

# **MATSCIENCE**

**INSTITUTE OF MATHEMATICAL SCIENCES  
MADRAS, INDIA.**

**SIXTEENTH ANNIVERSARY**

**ANNUAL REPORT 1977**

**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 1977***

*Patron :*

**Mr. C. Subramaniam**

*Chairman of the Board of Governors :*

**Hon'ble Mr. C. Aranganayagam, M.A., B.L.,**

**Minister for Education, Government of Tamil Nadu**

*Director :*

**Professor Alladi Ramakrishnan**

### Board of Governors\*

- |                                                                                                                              |          |
|------------------------------------------------------------------------------------------------------------------------------|----------|
| 1. Hon'ble Mr. C. Aranganayagam, M.A., B.L.<br>Minister for Education<br>Government of Tamil Nadu<br>Madras.                 | Chairman |
| 2. Mr. C. G. Rangabashyam, I.A.S.,<br>Secretary to Government<br>Education Department<br>Government of Tamil Nadu<br>Madras. | Member   |
| 3. Mr. C. S. Rangachari, I.A.S.,<br>Dy. Secretary to Government of India,<br>Department of Atomic Energy<br>Bombay.          | Member   |
| 4. Dr. P. K. Iyengar<br>Director<br>Physics Group<br>Bhabha Atomic Research Centre<br>Bombay.                                | Member   |
| 5. Professor Alladi Ramakrishnan<br>Director<br>The Institute of Mathematical Sciences<br>Madras.                            | Member   |
| 6. Professor N. R. Ranganathan<br>The Institute of Mathematical Sciences<br>Madras.                                          | Member   |

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\* Mr. R. C. Sharma, a representative of the Government of India and Professor K. R. Unni, a representative of the Institute completed their term of office on 24-8-1977.

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### Academic Council

Professor Alladi Ramakrishnan Director Institute of Mathematical Sciences Madras.	Chairman
Professor R. Vasudevan Institute of Mathematical Sciences Madras.	Member
Professor K. R. Unni Institute of Mathematical Sciences Madras.	Member
Professor N. R. Ranganathan Institute of Mathematical Sciences Madras.	Member
Professor T. S. Santhanam Institute of Mathematical Sciences Madras.	Member
Professor V. Radhakrishnan Associate Professor Institute of Mathematical Sciences Madras.	Member
Professor K. H. Mariwalla Associate Professor Institute of Mathematical Sciences Madras.	Member
Professor K. Srinivasa Rao Associate Professor Institute of Mathematical Sciences Madras.	Member

## **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 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 or 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.



**Professor Bardeen at Matscience**



## News of the Institute

### **Fifteenth Anniversary**

The fifteenth anniversary of the institute was celebrated on the 24th January 1977. Shri R. V. Subrahmanian, Adviser to the Governor of Tamil Nadu presided over the celebration and the Director of the institute presented the annual report. Professor Malcolm S. Adiseshiah, Vice-Chancellor of the Madras University delivered the anniversary address in which he announced the formation of the Joint council of Matscience and Ramanujan Institute for pure and applied mathematics with Professor Alladi Ramakrishnan as Chairman.

The fifteenth anniversary symposium was conducted for two days from 24th and 25th January, 1977. Professors T. Kailath (from Stanford University, U.S.A.), P. M. Mathews, V. Devanathan (both from the University of Madras), V. K. Thankappan (from University of Calicut) and S. Venkatraman (M.I.T. Madras) participated in the symposium besides the academic members of the institute.

Professor J. Bardeen who has the unique honour of getting the Nobel prize twice, paid a visit to the institute during the symposium and had discussions with the members.

### **Conference on "Mathematics in Social, Economic and Life Sciences"**

Matscience conducted a conference on Mathematics in Social, Economic and Life Sciences from the 4th to 7th March 1977 at Mysore. The conference was inaugurated by Professor Alladi Ramakrishnan. In his inaugural address the Director traced the development of queueing theory and observed that it may be necessary to modify the conceptual basis of probability theory in treating systems which are endowed with volition or free will. He also stressed the need for interdisciplinary seminars. About 35 participants from different parts of the country and from different research organisations presented their work at the conference. The proceedings of the conference has been published as Matscience Report.

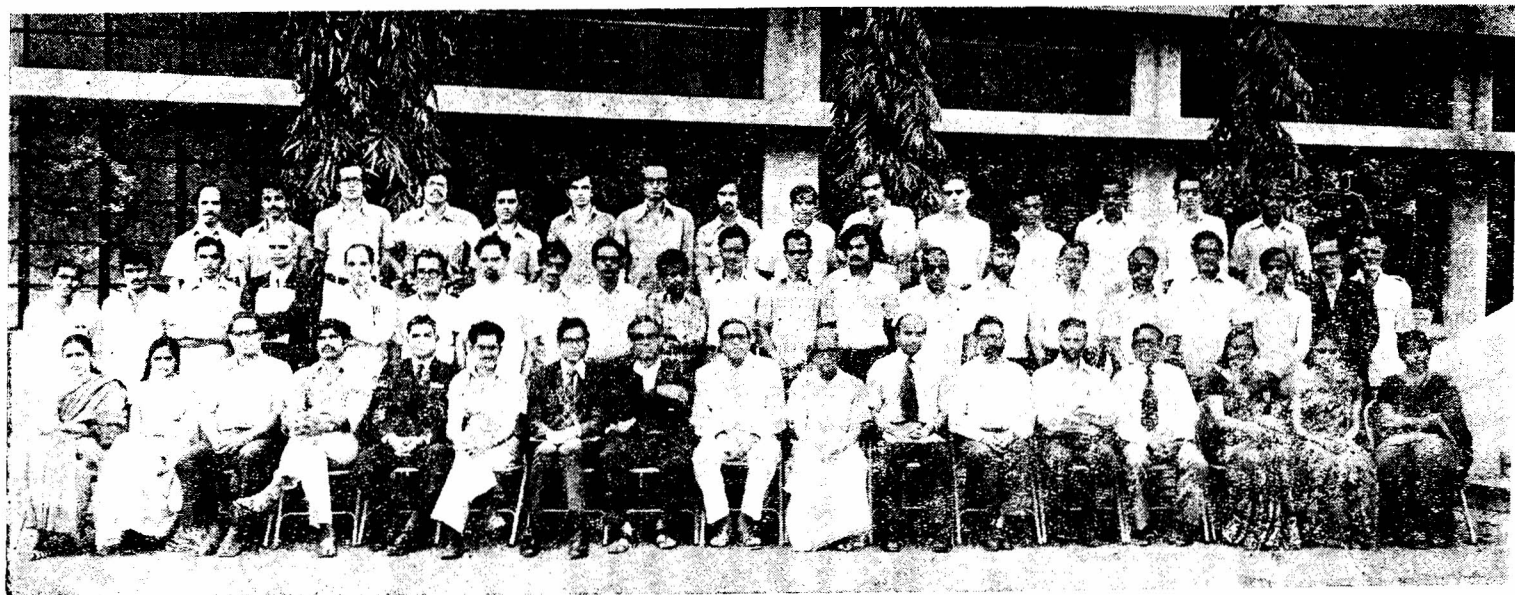
## **Conference on “Mathematical Analysis and Applications”**

