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THE INSTITUTE OF MATHEMATICAL SCIENCES

Madras INDIA

ANNUAL REPORT

1991 - 92

THE INSTITUTE OF MATHEMATICAL SCIENCES

C.I.T. Campus, Taramani

Madras 600 113, India

ANNUAL REPORT

April 1991 – March 1992

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FOREWORD

This is the third occasion for me to write the Foreword of the Annual Report of the Institute. I am very pleased to present the progress made by the Institute in its many subdisciplines and note the distinctions achieved by the members.

During the year under review, the Institute adopted a new CONSTITUTION & BYELAWS for its governance. Accordingly the governing bodies are now the Board and the Executive Council of the Institute. While the Board meets once a year and considers the general policy matters and approves the budget of the Institute, the Executive Council meets as often as necessary and guides the Institute in all its activities. The Institute will have the benefit of distinguished academicians as members on both these bodies and I am confident that their wide experience will be very useful for us. The byelaws have been so framed that the decision-making is fair and swift, so that they help in achieving all the objectives of the Institute.

The quest for exceptionally talented faculty to increase the strength of the Institute continued. A large number of applications reflected a keen interest in the Institute and offers were made to a few.

The idea of holding intensive workshops on various special topics continued during the year under review. Belonging to this category was a workshop on Geometrical Phases, a topic in which there is considerable activity in our country. The proceedings of the workshop which was conducted during 7–11 October 1991 is to be published by the Indian National Science Academy as one of its journal supplements and it will be simultaneously regarded as one in the series of IMSc reports. Following the announcement of Nobel prize for *P. de Gennes*, a one day symposium highlighting the Physics of Complex Fluids was held. The thirtieth anniversary was observed with another one day symposium and the event was fittingly inaugurated by the Institute's founder Director Professor Alladi Ramakrishnan.

The space crunch in the Institute will hopefully disappear, once the third floor to the Library Building is completed. The construction work made considerable progress during the year and it is expected that it will be ready for occupation soon.

The academic activities of the Institute, the various seminars and colloquia held during the year, the distinguished visitors to the Institute etc. will be detailed in the report. I would like to highlight the special honours won by our distinguished faculty. Prof. G. Rajasekaran was awared FICCI medal for his contributions in gauge field theories. Prof. R. Balasubramanian was honoured with B.M.BIRLA AWARD, 1991 for his Contributions to Number Theory. The year saw the formal retirement of Professor R.Vasudevan, after the completion of five years of extension of his appointment after his superannuation. He has been associated with the Institute since its inception and his contribution to its growth will be in the cherished memory of the Institute for all time to come.

The upgrading of the infrastructure of the Institute to make it responsive to the needs of the academic activity is the task of the administrative machinery. Shri G.Sethuraman, Chief Administrative Officer and the other staff members continue to provide the necessary initiative.

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This report has been prepared through the efforts of Professor R.Parthasarathy and the Committee consisting of Prof.S.Nag, Dr.R.Ramanujam, and Mr.K.S.Santhanagopalan. Mrs.S.M.Parijatham prepared the LaTeX version of the Annual Report. To them I owe my gratitude.

R.RAMACHANDRAN
DIRECTOR

August 1992

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EXECUTIVE COUNCIL

Dr.P.K.IYENGAR, Chairman, Atomic Energy Commission and Secretary to Govt. of India, Department of Atomic Energy, CSM Marg, Bombay 400 039 (CHAIRMAN).

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Prof.R.RAMACHANDRAN, Director, Institute of Mathematical Sciences, Madras (MEMBER SECRETARY).

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THEORETICAL COMPUTER SCIENCE

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Dr.   RAMANUJAM, R.
Dr.   VENKATESH RAMAN

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Dr. RAMAKRISHNAN, B.

PHYSICS

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Dr. GOVINDARAJAN, Suresh
Dr. JANAKI BALAKRISHNAN (CSIR)
Dr. RAJESWARI, V. (UGC)
Dr. SANJAY KUMAR, M.
Dr. SASANKA GHOSH
Dr. SUBRAMONIAM, G.
Dr. SUBRAHMANYAM, V.

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[1] *upto 16.10.91*
[2] *Retired on 31.1.92*
[3] *Resigned from service with effect from 1.9.1991*
[4] *Retired on 30.11.91*

STUDENTS

JUNIOR RESEARCH FELLOWS

MATHEMATICS

Ms. AMORA NONGKYNRIH

Ms. BHATTACHARYA, Dakshini

Mr. CHAKRABORTY, Kalyan

Ms. CHITRA, V.M.

