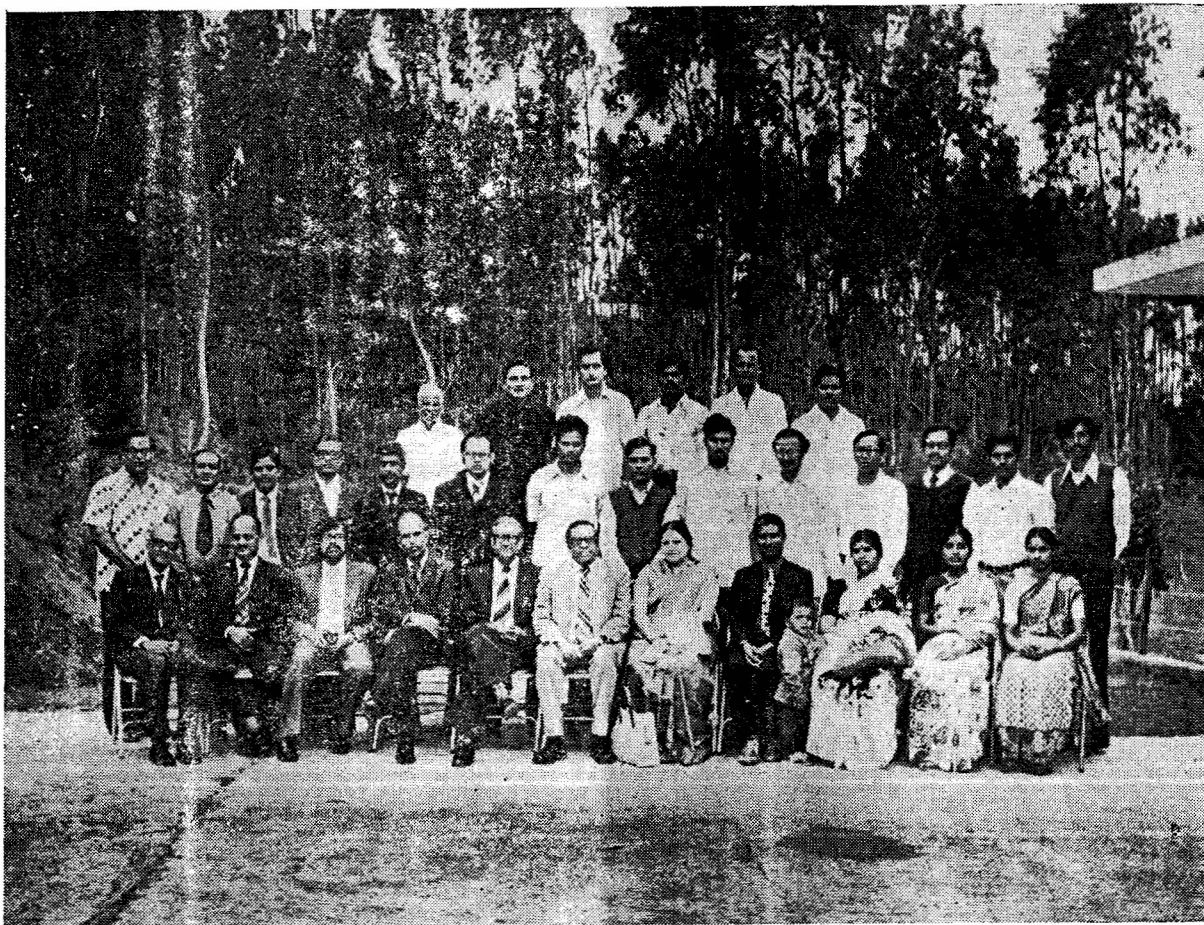


“We greeted two eminent mathematicians Dan Zagier and Harder from the University of Bonn ” (1979)



The Second Matscience Conference on Number Theory at Ooty (1980)

Second Matscience Conference on 'Number Theory'



The Participants of the Conference (August, 1980).