Matscience conducted a conference on “Mathematical Analysis and Applications” for four days from the 7th to the 10th September, 1977 in Mysore. Inaugurating the conference Professor Alladi Ramakrishnan observed that such conferences foster the creative endeavours by young researchers. During his inaugural address he gave the new concept of exterior relative velocity in the special theory of relativity. More than forty original papers were presented by the participants from all over India.

Dr. R. Jagannathan who worked for his Ph.D. degree under the guidance of Prof. Alladi Ramakrishnan was awarded the gold medal for the best thesis submitted during 1976-77 in the University of Madras.



Participants of the Matscience Symposium on Mathematics in Social, Economic and Life Sciences held at Mysore (March 1977).



Participants of the Matscienco Conference on Mathematical Analysis and Applications held at Mysore (Sept. 1977)

## Academic Staff

Professor Alladi Ramakrishnan                      Director  
Professor R. Vasudevan  
Professor K. R. Unni  
Professor N. R. Ranganathan  
Professor T. S. Santhanam  
Professor V. Radhakrishnan  
Professor K. H. Mariwalla  
Professor K. Srinivasa Rao  
Professor R. P. Agarwal  
Professor R. Parthasarathy  
Professor R. Sridhar

### Senior Research Fellows :

Dr. V. V. Rama Rao  
Dr. B. R. Gudagudi \*

### Junior Research Fellows :

Miss. S. Poornima *	Mr. V. N. Sridhar
Miss. V. Indumathy *	Mr. J. S. Prakash
Miss. N. Indira **	Mr. C. Jayaram
Miss S. N. Uma	Mr. A. Bagavadhyram *
Mr. V. M. Kothandaraman	Mr. E. Thandapani

Miss. S. Susila \*\*\*  
Mr. P. R. Vittal\*\*\*

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\* Persons who have completed their tenure at the Institute.

\*\* National Science Talent Scholar.

\*\*\* U. G. C. Teacher Trainee

## Administrative Staff

### Librarian

Mr. K. S. Santhanagopalan (1977)

### Accountant

Mr. R. Venkatasubramanian (1976)

### Stenographers & Typists

Mr. R. Jayaraman (1962)

Mr. N. S. Sampath (1963)

Mr. S. Krishnan (1963)

Mr. A. R. Balakrishnan (1965)

Mr. R. Ganapathy (1971)

### Supporting Staff

Mr. D. Varadarajan (1962)

Mr. M. Gangan (1962)

Mr. S. Muthusigamani (1964)

Mr. P. Govindan (1968)

Mr. T. R. Narayanan (1969)

Mr. G. Elumalai (1969)

Mr. M. Kanniappan (1972)

Mr. G. Venkatesan (1972)

Mr. K. Chellakutti (1973)

Mr. V. Jayaraman (1975)

Mr. M. Munuswamy (1975)

Mr. T. Venugopal (1975)

Mr. M. Selvaraj (1976)

## Delegations And Invitations

Professor Alladi Ramakrishnan was invited to deliver lectures on his recent work in the following centres of research during the months March-June (1977).

City College of the City University of New York, New York; Massachusetts Institute of Technology, Cambridge, Massachusetts; Catholic University, Washington; Southern Illinois University at Carbondale, Illinois; University of Texas at Dallas, Texas; University of Texas at Arlington, Texas; Colorado State University, Fort Collins, Colorado; Rockwell International, California; University of California at Santa Barbara, California; SLAC, Stanford University, Stanford, California; University of New Mexico, Albuquerque, New Mexico; University of Manitoba, Winnipeg, Canada;

Professor Alladi Ramakrishnan was invited for lectures at the following centres of research during November-December 1977.

Institute of Henri Poincare, Paris, France; University of Liege Belgium; Institute for Theoretical Nuclear Physics, University of Bonn, West Germany; University of Wurzburg, Wurzburg; Technical University, Clausthal, Germany.

He participated in International Conference on Mathematical Methods, Oberwolfach, Germany (4-9 December 1977) where he presented the results of his recent investigations.

Professor R. Vasudevan was invited to participate in the space science symposium (January 1977) in Vikram Sarabai Space Sciences centre at Trivandrum organised by Indian Space Research Organisation in which he presented two papers on Transport of Radiation. He gave a series of lectures on "Superfluid Physics" at the Department of Physics, Indian Institute of Technology, Madras during which he delivered a course of 15 lectures (February-April 1977). Professor R. Vasudevan also participated in the workshop on "Recent Developments in the Quantum Field Theory and Functional Integration" conducted by the Centre for Theoretical Studies Indian Institute of Sciences, Bangalore during July 1977. He was invited by the Safety Research Laboratory at the Reactor Research Centre, Kalpakkam to deliver a talk on "Imbedding Methods in Radiation Dosimetry".

Professor N. R. Ranganathan participated in the Workshop on "Recent Developments in Quantum Field Theory and functional Integration" organised by

Centre for Theoretical Studies, Indian Institute of Science, Bangalore in July 1977. He also gave a talk entitled Grassmann Calculus in Quantum Field Theory. He delivered a seminar under the auspices of Joint Council of Matscience and Ramanujan Institute, University of Madras on 20th September 1977 on Representations of Generalised Clifford algebras and groups at the Ramanujam Institute. He was invited by the Institute of Physics, Bhubaneswar, Orissa to give a talk on Applications of Finite groups to solid state physics on 28th September 1977.