Ms. FLORENCE ISIDO, D.

Ms. KULKARNI, M.V.

Ms. PADMA, R.

Ms. RADHA, R.

Mr. REUBEN RABI

Ms. VANAJA, S.[1]

Ms. VELAMMAL, G.[2]

Mr. VENKATARAMAN, S.

PHYSICS

Mr. BOKIL, Hemant

Mr. CHAKRABORTY, Biswajit[3]

Mr. CHELUVARAJA, Srinath

Mr. GADIYAR, G.H.

Ms. INDUMATHI, D.

Mr. JOHN, Varghese

Mr. KHAN, S.A.

Ms. MARY ELIZABETH, S.

Mr. MATHUR, Manu[4]

Mr. MUTHUKUMAR, V.N.

Mr. NANDA KUMAR, R.

Mr. PRAKASH MATHEWS

Mr. RAKSHIT, A.M.

Ms. RAMADEVI, P.

Mr. RAVINDRAN, V.

Mr. SARDAR, Manaskumar

Ms. SHUBASHREE, Desikan

Mr. SUNDAR, K.

Mr. VYTHEESWARAN, A.S.

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[1] *JRF Completed dt.4.3.92*

[2] *JRF Completed dt. 4.3.92*

[3] *JRF Completed dt. 3.7.91*

[4] *JRF Completed dt. 15.8.91*

ADMINISTRATIVE STAFF

Mr. SETHURAMAN, G.   Chief Administrative Officer
Mr. JAYARAMAN, R.   Deputy Registrar
Mr. KRISHNAN, S.   Accounts Officer
Mr. SANTHANAGOPALAN, K.S.   Librarian

Mr. AMULRAJ, D.   Mr. PARTHIBAN, V.
Mr. ASHFACK AHMED, G.   Mr. RADHAKRISHNAN, M.G.
Mr. BALAKRISHNAN, A.R.   Mr. RAJASEKARAN, N.
Mr. BALAKRISHNAN, J.   Mr. RAJENDRAN, C.
Mr. CHELLAKUTTY, K.   Mr. RAVICHANDRAN, N.
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Mr. JAYARAMAN, V.   Ms. USHA DEVI, P.
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Mr. MUNUSWAMY, M.   Mr. VASUDEVAN, T.V.
Mr. MUTHUKRISHNAN, M.   Mr. VARADARAJ, M.
Mr. MUTHUSIGAMANI, S.   Mr. VENKATESAN, G.
Mr. NITHYANANDAM, G.   Mr. VENUGOPAL, T.
Ms. PARIJATHAM, S.M.

RESEARCH WORK : SOME OUTLINES

MATHEMATICS

Mean value lower bounds are obtained for a general Dirichlet's series and this is used to prove omega results for the zeta function. For L-functions, a mean value upper bound is obtained. An earlier result on additive completion of squares is further investigated.

The Galois module structure of relative quadric extensions is studied. The results of Leopoldt on cyclotomic fields on the structure of ring of integers of cyclotomic extensions is extended to this case.

It has been proved that, under certain linear combination of Shimura liftings commuting with the action of Hecke operators, the space of modular forms of weight $k + \frac{1}{2}$ for $\Gamma_0(4M)$ with quadratic character is isomorphic to the space of modular forms of weight $2k$, level $2M$ with trivial character, where M is an odd and square-free natural number.

A conjecture made by H.Saito and N.Kurokawa states the existence of a 'lifting' from the space of elliptic modular forms of weight $2k - 2$ to a subspace of the space of Siegel modular forms of weight k which is compatible with the action of Hecke operators. This correspondence has been generalized to the case of congruence subgroups where the level is an odd square-free natural number.

In previous work connecting the geometric quantization approach to the path integral approach for string theory, it had been shown how $Diff(S^1)$ is intimately related to the moduli spaces of Riemann surfaces. A mapping has now been discovered relating $Diff(S^1)$ to infinite dimensional period matrices. This map generalizes the classical map that associates to any closed Riemann surface its Jacobi variety. In view of previous results, it has then been shown that the Weil-Petersson metric on infinite dimensional Teichmüller space agrees, via the new map, with the Siegel symplectic metric on the space of period matrices, and with the Kirillov-Kostant metric on $Diff(S^1)/SL(2, R)$. Applications to non-perturbative string theory are investigated.