Delegations and Invitations

Professor Alladi Ramakrishnan was invited to lecture on his recent research work in the following centres of research in U.S. and Canada during February to May, 1980: University of Denver, Denver; University of Florida at Gainesville; University of California at Irvine; Southern Methodist University at Dallas; University of Texas at Dallas; The Catholic University of America at Washington D.C.; Rockwell International Science Centre at California; University of Wisconsin at Madison; Case Western Reserve University at Cleveland; University of North Carolina at Chapel Hill; Duke University, Durham at North Carolina; University of Tennessee at Knoxville; University of Manitoba at Winnipeg and University of Alberta at Edmonton.

Professor R. Vasudevan was invited to spend a period of three months as visiting professor at the Department of Electrical Engineering, University of New Hampshire (USA) Durham, from June 1980. He was also a visiting professor at the Centre for Applied Mathematics, University of Georgia at Athens during September and a visiting research professor at the Department of Neurosurgery, School of Medicine, Loma Linda University, California, U.S.A. during October - November. He visited the Department of Physics, University of California, Irvine.

Professor T. S. Santhanam returned to Matscience after completing his visiting assignment as a Senior Research Fellow in the Australian National University, Canberra. He participated and presented his recent research work at the Fifth High Energy Physics Symposium held during 26th to 30th December 1980 at Cochin.

Professor K. H. Mariwalla participated in the Einstein Centenary Symposium held at Nagpur during February.

Professor K. Srinivasa Rao came back after spending a period of eight months at the Institute for Theoretical Nuclear Physics, University of Bonn, West Germany as an Alexander von Humboldt Foundation Fellow. He took part in the meeting on "Scattering Theory" held at Oberwolfach, from August 4-9. He presented a paper at the Europhysics Conference on Computational Methods in High Energy and Nuclear Physics held at Bologna, Italy in September. He gave a seminar at the Department of Physics of the University of Padova, Italy.

Professor R. Sridhar participated in the Annual Nuclear Physics and Solid State Physics Symposium conducted by Department of Atomic Energy held at I. I. T., New Delhi, during December.

Professor R. Parthasarathy participated in the Seventh High Energy Physics Conference held at the International Centre for Theoretical Physics at Trieste, Italy during June—July and later spent a month at ICTP as a visitor. He was invited to participate at the Second National Workshop on Advanced High Energy Accelerator Facility in India held at BARC during October 27–31 and gave an invited talk on “Physics with Muon Beams”. He participated and presented a paper on his recent research work at the Fifth High Energy Physics Symposium held at Cochin during 26–30th December.

Dr. R. Jagannathan participated and presented a paper on his recent research work at the Fifth High Energy Physics Symposium held at Cochin during 26–30th December.

Invited Lectures

<p>Professor T. V. Narayana Mathematics Department University of Alberta Edmonton, Alberta</p>	<p>“Theory of Tournaments”</p>	<p>February</p>
<p>Professor Alladi Prabhakar Principal, College of Engineering Osmania University Hyderabad</p>	<p>“EMG in Health and disease”</p>	<p>April</p>
<p>Professor V. S. Vaidhyanathan Department of Biophysics University of Buffalo Buffalo, USA</p>	<p>“Influence of fluxes on stationary state membrane potential”</p>	<p>„</p>
<p>Dr. Krishnaswami Alladi Department of Mathematics University of Michigan Michigan, USA</p>	<p>“The role of the Mobius function in analytic number theory”</p>	<p>June</p>
<p>-do-</p>	<p>“Sieve methods in number theory”</p>	<p>July</p>
<p>Professor S. Panchapekan Department of Mathematics Southern Illinois University Carbondale, Illinois, USA</p>	<p>“Some recent results in selection and ranking</p>	<p>„</p>
<p>Professor K. Ramachandra School of Mathematics Tata Institute of Fundamental Research, Bombay</p>	<p>“Special topics in number theory”</p>	<p>August</p>
<p>Dr. B. K. Shivamoggi Department of Theoretical Physics Australian National University Canberra, Australia</p>	<p>“Weakly nonlinear dispersive waves”</p>	<p>„</p>

<p>Dr. S. Ramadurai Department of Theoretical Physics Tata Institute of Fundamental Research, Bombay</p>	<p>"Origin of Solar System"</p>	<p>September</p>
<p>Professor Joseph Cerny Head, Nuclear Science Division & LBL Associate Director University of California California, USA</p>	<p>"Studies of light exotic nuclei with on line mass separators"</p>	<p>November</p>
<p>Professor C. J. Eliezer Department of Applied Mathematics La Trobe University, Bundoora Victoria, Australia</p>	<p>(i) "Mathematical structure of symmetries in nature"</p>	<p>„</p>
	<p>(ii) "Lie symmetries"</p>	<p>December</p>