Professor T. S. Santhanam participated in the International Conference on "Mathematical Methods" held at Bonn, West Germany during July 1977 and in the International Conference on "Group Theoretical Methods" held at Tubingen, West Germany. He gave a lecture at the German Physical Society Meeting on Particle Physics held at Aachen during March 1977. He further lectured at the following centres of research in Europe; University of York, York, England; University of Liverpool, Liverpool, England; University of Clausthal, Clausthal, West Germany.

Professor K. Srinivasa Rao is currently visiting the Institute for Theoretical Nuclear Physics, University of Bonn, Bonn, West Germany as a Humbolt Foundation Fellow (from February 1st 1977). He delivered lectures at the Universities of Lund and Uppsala, Sweden (March 1977). He presented a paper at the International Colloquium at Tubingen (July 1977) and participated in the colloquium on Mathematical Physics, Bonn (July 1977). He was invited by NORDITA, Lund (Sweden) as a visiting scientist during November 1977.

Professor R. Parthasarathy was invited to participate in the workshop on "High Energy Physics and Particle Phenomenology" organised by the University Grants Commission at the University of Jammu during October 1977 in which he presented his work on "Muon capture and pole model".



## Faculty at the Institute

**Professor ALLADI RAMAKRISHNAN.**

**Present Position:** Director, MATSCIENCE.

**Qualifications:**

- B.Sc. (Hons.) Madras (1943); Ph.D. (Manchester, 1951).
- Fellow of the Indian Academy of Sciences (1955).
- Vice-President of the Tamil Nadu Academy of Sciences (1976).

**Publications:**

Published 130 papers in the following journals:

Astrophysical Journal (USA); Proceedings of the Royal Society (London) (U.K.); Proceedings of the Cambridge Philosophical Society (U.K.); Journal of Royal Statistical Society (U.K.); Progress of Theoretical Physics (Japan); Nuclear Physics (Holland); Philosophical Magazine (U.K.); Kon. Wed. Academy Amsterdam, (Holland); Indagationes Mathematicae (Holland); Annals of Institute of Henri Poincare (France); Zeit. fur Angewand Math und Mech. (Germany); Bulletin of Mathematical Biophysics (USA); Journal of Mathematical Analysis and Applications (USA); Zeitschrift fur Physik (Germany); IL Nuovo Cimento (Italy); Symposia on Theoretical Physics and Mathematics (USA); Proc. of the Indian Academy of Sciences (India); Current Science (India); Proceedings of the Tamil Nadu Academy of Sciences (India); Journal of Mathematical and Physical Sciences (I.I.T. Madras) (India).  
Participated in 28 international conferences and 51 national conferences.

**Academic Assignments:**

Visiting Member of the Institute for Advanced Study, (Princeton (USA) (1957-58); Visiting Scientist at the University of Sydney (Australia); University of Berne, Switzerland (1960); International Centre for Theoretical Physics, Trieste, Italy (1965, 67, 68); Consultant to Rand Corporation, (USA) (1962-64).

Visited and lectured at 138 advanced centres of research abroad in the following countries:

England, USA, Canada, USSR, Ireland, France, Belgium, Holland, Germany, Italy, Austria, Switzerland, Norway, Sweden, Denmark, Iran, Japan, Australia.

**Author of the following books:**

- i. "Elementary particles and cosmic rays" (Pergamon Press, 1962, USA).
- ii. "L-Matrix theory or the Grammar of Dirac Matrices" (Tata-McGraw Hill, 1972, New Delhi).

**Author of a review article entitled:**

"Probability and Stochastic Processes" in Handbuch der Physik Band III, Published by Springer-Verlag, Germany (1959).

Edited the series "Symposia on Theoretical Physics and Mathematics"  
Published by Plenum Press, New York, USA.

Associate Editor of "Journal of Mathematical Analysis and Applications"  
Academic Press (New York), USA.

Executive Editor of the Proceedings of the Tamil Nadu Academy of sciences  
(Madras, India). An Executive Editor of Jour. Mathematical and Physical  
Sciences" Madras.

**Professor R. VASUDEVAN**

**Present Position:** Professor.

**Qualifications:** M.A., Madras (1947); M.Sc., Madras (1954) Ph.D. Madras (1959).

**Publications:**

Published 95 papers in the following journals:

Astrophysical Journal (USA); Proceedings of Indian Academy of Sciences  
(India); Nuclear Physics (Holland); Journal of Mathematical Analysis and  
Applications (USA); Proceedings of the Physical Society (London) (UK);  
Physical Review (USA); Physical Review Letters (USA); IL Nuovo Cimento  
(Italy); Zeitschrift fur Physik (Germany); Symposia on Mathematics and  
Theoretical Physics, Plenum (USA); Journal of Mathematical and Physical  
Sciences (I.I.T., Madras) (India); Annals de Institut Henri Poincare (France);  
Letter al Nuovo Cimento (Italy); \* Journal of Numerical Analysis (USA);  
Kybernetik Journal (USA); Journal of Applied Probability (USA); Mathe-  
matics of Computation (USA); Utilitas Mathematica (Canada); Journal of  
Mathematical Physics (USA); Mathematical Biosciences Journal (USA);  
Journal of Astrophysics and Space Sciences; Computers in Mathematical  
Sciences and their applications (USA).

Edited 2 Matscience Conference Proceedings as Matscience Reports.

**Coauthor of the book:**

"Introduction to Random differential equations and their applications" (with  
S. K. Srinivasan) published by American Elsevier (N. Y., 1971).

**Academic Assignments:**

Senior Research Physicist of the University of California at La Jolla (1959-61);  
at Berkeley (1961-63). Consultant to Rand Corporation; Santa Monica, USA  
(1961-63). Had visiting positions at University of California, Berkeley, USA  
(1965-66); University of Naples, Italy (1968); University of Southern  
California, Los Angeles, USA (1970-73; 1974; 1976).

Associate editor of the Mathematical Biosciences journal (Published from  
USA). Member of the editorial board of the journal "Neurological Research"  
(Published from USA).