The complex analytic and real analytic descriptions of the tangent space to the Teichmüller space have been shown to have a simple new relationship. This rests on relating power series coefficients of conformal mappings with Fourier coefficients of conformal welding. Many new formulae related to earlier work of L.Ahlfors and S.Kerckhoff emerge.

An inverse problem of recovering the drift of a random stochastic differential equation in one-dimension from the knowledge of the transition probability densities on a half space has been done.

The almost-periodic nature of a Jacobi matrix with finite band purely absolutely continuous spectrum has been studied.

Non-linear functional analysis techniques are applied to obtain many results in the study of partial and ordinary differential equations. Methods employed are from bifurcation theory and variational calculus.

In the area of Mathematical Economics, the problem of designing efficient allocation mechanisms to realize given goals has been studied. In the case when the parameter spaces are vector spaces over Z_2, an algorithm has been given to realize a linear goal function by designing a non-parametric efficient mechanism. Extensions to parametric mechanisms and the case where parameter spaces are vector spaces over Z_p, are being studied.

PHYSICS

Quantum Mechanics, Field Theory, Nuclear and Particle Physics

New forms of quantum statistics, called 'orthofermi and orthobose statistics' have been discovered and their statistical mechanics and quantum field theory have been developed. A q-deformation which interpolates smoothly between orthofermi and orthobose statistics has been found and this allows the construction of a new family of Hilbert spaces with positive definite norms.

The number operators for multimode systems of deformed oscillators covariant under the actions of quantum groups $SU_q(n)$, $SU_q(n \mid m)$, $GL_{p,q}(n)$ and $GL_{p,q}(n \mid m)$ have been constructed explicitly in terms of the creation and annihilation operators, and the relation between the various kinds of the deformed oscillator systems such as the representation of their algebras in terms of coordinates and q-derivatives, realization in noncommutative spaces and their physical behaviour are studied.

Representations of deformed general linear groups have been examined and for the first time, oscillator realizations of two parameter quantum algebras leading to the notion of a (p, q)-oscillator have been studied. A 2-parameter deformation of the Virasoro algebra and the KdV equation have been analysed, leading to the studies of the deformation of the Jaynes-Cummings model of quantum optics and construction of the number operators.

A non-trivial q-fermion algebra has been proposed leading to super q-oscillator. Its algebra has been studied. q-fermion coherent states have been constructed using quasi-Grassmannian variables and non-linear shift automorphisms. Matrix elements of the shift operators in the Fock space are evaluated and are found to involve analogues of the q-Charlier polynomials.

A study of $SU(3)$ Racah-Wigner algebra using the Gel'fand pattern calculus has been started with a view to generate the Racah coefficients analytically. Parallel algorithms

for the computation of the angular momentum recoupling coefficients are studied. Using the theory of basic hypergeometric series, explicit forms for the 3-j and 6-j coefficients of $SU_q(2)$ have been obtained.

Atiyah-Singer index theorms can be used to relate the zero modes of the Dirac operator on a general manifold, with the number of fermion generations. Investigations are being made to study whether the Standard Model and the space-time manifold on which it is described, yield any constraints from its topological structure.

A detailed analysis of the spectrum of many anyon quantum mechanics has been made. A class of exact solutions for N-anyons in an external harmonic oscillator potential has been exhibited and is found to be linear in the statistical parameter α. Subsequently, eigenvalues that are non-linear in α have been obtained analytically. Using asymptotic analysis of the eigenvalue equations, the non-linearity of the interpolating eigenvalues has been demonstrated.

A generalization of supersymmetric quantum mechanics named orthosuper- symmetric quantum mechanics has been constructed. Parasupersymmetric quantum mechanics is given a simpler reformulation and its infinite order limit is found.

The issue of gauge independence of observables within the context of perturbative Quantum Gravity has been studied and it is established that though the Standard Proofs of gauge independence do not apply to certain class of Quantum Field Theories including Quantum Gravity, the gauge independence of S-matrix can be regained when expressed in terms of suitable observables.

The theoretical framework to go beyond saddle point approximation for the low lying spectrum of QCD has been established and a few relevant degrees of freedom are isolated in terms of which this can be realized.