List of Publications

(1980)

Alladi Ramakrishnan

1. On the Generalisation of the Gell-Mann Nishijima Relation
(Proc. of the Einstein Centennial Symposium on Symmetries in Science, Southern Illinois University at Carbondale, USA, 1979-Plenum, 1980).
2. A New Concept in Probability Theory
(to appear in Jour. Math. Anal. & Appl.)
3. Duality in Stochastic Processes
(to appear in Jour. Math. Anal. & Appl.)

R. Vasudevan

1. Path Integral Method for Radiation Transport in a Random Medium
(Proc. of the Matscience Conf. on Economics, Social and Life Sciences, Mysore, 1980 (to appear).
2. Scaling Laws in Phase Transitions - I & II
(To appear in Proc. of the Matscience Conf. on Charmed Physics, Mysore, 1979)
3. ——— (with P. R. Vittal and A. Vijayakumar)
Neuronal Spike Trains with Exponential Decay
(to appear in Jour. Neurological Research, New York)
4. ——— (with R. Jagannathan and T. S. Santhanam)
Finite Dimensional Quantum Mechanics of a Particle
(to appear in International Jour. of Theoretical Physics)
5. ——— (with K. Sivaprasad and H. M. Hubey)
Wave Propagation in a Random Inhomogeneous Medium
(Proc. of the Inter. Conf. in Electromagnetic and Antenna Theory, Munich, 1980)
6. ——— (with K. Sivaprasad and H. M. Hubey)
Reflections from an Inhomogeneous Slab
(to appear in Radio Science Journal, IEEE)
7. ——— (with R. Jagannathan)
Boson, Para-Boson and Boson-Fermion Representations of Some Graded Lie Algebras
(to appear in the Jour. of Math. Physics)

K. R. Unni

1. ——— (with C. Puttamadaiah)
On Numerical Ranges and Spectrum of Linear Operators on S.I.P. Spaces
(Math. Rep. Vol. 3, 1980)
2. ——— (with K. Sivasubramaniam)
On the Space of Functions whose n'th differences satisfy Lipschitz Condition
(to appear in Math. Rep. Vol. 4, 1981)

N. R. Ranganathan

1. ——— (with J. S. Prakash)
Two Algorithms for Symmetric Groups
(Jour. Physics A, 13, 1980)

T. S. Santhanam

1. Generalized Coherent States
(Proc. Einstein Centennial Symposium on Symmetries in Science held in
Carbondale, USA, March 1979, Plenum 1980)
2. ——— (with S. N. Biswas)
Coherent States for Parabolic Oscillators
(to appear in J. Austral. Math. Soc. Series B, 1980)
3. ——— (with R. Jagannathan and R. Vasudevan)
Finite Dimensional Quantum Mechanics of a Particle
(to appear in Int. J. Theor. Physics)
4. Are the Nucleons really composites of three valence quarks?
(to appear in Proc. Tamil Nadu Acad. Sciences)

K. H. Mariwalla

1. Much Ado in Mechanics
(to appear in Phys. Letters A)
2. A Complete set of Integrals in Non-Relativistic Mechanics
(to appear in Jour. Physics, A)
3. Uniqueness of Classical and Relativistic Systems
(to appear in Phys. Letters A)

K. Srinivasa Rao

1. ——— (with S. Susila, M. Nilsson, B. Schroder, B. Bulow, J. Grintals, G. G. Jonsson and B. Lindner)
Photoproduction of π^+ from ${}^9\text{Be}$
(Z. Phys. A294, p. 253, 1980)
2. ——— (with R. Sridhar and S. Susila)
The Charge Form Factor and Quadrupole Moment of ${}^7\text{Li}$
(to appear in Physica Scripta)

R. Sridhar

1. Temperature Dependence of the Structure Factor and the Velocity of Sound in Liquid ${}^4\text{He}$
(to appear in Nucl. Phys. & Solid State Phys. (India) 23C, 1980)
2. Correlations in Liquid ${}^4\text{He}$
(to appear in Proc. Tamil Nadu Acad. Sciences)
3. ——— (with K. Srinivasa Rao and S. Susila)
The Charge Form Factor and the Quadrupole Moment of ${}^7\text{Li}$
(to appear in Physica Scripta)