Member of the editorial board of the "Journal of Mathematical and Physical  
Sciences" Madras (India).

**Professor K. R. UNNI.**

**Present Position :** Professor.

**Qualifications :**

B. A. (Hons.) Madras (1955); M. S. Utah (USA) 1961; North Western (U.S.A) (1963.)

**Publications :**

Published 16 papers in the following journals :

Canadian Journal of Mathematics (Canada); Bulletin of American Mathematical Society (USA); Tohoku Mathematical Journal (Japan); Scripta Mathematica (Sweden); Journal of Mathematical Analysis and Applications (USA); Nanta Mathematica (Singapore); Journal of Mathematical and Physical Sciences (India); Symposia on Mathematics and Physics (USA); Studia Mathematica (Poland).

Edited (along with H. G. Garnir and J. H. Williamson) "Functional Analysis and its Applications", lecture notes in Mathematics, No. 399 (Springer-Verlag, 1974) being the Proceedings of the International Conference, Madras (1973).  
Published 5 Matscience Reports.

Teaching Assistant, Utah (1960-61); Graduate Assistant, North Western, USA (1961-63); Utah State University, USA (1963-64).

Participated in 2 International Conferences (one in Montreal and the other in Madras).

Visited and lectured at five centres of research in the following countries :

U.S.A., Canada, Belgium, France.

Vice-President of the Calcutta Mathematical Society. Member of the editorial board of Bulletin of Calcutta Mathematical Society, Journal of Mathematical and Physical Sciences (Madras).

**Professor N. R. RANGANATHAN**

**Present Position :** Professor.

**Qualifications :** M.Sc., Madras (1955); Ph.D. Madras (1961).

**Publications :** Published 31 papers in the following journals :

Proceedings of the Indian Academy of Sciences (India); IL Nuovo Cimento (Italy); Nuclear Physics (Holland); Journal of Mathematical Analysis and Applications (USA); Reports in Mathematical Physics (Poland); Physica Status Solidi (Germany); Physics Letters (Holland).

Visiting positions in Brandeis University, USA (1961-63); C. E. N. Saclay, France and University of Naples, Italy (1965-66); I. C. T. P. Italy (1973).

Taken part in 3 international conferences.

**Professor T. S. SANTHANAM**

**Present Position:** Professor.

**Qualifications:**

M.Sc., Madras (1962); Ph.D. Madras (1970); Research degree in Theoretical Physics, Trieste, Italy (1966).

**Published 40 papers in the following journals:**

Journal of Mathematical Physics (USA); Physical Review (USA); Physics Letters (Holland); IL Nuovo Cimento, Nuovo Cimento Letters (Italy); Progress of Theoretical Physics (Japan); Nuclear Physics (Holland); Foundations of Physics (USA); Zeitschrift fur Physik (Germany); Forts der Physik (Germany); Jour. Mathematical Analysis and Applications (USA); Journal of Mathematical and Physical Sciences (Madras); Proc. of the Tamil Nadu Academy of Sciences (India); Symposia on Theoretical Physics (USA); One Matscience Report and papers in 7 international conference proceedings.

**Taken part in seven international conferences and 6 national conferences besides the conferences organised by Matscience.**

Had visiting positions at ICTP, Trieste (1965, 69, 71); University of Bonn, Germany (1970, 73); NORDITA, Denmark (1973); University of Texas, Austin, USA (1972); University of Wurzburg, Germany (1975-77).

**Visited and lectured at 42 research institutions in the following countries :**

Italy, Iran, Switzerland, Belgium, Holland, Sweden, Finland, Germany, France, U.K., Ireland, USA, Japan.

**Professor V. RADHAKRISHNAN**

**Present Position:** Associate Professor.

**Qualifications:** M.Sc., Madras (1959); Ph.D. Bombay (TIFR) (1966).

**Published 9 papers in the following journals:**

IL Nuovo Cimento (Italy); Bull. Academie Royale Belgique (Belgium); Physics Letters (Holland); Physica Status Solidi (Germany); Australian Journal of Physics (Australia); Canadian Journal of Physics (Canada); Journal of Applied Physics (USA); 4 papers in conference proceedings.

**Academic Assignments:**

Assistant Professor, Purdue University, USA (1969); Visiting positions at Institute of Theoretical Physics, McGill, Canada (1967-69); University of Paris, France (1970).

**Taken part in two international conferences.**

**Professor K. H. MARIWALLA**

**Present Position:** Associate Professor.

**Qualifications:** M.Sc., Bombay (1958); Ph.D. Georgia, USA (1963).

**Publications:** Published 12 papers in the following journals and 12 papers in the Proceedings of various conferences.

Reviews of Modern Physics (USA); Jour. of Mathematical Physics (USA);  
IL Nuovo Cimento (Italy); Physics Reports (Holland).

**Academic Assignments:**

Teaching Assistant in British Columbia (1959, 61);  
Georgia (1961-63); Assistant Professor, University of Southern Carolina  
(1963-65); Associate Professor, Arya-Mehr, Tehran (1969-70).

**Visited and lectured 7 centres of research in the following countries:**

Norway, USA, Turkey, Iran, USSR.

**Professor K. SRINIVASA RAO**

**Present Position:** Associate Professor.

**Qualifications:** M.Sc. Madras (1964); Ph.D. Madras (1970).

**Publications:** Published 25 papers in the following journals:

IL Nuovo Cimento (Italy); Nuclear Physics (Holland); Physics Letters  
(Holland); Nuclear Physics and Solid State Physics (India); Journal of  
Physics (UK); Journal de Physique (France); Physical Review (USA);  
Progress of Theoretical Physics (Japan); Canadian Journal of Physics  
(Canada); Journal of Mathematical Physics (USA).

Two Matscience Reports and 6 papers in Proceedings of International  
Conferences. Edited two Matscience Reports and author of the book:  
"Introduction to computers and Programming" (Published by S. Viswanathan,  
Madras, 1974).

Had visiting positions at McGill Univ. (1974), McMaster Univ. (1974), Catholic  
Univ. of America (1976) and Univ. of Bonn (Feb. '77—Jan. '78).

**Visited and lectured at 23 centres of research in the following countries:**

USA, U.K., France, Germany, Switzerland, Italy, Mexico, Canada, Sweden,  
Denmark.