A formalism to study the extrinsic geometry of the string world sheet in non-critical dimensions has been developed using Generalized Gauss map. The actions involving the extrinsic curvature and the Nambu-Goto area term are shown to be that of a constrained $G_{2,n}$ non-linear σ model. A theorm giving the integrability conditions in R^n ($n > 4$) has been proved. Introducing a new notion of super Gauss map, $N = 1$ world sheet supersymmetry is described and a SUSY generalization of the action (off-shell) involving extrinsic curvature is found.

Three dimensional SU(2) Chern-Simons theory has been studied as a topological field-theoretic description of knots and links. A systematic method has been developed to obtain the link invariants with this field-theoretic framework. This method yields new knot invariants of which the Jones Polynomials are the simplest example.

For surfaces of constant mean curvature densities, the extrinsic geometry of the world

sheet is shown to be that of 2-d gravity. A hidden symmetry in conformal gauge, the Virasoro, has been found. A generalization of the Kenmotsu equation and representation theorm has been made for immersions in R^n $(n > 4)$.

The behaviour of a class of spontaneously broken supersymmetric models in $(2+1)$ dimensions is studied at non-zero temperatures. It is found that SUSY is explicitly broken by the temperature and the Goldstino acquires a mass.

A chromoelectric vacuum that confines some degrees of freedom of both quarks and gluons (in the sense that they do not exist as asymptotic states) is constructed. Nevertheless the colour singlet constructs can propagate.

$O(3)$ non-linear σ-models with Hopf term in $(2+1)$ dimensions have been studied using the $(2+1)$ dimensional fermionization techniques developed earlier. It has been noticed that for $\frac{\pi}{2s}$ as the coefficient of the Hopf term, the model is equivalent to a particular spin-S theory with local two body interactions.

It is shown that an $SU(2)$ lattice gauge theory on a square lattice is equivalent to an $U(1)$ lattice gauge theory on a Kagome' lattice and similarly $SU(3)$ to $U(1) \times U(1)$ gauge theory, therby realizing the description of gauge theories using colour invariant flux lines. Their continuum case has been studied.

The covariant deWitt-Vilkovisky approach has been used to get gauge independent results for the effective action for QED in Euclidean deSitter space and for quantum fields in a curved background space-time, minimally coupled to gravity. The effective action obtained was gauge independent both on-mass shell and off-mass shell.

A detailed study of the structure of $c < 1$ conformal matter coupled to 2-d gravity in the Coulomb gas formulation, has been made. The double cohomology of the BRST structure of the theory was clarified and used in the explicit construction of the physical states. The states with non-trivial ghost number are related to those with zero ghost number, using 'descent equations'. The validity of these relations at the level of the correlation functions has been established. This provides a way to understand the chiral ring structure of the physical states and the relationship between Liouville coupled to matter theories and topological field theories. Further, it was shown that negative number of screening operators is not a necessity in the Coulomb gas description of these theories, and that other suitable physical operators could play the role of screening operators.

It has been found that many second class constrained Hamiltonian systems can be reformulated as first class systems within the same phase-space. New phase-space techniques are developed which are applicable in treating problems in anomalous theories.

The analysis of the two jet production in polarized $p - p$ collisions is important for future experiments. Despite the incoherent sum over a large number of diagrams (even in

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the leading order), it has been shown that the expression for the cross-section simplifies to a product of a combination of parton densities and kinematical factors, even in the polarized sector, allowing a plausible determination of the polarized densities unambiguously.

The non-leptonic decays of B-mesons are considered and a selection rule which isolates those modes that are free of most of strong interaction effects is obtained. An attempt to interpret the observed $\Upsilon(4s) \rightarrow J/\psi + X$ signal as the decay of a four-quark state near $\Upsilon(4s)$ has been made. The CP-violating observables ε' and d_u in an attractive horizontal symmetric model have been calculated and found to be too small to observe in the near future.

The spin content of nucleons show surprises which appear to be related to the QCD anomaly of the $U(1)$ axial vector current. Various phenomena that may measure and correlate gluons and sea quarks with the spin content have been studied.

The equation-of-state of degenerate as well as hot $(kT < 15MeV)$ nuclear and nucleon matter at high densities are presented using the chiral σ-model which includes the isoscalar vector field generated dynamically. Their application to neutron star along with a comparison with heavy ion collision experiments are studied.