R. Parthasarathy

1. ——— (with V. N. Sridhar)
Gamma-Neutrino angular correlations in polarized muon capture in ${}^{28}\text{Si}$ - Part II
(to appear in Physical Review C)
2. Bound on Number of Leptons in Weinberg-Salam model
(Journal of Physics 6 (1980) L 119)
3. ——— (with Y. K. Gambhir, P. Venkataramaiah and P. Raghavendra Rao)
Microscopic description of total Muon Capture rates for even Isotopes of Ti, Cr and Fe.
(to appear in Jour. Phys. G)
4. ——— (with V. N. Sridhar)
Meson exchange corrections in Muon Capture by ${}^{12}\text{C}$
(to appear in Nucl. and Solid State Phys. B)
5. ——— (with V. N. Sridhar)
Recoil Nuclear Polarization in Muon Capture by ${}^{28}\text{Si}$
(to appear in Nucl. and Solid State Phys. B)

R. Jagannathan

1. ——— (with V. A. Chinnappan and G. A. Savari Raj)
On the Isotopic Invariants of Polyatomic Molecules
(to appear in the Indian Journal of Pure & Applied Physics)
2. ——— (with R. Vasudevan)
Boson, Para-Boson and Boson-Fermion Representations of some graded Lie Algebras
(to appear in the Jour. of Math. Physics)
3. ——— (with T. S. Santhanam and R. Vasudevan)
Finite Dimensional Quantum Mechanics of a Particle
(to appear in the Inter. Jour. of Theoretical Physics)

R. P. Agarwal

1. On an Integral Inequality in n Independent Variables
(to appear in J. Math. Anal. & Appl.)
2. ——— (with E. Thandapani)
On Discrete Generalization of Gronwall's Inequality
(to appear in Bull. Inst. Math. Acad. Sinica, Vol. 9, No. 2, 1981)
3. ——— (with E. Thandapani)
On Some New Integrodifferential Inequalities: Theory and Applications
(to appear in Tamkang Jour. of Math. Vol. 11, 1980)
4. ——— (with E. Thandapani)
On Some New Discrete Inequalities
(to appear in Jour. Appl. Math., 1980)
5. ——— (with E. Thandapani)
On Nonlinear Discrete Inequalities of Gronwall's Type
(to appear in Annals Universitatea, A. L. I. Cuza, Iasi, Romania)
6. ——— (with E. Thandapani)
Some New Discrete Inequalities in two Independent Variables
(to appear in Annals Univ. A.L.I. Cuza, Iasi, Romania)
7. ——— (with E. Thandapani)
On Discrete Inequalities in n Independent Variables
(to appear in Rivista di Matematica della Università di Parma)

V. N. Sridhar

1. ——— (with R. Parthasarathy)
Meson Exchange Corrections in Muon Capture by ^{12}C
(to appear in Nucl. Phys. and Solid State Phys. (India) 23B, 1980)

J. S. Prakash

1. k-Particle Greens Functions and Reduction of Irreducible Representations of a Group to its Subgroup
(to appear in J. Phys. A, 13, 1980)
2. ——— (with N. R. Ranganathan)
Two Algorithms for Symmetric Group
(to appear in J. Phys. A, 13, 1980)

E. Thandapani

1. ——— (with R. P. Agarwal)
Gronwall's Inequality
(to appear in Bull. Inst. Math. Acad. Sinica, Vol. 9, No. 2, 1981)
2. ——— (with R. P. Agarwal)
On some new Integrodifferential Inequalities: Theory and Applications
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5. ——— (with R. P. Agarwal)
Some New Discrete Inequalities in Two Independent Variables
(to appear in Annals Univ., A. L. I. Cuza, Iasi, Romania)
6. ——— (with R. P. Agarwal)
On Discrete Inequalities in n Independent Variables
(to appear in Rivista di Matematica della Universita di Parma)

S. N. Uma

1. Representations of Parabose Operators by Graded Lie Algebraic Method
(to appear in Tamil Nadu Academy of Sciences)