**Participated in five international conferences.**

**Professor R. P. AGARWAL**

**Present Position :** Assistant Professor.

**Qualifications :** M.Sc., Agra (1969); Ph.D. I.I.T. Madras (1973).

**Published 14 papers in the following journals :**

Journal of Mathematical and Physical Sciences (India); Proceedings of Indian Academy of Sciences (India); Indian Journal of Pure and Applied Mathematics (India); Proceedings of ISTAN (India);  
Proc. Tamil Nadu Academy of Sciences (India).

**Professor R. PARTHASARATHY**

**Present Position :** Assistant Professor.

**Qualifications :** M.Sc. Madras (1969); Ph.D. Madras (1973);

**Published 15 papers in the following Journals :**

Annals of Physics (USA); Nuclear Physics (Holland); Journal de Physique (France); Journal of Physics (England); Acta Physica Polonica (Poland); Nuclear Physics and Solid State Physics (India); Proceedings of Tamil Nadu Academy of Sciences (India); 3 papers in Proceedings of various conferences.

**Visited and lectured at 4 centres of research in the following countries :**

Belgium, France, Italy, Switzerland.

**Taken part in one international conference.**

**Professor R. SRIDHAR**

**Present Position :** Assistant Professor.

**Qualifications :** M.Sc. I.I.T. Madras (1964); Ph.D, Madras (1971).

**Published 10 papers in the following journals :**

Physics Letters (Holland); IL Nuovo Cimento (Italy); Acta Physica Polonica (Poland); Progress of Theoretical Physics (Japan); Physica (Holland). 5 papers in the proceedings of various conferences and two Matscience Reports.

**Visited and lectured at 9 centres of research in the following countries :**

Austria, Italy, Switzerland, Belgium and U.K.

**Taken part in one international conference.**

## Invited Lectures

<p>Professor K. B. Sinha Department of Theoretical Physics, University of Geneva, Geneva.</p>	<p>‘The spectral theory of Schrodinger operation and scattering’ (two lectures)</p>	<p><b>January</b></p>
<p>Professor N. Mukunda Centre for Theoretical Studies Bangalore.</p>	<p>‘Singular Lagrangian system’</p>	<p>„</p>
<p>Professor J. N. Srivatsava Department of Statistics Colorado State University U.S.A.</p>	<p>‘Search Models, Coding theory etc.’ (two lectures)</p>	<p>„</p>
<p>Professor C. J. Eliezer Department of Mathematics La Trobe University Melbourne, Australia.</p>	<p>‘Optimal Principles’</p>	<p>„</p>
<p>Professor Jan Nilsson Institute for Theoretical Physics, Gothenberg, Sweden.</p>	<p>‘Topological quantum numbers and structure of the Vacuum’</p>	<p><b>February</b></p>
<p>Professor Nataraj Sharma Bhabha Atomic Research Centre Bombay.</p>	<p>‘Ion implantation’</p>	<p>„</p>
<p>Professor William Karush Department of Mathematics California State University Los Angeles, USA.</p>	<p>‘Problems of applying mathe- matics to social sciences’</p>	<p><b>April</b></p>
<p>Professor Saburo Miyaka Director, Cosmic Ray Laboratory Tokyo; Japan.</p>	<p>‘Experiments in cosmic ray physics and allied fields’</p>	<p>„</p>
<p>Dr. S. V. Talekar Department of Bio Physics National Institute of Mental Health and Neuro Sciences, Bangalore.</p>	<p>‘Bio Membranes’</p>	<p><b>May</b></p>

Professor G. Sankara Narayanan Head of the Department of Mathematics and Statistics, Annamalai University Annamalai Nagar.	'Branching process with and without immigration'	May
Dr. John Jayne University College, London.	(i) 'Closed convex sets in Banach spaces' (ii) 'Isometric theory of Banach spaces'	"
Dr. A. R. Prasanna Physical Research Laboratory Ahmedabad.	'Charged particle motion in general relativity'	"
Dr. R. Jagannathan Department of Physics St. Joseph's College, Tiruchi.	'A New approach to representations of Clifford Algebras'	June
Professor G. Venkataraman Principal Physicist and Head of Theory Division, RRC, Kalpakkam.	'A Stochastic theory of Anelastic creep'	"
Dr. N. Ramanathan Pool Officer Institute of Tropical Meteorology Poona.	'Dynamical Meteorology'	July
Professor P. K. Ghosh Department of Applied Mathe- matics University College of Science Calcutta University, Calcutta.	'R-function'	"
Dr. J. R. Banavar Department of Physics University of Pittsburg Pittsburg, USA.	'Helicity modular and superfluid density in the XY model and in a weakly interacting Bose gas'	"
Dr. S. Kichanaswamy Institute de Henri Poincare Paris, France.	'Discordant red shift and relativistic ejection'	"
Dr. R. K. Gupta University of Rohthak Rajasthan.	'Theory of nuclear fission and heavy ion reactions'	"



<p>Professor A. V. Holden School of Medicine University of Leeds U.K.</p>	<p>(i) 'Flicker Noise problem in membranes' (ii) 'Neural field equations'</p>	<p>August</p>
<p>Mr. Krishnaswami Alladi Graduate Student, University of California, Los Angeles. USA.</p>	<p>(i) 'An Analogue to the prime number theorem for arithmetic programme' (ii) 'Applications of duality principle to prime number theorem'</p>	<p>„</p>
<p>Professor D. Sundarraman Ramanujam Institute for Advanced Study in Mathematics, University of Madras, Madras.</p>	<p>'The seven elementary Catastrophies'</p>	<p>July</p>
<p>Professor Cecille de witt University of Texas, Austin, U.S.A.</p>	<p>'Functional Integration'</p>	<p>August</p>
<p>Professor N. Mukunda, Chairman, Centre for Theoretical Studies, Indian Institute of Science, Bangalore.</p>	<p>'The Diagonal representation in Quantum Optics'</p>	<p>October</p>
<p>Dr. M. R. Subrahmanya</p>	<p>'On simultaneous best approximations' (two lectures)</p>	<p>November</p>
<p>Professor D. Vere-Jones Mathematics Department Victoria University of Wellington New Zealand.</p>	<p>'Conditional risk models and some applications'</p>	<p>December</p>
<p>Air Commodore S. Lakshmi- narayanan Director of Metereology Delhi.</p>	<p>'Use of kinematical determinant to locate the centre of cyclone and the ring of maximum wind enclosing the centre'</p>	<p>„</p>