The fermionic gauge symmetry in Green-Schwarz-Siegel Superstring is shown to emerge upon Hamiltonian reduction of a WZW model whose currents take values in the super-coset $ISO(9,1|16)/SO(9,1)$.

A David-Distler-Kawai type of solution is given for 2d gravity for the case when the world-sheet has the topology of a disk, using modified Dirichlet boundary conditions proposed by Alvarez.

Heterotic Sigma models on manifolds compactified by the Scherk-Schwarz mechanism are analyzed to show that spontaneous breaking of spacetime supersymmetry is impossible with vanishing cosmological constant.

The Siegel superparticle constraints are modified to incorporate world line supersymmetry for a first ilk superparticle.

Classical and Quantum Optics

A complete characterization of the Mueller matrices of polarization optics has been developed and applied to actual experiments, leading to unsuspected questions regarding Howell experiment. Changes in the spectral and coherence properties of light on reflection have been studied.

A new representation for the squeezed states of light has been constructed, suggesting

a possible realization of squeezed states as superposition of coherent states. Photon number distribution in a squeezed coherent state with independent squeezing and coherent excitation parameters has been studied and the results confirm oscillations in the photon number. This study predicts a novel feature of collapses and revivals for some ranges of the parameters. Using Iwasawa decomposition for the squeezing group, a Güoy effect for the squeezed staes (similar to the classical Güoy effect suffered by a beam of light as it crosses the focus) is demonstrated.

Hamilton's theory of turns has been used to study geometric phase for systems governed by $SU(2)$ symmetry.

Diagrammatic techniques have been developed for calculating the non-linear response of a system under relaxation and interacting with intense pump and weak probe fields. These techniques have been applied to the study of several intense-field phenomena in quantum optics.

Condensed Matter Physics

An attempt is being made to write a computer program to find out the ground state energy of a strongly correlated system using the Hubbard Hamiltonian in a 2-dim. system for 4 sites, which includes the Gutzwiller projection. Band structure calculations using Linear Muffin-Tin orbital method for the binary intermetallic compounds to explain their physical properties are performed.

Necessary theoretical frame work for adsorbate mediated transition is developed and the dependence of the transition rates on various parameters such as chemisorption bond strength, reactant's solvation energy, adsorbate coverage factor etc. are analysed.

A pseudospin model of liquid ^4He below the λ transition point is formulated, incorporating the hard-core repulsion and the nearest-neighbour interaction. This model has been found to be equivalent to Gross-Pitaevskii model in the presence of a self generated gauge field by specializing to cylindrically symmetric vortex solutions. This gauge field is identified with that part of the total fluid velocity which has a non-vanishing curl.

An investigation of the problem of two $t - J$ planes with an interlayer coupling $t_\perp$, by exact diagonalization is started. The preliminary results indicate that in-plane superconducting correlations are enhanced with increasing $t_\perp$, illustrating the interlayer tunneling mechanism of Wheatley, Hsu and Anderson.

A theory for the normal and superconducting states of doped solid C_{60} has been developed by identifying the 'Stability of Molecular Singlets' (SMS) as an important feature of $M_X C_{60}$. The SMS is argued to arise from the intramolecular carbon $p\pi$-electron correlations and is modelled as an effective intramolecular pairing resulting in a narrow band, negative U Hubbard model. This model besides explaining the observed superconductivity in doped C_{60}, predicts anomalous boson-metal like normal state properties. A

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microscopic origin of SMS is under study.

A novel relaxation mechanism in CuO based compounds, which show non-zero nuclear spin relaxation rate even at zero temperature, based on Anderson's theory of the 2-dim. Luttinger liquid has been proposed, in which a nuclear spin can relax by emitting a pair of spin $\frac{1}{2}$ excitations (spinons). This mechanism explains the experimental results.

The RVB mean field solutions are being re-examined to understand the spin $\frac{1}{2}$ excitations in antiferromagnetic parent compounds of the CuO superconductors, as recent experiments indicate that the underlying spin excitations may be spin $\frac{1}{2}$ objects.

A microscopic derivation of the interlayer tunneling mechanism for high T_c superconductivity is made and its various aspects such as the development of $3-d$ $ODLRO$, are investigated.

A model for CuO superconductors treating the electrons as classical charged particles executing Brownian motion is being developed. The preliminary results explain the different temperature dependence of the Hall angle and the longitudinal resistivity, thereby suggesting two relaxation times.