## List of Publications

### Professor Alladi Ramakrishnan

1. "Lorentz to Gell-Mann - Can the masters be retouched?"  
Proc. Tamil Nadu Acad. Sciences, Madras Vol. 1 (1978)
2. "A new concept in special relativity—Exterior Relative Velocity"  
Proc. Tamil Nadu Acad. Sciences, Madras Vol. 1 (1978)
3. "New concepts in Matrix theory"  
Jour. Math. Anal. and Appl. U.S.A. 60 (1977) 255

### Professor R. Vasudevan

1. "A note on representations of Para Fermi Algebra" (with R. Jagannathan)  
(to appear in J. Math. Physics, U.S.A.)
2. "Quasilinearisation and the matrix Riccati equation" (with R. Bellman)  
(to appear in J. Math. Anal. Appl. U.S.A.)
3. "Cerebral blood flow in stroke type patients" (with G. Austin, D. Laffin,  
E. Lichter and W. Hayward) to appear in "Microvascular Anastomosis for  
cerebral Ischemia" U.S.A. (Ed.) F. Fein.
4. "Mathematics in medicine, tumor detection, radiation dosimetry and  
simulation and physchtherapy"—a survey (with R. Bellman, R. Kasheff,  
C. Smith and S. Ueno) Jour. of IZVESTIJA of Estonian Academy of  
Sciences, U.S.S.R. 6, 579 (1977)
5. Completed draft of the book of 13 chapters entitled "Wave propagation—  
an imbedding approach" (with R. Bellman) (to be published)
6. "Matrix Reccati Equations" Read at the MATSCIENCE conferece on  
Mathematical Analysis and Applications, Mysore (Sept. 1977)
7. "Measurement and quantitative analysis of cerebral blood flow by Non-  
invasive techniques" in Matscience Report 86.
8. "Mathematical models in Medicine and Biology"—Review in Proceedings  
of Tamil Nadu Academy of Sciences, Madras. 1, (1977) No. 1.

### Professor N. R. Ranganathan

1. "Generalised Clifford Algebra and Groups" Read at the Fifteenth Anniver-  
sary Symposium, Matscience (January, 1977).
2. "Applications of Grassman calculus" Read at the Matscience seminar on  
"Mathematical Analysis and Applications", (September 1977).

**Professor T. S. Santhanam**

1. "Quantum mechanics in discrete space and angular momentum" *Foundations of Physics U.S.A.* **7**: 121 (1977)
2. "Does Weyl's commutation relations imply a generalised statistics?" *Nuovo Cimento Letters* **20**, Italy 13 (1977)
3. "Quantum Mechanics of bounded operators" *Foundations of quantum mechanics; A fifty year's survey*—edited by W. Price and S. S. Chissick, John Wiley (London) 227-243 (1977)
4. "Multi-Quark model and the embedding of Groups I" (with B. Gruber) *J. Math. Physics U.S.A.* **18**, 849 (1977)
5. "Multi-Quark model and the embedding of Groups II" (with B. Gruber) (to be Submitted for Publication)
6. "A Seven Quark model for the spectrum of hadrons" (with B. Gruber) *Phys. Rev. D. U.S.A.* **14** (1977) No. 11.
7. "Super symmetry and exceptional groups" to appear in the *Proceedings of the International Conference on Group Theoretical Methods in Physics*. Tübingen, Germany, July 1977.
8. "Quantum mechanics in finite dimensions-II" (with K. B. Sinha) (to be submitted for publication)
9. "Electrodynamics in finite space" (with M. Lorente) (to be Submitted for publication)
10. "New quarks and new physics" *Proc. Tamil Nadu Academy of Sciences, Madras* (1977) Vol. 1.
11. "Quantum mechanics in Discrete space" Read at the *Proc. Matscience Conference on "Mathematical Analysis and Applications"* Mysore, Sept. 1977.

**Professor V. Radhakrishnan**

1. "A simplified phenomenological model for nerve conduction" (with V. N. Sridhar—Read at *Matscience Conference on "Mathematical Analysis and Applications"* Mysore, Sept. 1977.
2. "Structural phase transitions" Read at the *Matscience conference on "Mathematical Analysis and Applications"* Mysore, Sept. 1977,

**Professor K. H. Mariwalla**

1. "Huygens and special relativity—A kinematic approach"—Read at the *fifteenth anniversary symposium, Matscience* (January 1977).

2. "Velocity space approach to special theory of relativity"—Read at Proc. of the Matscience Conference on "Mathematical Analysis and Applications" Mysore, Sept. 1977.

**Professor K. Srinivasa Rao**

1. "On the Canonical parameters for the  $3j$  and  $6j$  co-efficients" (Submitted to Jour. Math. Physics. (U.S.A.)).
2. "New Fortran Programs for angular momentum co-efficients" (Submitted to Computer Phys. Comm. (U.S.A.)).

**Professor R. P. Agarwal**

1. "Iterative methods for the system of second order boundary value problems"—J. Math. Phys. Sci. India **11**, 209 (1977).
2. "Component wise convergence in quasilinearisation" (to appear in Indian Academy of Sciences, 1977).
3. "Existence and uniqueness for non-linear functional differential equations" (to appear in Indian J. Pure and Appl. Math.).
4. "On linear two-point boundary value problems with a parameter" (to appear J. Math. Phys. Sci. India 1978).
5. "Improved error bounds for the Picard iterates" (to appear J. Math. Phys. Sci. India 1978).
6. "On periodic solutions of non linear second order differential systems" Read at the Conference on "Mathematical Analysis and its Applications", Mysore, 1977.

**Professor R. Parthasarathy**

1. "Recoil nuclear polarization in Radiative Pion Capture"—Read at the Fifteenth Anniversary Symposium, Matscience, Jan. 1977.
2. "Neutron—Nuetrino angular correlations in muon capture"—Proc. Tamil Nadu Acad. Sci. Madras (in press)
3. "Axial vector form factor in muon capture"—Nucl. Phys. and Solid State Phys. India **19B**, 103 (1977).
4. "Neutron spectrum in muon capture by  $^{40}\text{Ca}$ " Journ. Phys. (G) U.K. **3**, L 185 (1977).
5. "Weak Hadronic form factors in muon capture" Acta Phys. Pol. Poland (in press)

6. "Gamma rays following muon capture in  $^{28}\text{Si}$ " Submitted to Journ. Phys. (G), U.K..
7. "Neutral Currents in electron scattering". Read at symposium on "Perspectives in Nuclear and Solid State Physics" November 1977, University of Madras, Madras.
8. "Dispersion theory of Nuclear reactions—applications to muon capture"—Read at Matscience Conf. on "Mathematical Analysis and Applications"—Mysore, Sept. 1977.

**Professor R. Sridhar**

1. "Velocity correlations in liquid He<sup>4</sup>". Read at the Fifteenth Anniversary Symposium, Matscience (Jan. 1977).
2. "On the description of Rotational flow in Quantum Hydrodynamics" Physics Letters, North Holland 61A, 117 (1977).
3. "On the velocity operator in quantum hydrodynamics" Acta Physica Polonica, Poland 52, (1977).
4. "Creterion for rotational flow in Quantum Hydrodynamics" Read at the Matscience Conf. on "Mathematical Analysis and Applications" Mysore, Sept. 1977.
5. "The quantum hydrodynamic treatment of liquid He II" Submitted to the Third National Seminar on Cryogenics, NIFFT, Ranchi (December 1977).

**Dr. V. V. Rama Rao**

1. "On a problem of G. Birkhoff" (to be submitted for publication).
2. "Characterisation of a class of D.R.L. semigroups by sheaves" Proc. of Tamil Nadu Academy of Sciences, Madras Vol. 1, (1977).
3. "Remarks on Normal and distributive (\*) lattices" to appear in Proc. of Tamil Nadu Academy of Sciences, Madras (1978).

**Miss S. Poornima**

"Multipliers from a Segal algebra into  $L^1(G)$ " (to be submitted for publication)

**Miss V. Indumathi**

"On Proximal subspaces of finite codimension in normed linear spaces"—(to be submitted for publication).

**Miss N. Indira**

“On a theorem of Sharma and Tzimbarario” (Submitted for publication in ‘Analysis Mathematica’).

**Mr. P. R Vittal**

1. “On compensation functions and the method of images” (with R. Vasudevan and Vijayakumar) submitted for publication in the Journal of “stochastic Process and their Applications” (U.S.A).
2. “On a first passage time problem” Read at the Matscience conference on “Mathematical Analysis and their applications”. Mysore (Sept. 1977).

SYMPOSIA, SEMINARS AND SUMMER SCHOOLS,  
CONDUCTED BY MATSCIENCE

**Anniversary Symposia at MATSCIENCE, Madras**

<i>Year</i>	<i>Title</i>	<i>Period</i>
1963	Resonance States in Elementary Particles	14-16, January
1964	Recent Trends in Theoretical Physics	3- 7, „
1965	Third Anniversary Symposium	3-12, „
1966	Fourth Anniversary Symposium	3- 9, „
1967	Fifth Anniversary Symposium	2-15, „
1968	Sixth Anniversary Symposium	17-31, „
1969	Seventh Anniversary Symposium	20-25, „
1970	Eighth Anniversary Symposium	10-14, „
1971	Ninth Anniversary Symposium	12-18, „
1972	Tenth Anniversary Symposium	8-10, „
1973	Eleventh Anniversary Symposium and International Conference on Functional Analysis	1- 7, „
1974	Twelfth Anniversary Symposium	10-12, „
1975	Thirteenth Anniversary Symposium	4, „
1976	Fourteenth Anniversary Symposium	6-9, „
1977	Fifteenth Anniversary Symposium	24-25, „

### Summer Schools and Conferences

<i>Year</i>	<i>Title</i>	<i>Period</i>	<i>Venue</i>
1963	High Energy Physics	1—15, June	KODAIKANAL
1964	Theoretical Physics	24 Aug.—13 Sept.	BANGALORE
1965	Theoretical Physics	17 Aug.—4 Sept.	BANGALORE
1966	Recent Trends in Theoretical Physics	27 Sep.—15 Oct.	BANGALORE
1967-68	First Seminar in Analysis	20 Dec. 67—16 Jan. 68	MADRAS
1968	Fourth Matscience Summer School	24—28, Sept.	MADRAS
1968-69	Second Seminar in Analysis	26 Dec. 68—10 Jan. 69	MADRAS
1970	Frontiers of Physics	14—20, Sept.	OOTACAMUND
1970	Elementary Particles and Nuclear Physics	22—31, Jan.	BANGALORE
1970	Third Seminar in Analysis	18th Feb. to 2nd March	OOTACAMUND
1971	Clifford Algebra, its Generalization and Applications	30 -31, January	OOTACAMUND
1971	Fourth Seminar in Analysis	1—10, February	OOTACAMUND
1971	Cosmology, Gravitation and Applications to Particle Theory	5—9, November	MYSORE
1971	Fourier Optics, Lasers and Holography	11—15, November	BANGALORE
1972	Twin Conferences 1. Fifth Seminar in analysis and 2. Symposium on Matrix Theory.	11—22, March	BANGALORE
1973	Nuclear Physics	1—5, March	BANGALORE



<i>Year</i>	<i>Title</i>	<i>Period</i>	<i>Venue</i>
1973	Numerical Analysis and Combinatorial Methods	9—16, March	BANGALORE
1973	Probability Theory and Stochastic Processes	24—30, Sept.	BANGALORE
1974	Sixth Seminar in Analysis	11—20, February	BANGALORE
1974	Mathematics in Medicine and Biology	12—23, February	BANGALORE
1974	Green's Functions	22—26, Sept.	MYSORE
1975	Seventh Seminar in Analysis	8—17, March	MYSORE
1975	Collective Phenomena in Nuclei and Solids	13—16, Dec.	MYSORE
1976	Computational Methods, Matrix Algebra and Number Theory	6—9, Sept.	MYSORE
1977	Mathematics in Social, Economic and Life Sciences	4—7, March	MYSORE
1977	Mathematical Analysis and its Applications	7—10 Sept.	MYSORE