Methods of Mathematical Physics

By identifying a continuous classical unit vector field with the tangent to a space curve, it has been shown that the associated global anholonomy is related to certain topological quantities which depend on the dimensionality of the field. In 3-d there are two types of global anholonomy, one vanishing identically, the other assuming the form of a Hopf term.

The group-theoretical aspects of $_3F_2(1)$ series has been studied. The conjucacy classes, the irreducible representations and their characters, and the invariant subgroups of the 72 element group G_T are determined. The commutation relation for coupled $SO(3)$ tensor operators is constructed to give a Lie algebra with 9-j symbols in the structure constants. Upon realizing an exceptional Lie subalgebra in an example, its closure requirement is found to be related to the vanishings of relations involving 6-j symbols, but not to non-trivial 9-j symbols.

A simple and straightforward method of solution of multiplicative Diophantine equations has been obtained, in terms of arrays and g.c.d. conditions (without recourse to reciprocal arrays).

Invariant operators that serve to distinguish the multiplicity in the C.G series are constructed. It has been shown that every irreducible representation of $SU(3)$ can be realized once and only once in the Hilbert space of four oscillators and a planar rotor.

A generalization of the Beltrami equation for Gauss map in R^3 (due to Kenmotsu) to

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conformal immersion of 2-d surfaces in R^n $(n > 3)$ is made. Under suitable conditions on the geometry of the surface, this can lead to quasi-conformal mapping.

A method of arriving at the reflected and transmitted fluxes from a two dimensional target by constructing an integro-differential equation for the 2-dim. kernel has been developed.

Stochastic origin of quantum mechanical description of fields has been studied with the aim of viewing the usual paradoxes from a different angle. A stochastic model for the eye movement is developed and compared with the data.

THEORETICAL COMPUTER SCIENCE

Selection and sorting algorithms have been developed which minimize the data movement made while trying to keep the number of comparisons to the optimum. The work also illustrates the algorithmic time-space trade-offs for these problems.

Work has continued on logics with models based on true concurrency. A variety of results concerning decidability and axiomatization have been obtained for a temporal logic with step modality interpreted over transition systems with concurrent steps. For systems of communicating sequential agents, many variants of a tense logic have been studied, getting a complete axiomatization in each case.

PUBLICATIONS

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Acta Arith. 55 (1990) 351-364
On the Zeros of a class of Generalised Dirichlet Series -VII
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Proof of some conjectures on the mean value of Titchmarsh series-II Ilid 1-20

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Proof of some conjectures on the mean value of Titchmarsh series.

BALASUBRAMANIAN, R., PONNUSAMY*, and KARUNAKARAN,V.*
Proof of Hall's Conjectures on Star like Mappings (to appear in Journal of London Mathematical Society)

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* External Collaborator

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Vol.96, No:1, March 1992, 185-199.

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Break of Symmetry for a Critical Exponent Problem
Preprint

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Boolean Derivatives and Dieudonne Taylor Series
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On Efficient Resource Allocation Mechanisms for Finite sets
submitted to Indian Journal of Pure & Applied Mathematics

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to appear in J.Number Theory

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On the Saito-Kurokawa Descent for Congruence Subgroups
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NAG, S.
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TRENDS IN GEOMETRIC FUNCTION THEORY AND APPLICATIONS, World Sci-
entific, (Proceedings of an International Conference), 1991, pp.57-59.

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Keynote Lecture, in PROC. INTERNATIONAL SYMPOSIUM ON TOPOLOGICAL
AND GEOMETRICAL METHODS IN FIELD THEORY, Finland
(ed. J.Mickelsson), World Scientific, 1992, pp.267-292.

NAG, S.
On the Tangent Space to the Universal Teichmuller Space,
Preprint, I.M.Sc., 91/38, December 1991,
submitted for publication

NAG, S.
Self-dual Connections, Hyperbolic Metrics and Harmonic Mappings on Riemann Surfaces,
PROC. INDIAN ACADEMY OF SCIENCES (MATH. SCI.),
Vol.101, December 1991, pp.215-218.