#### SPECIAL ONE-DAY SYMPOSIA

1968	Mathematics as a stimulus to Physical thought (in honour of Professor Marshall Stone)	29 Dec.	MADRAS
1969	Computers in Science and Industry	25 March	MADRAS
1970	IMPACT Conference on 'Coordinate Transformations and their Applications'	1 April	MADRAS
1970	IMPACT Conference on 'Development in Aviation and their economic Impact on India'	20 Sept.	MADRAS
1971	Fifty Years of Mathematical Education in India	29 Dec.	MADRAS

## MASTECH CONFERENCES

(Sponsored by the Council of Scientific and Industrial Research)

<i>Year</i>	<i>Title</i>	<i>Period</i>	<i>Venue</i>
1969	Matrix Analysis and Applications to Science and Technology	25 Sept. to 3 Oct.	BANGALORE
1970	Probability and Statistics and their Applications to Science and Technology	14—20 Jan.	MADRAS
1971	Statistical Mechanics and their Applications to Science and Technology	24—27, Jan	BANGALORE
1971	Functional Analysis and its Applications to Science and Technology	14—17, Sept.	BANGALORE

## INSERVICE TRAINING PROGRAMME

(Sponsored by the Directorate of Collegiate Education)

1973	Inservice Programme for the Mathematics Teachers	1—15, May	MADRAS
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## LIBRARY

The institute Library started in 1962 approximately with 1500 Books and Journals and the total volume to-day exceed 15,000. During the year 1977, 814 books and bound volumes of periodicals have been added to the library. It is one of the best equipped research libraries in the country. More than 700 scientists and research workers from outside have made use of the library during the year.

We have been receiving good number of journals, books and lecture notes on exchange basis from institutions all over the world. About 150 preprints in the field of theoretical physics, pure and applied mathematics are being received in a month from leading research institutions like CERN, NORDITA, Lawrence Radiation Laboratory, etc. Once in a fortnight an author alphabetical list of the preprints is prepared.

The card catalogue for bound periodicals is under preparation and it will be ready soon.

### LIST OF AVAILABLE MATSCIENCE REPORTS AND SEMINAR IN ANALYSIS

<i>Report No.</i>	<i>Author(s)</i>	<i>Title</i>
9	L. I. Schiff	Lectures on Gravitation. 47 p. (1963).
55	H. S. Shapiro	Smoothing and approximation of functions. 109 p. (1966).
57	K. Srinivasa Rao & R. Sridhar	Nuclear models and nuclear matter. 202 p. (1967).
62	R. H. Good	Description of particles with any spin and with internal symmetry. 51 p. (1968).
66	F. Riahi	Lectures on non-relativistic scattering theory. 62 p. (1969).
67	K. Srinivasa Rao (Ed.)	Proceedings of the one day symposium on computers in science and technology. 55 p. (1969).

<i>Report No.</i>	<i>Author(s)</i>	<i>Title</i>
69	P. K. Geetha	Topics in modern mathematics. 110 p. (1970).
71	A. R. Prasanna	General relativity and cosmology. 57 p. (1970).
72	A. R. Prasanna	Gravitational collapse and gravitational radiation. 69 p. (1971).
74	Krishnaswami Alladi	Contributions to number theory. 62 p. (1972).
75	Alladi Ramakrishnan	Essays on Scientific Topics. 73 p. (1972).
76	—	Proceedings of the conference on "Cosmology, Gravitation & Applications to Particle Theory", Bangalore, 1971. 289 p. (1973).
77	—	Proceedings of the conference on "Fourier Optics, Lasers & Holography", Bangalore 156 p. (1973).
78	—	Proceedings of the conference on "Nuclear Physics", Mysore, 1973. 284 p. (1973).
79	—	Proceedings of the conference on "Numerical Analysis & Combinatorial Methods" Bangalore, 1973.
80	Krishnaswami Alladi	Lectures on Diophantine Approximations. 55 p. (1974).
81	Alladi Ramakrishnan	Applications of the theory of stochastic processes to physical problems. 144 p. (1974).
82	Vimala Walter	On fundamental and interpolating Spline functions. 64 p. (1975).
83	Krishnaswami Alladi	New concepts in Arithmetic functions. 65 p. (1975).

<i>Report No.</i>	<i>Author(s)</i>	<i>Title</i>
84	K. H. Mariwalla	Introduction to Vectors, Tensors and Relativity. 153 p. (1975).
85	R. Vasudevan (Ed.)	Proceedings of the conference on "Mathematics in Medicine and Biology", Bangalore, 1974. 221 p. (1975).
86	A Ramakrishnan	Essays on Scientific Topics II.
87	—	Proc. of the conf. on Matrix Algebra, Computational Methods and Number Theory—Mysore, 1976.
88	B. R. Gudagudi	Some studies in Pathos Graphs, 1977.
89	—	Proceedings of the Conf. on Mathematics, in Social, Economic and life Sciences, Mysore, 1977.

#### SEMINAR IN ANALYSIS

1	K. R. Unni	Lectures on Bernstein approximation problem. 107 p. (1969).
4	A. L. Brown	Abstract approximation theory. 118 p. (1970).
5	S. P. Singh Vimala Walter G. N. Keshava Murthy	Fixed Point Theorem Splines in Banach Spaces Multipliers on Segal Algebras.
6	S. P. Singh	On Fixed point theorems. 157 p. (1975).

These Reports are available at Rs. 10/- (within India) & at \$ 2.00 (outside India).

#### PROCEEDINGS OF THE CONFERENCE ON CLIFFORD ALGEBRA, ITS GENERALIZATION AND APPLICATIONS

—Conference organised by MATSCIENCE, 30th January–1st February 1971,  
held at Ootacamund, South India.

CONTENTS:

- T. Nono : Generalized Clifford algebra and linearizations of a partial differential equations.
- K. Yamazaki ; Structure of algebra extension of finite Abelian group.
- A. O. Morris : Projective representations of finite groups.
- Alladi Ramakrishnan : Generalized Clifford algebra and its applications  
OR A new approach to internal quantum numbers.
- I. Popovici & A. Turtoi : Generalized spinor structure.

(103 p. (1972) Rs. 10/- within India and \$ 2.00 outside India).