RUF, B.* and SRIKANTH, P.N.
On Some Superlinear Dynamical Systems
Preprint

SRIKANTH, P.N.
Uniqueness of Solutions of Nonlinear Dirichlet Problems
to appear in J.of Differential and Integral Equations

PHYSICS

AGARWAL, G.S.* and SIMON, R.
A new representation for squeezed states
Opt. Commun. (in press)

ANISHETTY, Ramesh., GADIYAR, G.H., MATHUR, M. and
SHARATCHANDRA, H.S.
Color invariant additive fluxes for SU(3) gauge theory
Physics Letters B 271, 391 (1992)

ANISHETTY, Ramesh and VYTHEESWARAN, A.S.
Gauge Invariance in Second class constrained systems
IMSc preprint No.92/10

ANISHETTY, Ramesh
Local Dynamics on Gauge Invariant Basis of non-Abelian gauge theories
Phys. Rev. D 44, 1895 (1991)

BALACHANDRAN, A.P.*, EINARSSON, T.* GOVINDARAJAN, T.R. and
RAMACHANDRAN, R.
Statistics and spin on two-dimensional surfaces
Mod.Physics. Letts. A 6, (1991) 2801

BALAKRISHNAN, Radha., BISHOP, A.R.* and DANDOLOFF, R.*
Gauge freedom, anholonomy and Hopf index of a three dimensional unit vector field
submitted to Phys.Rev. B

BALAKRISHNAN, Radha., SRIDHAR, R. and VASUDEVAN, R.
Vortices and gauge fields in the pseudospin model of liquid ^{4}He.
J.Phys.Condens. Matter 4 (1992) 655-666

BASKARAN, G. and TOSATTI, E.*
A theory of the normal and superconducting states of doped solid C_{60}
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BASKARAN, G. and SARDAR, M.
Spinor pair emission in a Luttinger liquid : A new mechanism for NMR relaxation in high
T_c compounds"
submitted to Phys.Rev.Lett.

BASKARAN, G.
Luttniger liquid in 2-dimensions : fermionic backflow and transfer of statistics
Progress of Theoretical Physics (Supplement) 107, 49 (92).

BASU, Rahul and CHOUDHURY, Debajyoti*
Confinement in a Chromoelectric Vacuum
submitted to Phys.Rev. D (IMSc 92/17)

BASU, Rahul, DATE, G. and MURTHY, M.V.N.
A class of exact solutions in many anyon quantum mechanics
to appear in Phys.Rev. B (IMSc 91/29)

BASU, Rahul, DATTA, B.* and SAHU, P.K.*
Degenerate and Hot Nucleon and Nuclear matter in a Chiral Sigma model
submitted to Astrophysical Journal (IMSc 92/06)

BASU, Rahul and MUKHERJEE, A.*
The Goldstino revisited in 2+1 dimensions
to appear in Phys.Lett. B (IMSc 91/21)

BHOWMICK, D.*, RAY, A.K.*, RAYCHAUDHURI, S.* and
UMA SANKAR, S.
CP-Violating Phenomena in an $SU(2)_L$ x $SU(2)_R$ x $SU(3)_H^{VL}$ x $U(1)_{B-L}$ Horizontal symmetric Model
submitted to Phys.Rev.D

CHAKRABARTI, R.* and JAGANNATHAN, R.
On the number operators of single-mode q-oscillators
submitted to J. Phys. A: Math. Gen.

CHAKRABARTI, R.* and JAGANNATHAN, R.
On the representations of $GL_{p,q}(2)$, $GL_{p,q}(1/1)$ and noncommutative spaces
J. Phys. A: Math. Gen. 24 (1991) 5683

CHAKRABARTI, R.* and JAGANNATHAN, R.
On the representations of $GL_q(n)$ using the Heisenberg-Weyl relations
J. Phys. A: Math. Gen. 24 1991 1709

CHAKRABARTI, R.* and JAGANNATHAN, R.
On a two-parameter deformation of the Jaynes-Cummings model: a path integral representation
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CHAKRABARTI, R.* and JAGANNATHAN, R.
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CHAKRABARTI, R.* and JAGANNATHAN, R.
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CHATURVEDI, S.*, KAPOOR, A.K.*, SANDHYA, R.* SRINIVASAN, V.* and SIMON, R.
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DANDOLOFF, R.*, BALAKRISHNAN, Radha and BISHOP, A.R.*
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submitted to J.Phys. A

DATE, G., KRISHNA, M. and MURTHY, M.V.N.
Asymptotic Analysis and Spectrum of Three Anyons
IMSc Preprint 92/17
submitted to Nuclear Physics B

DUTTA, B.*, MUKUNDA, N.*, SIMON, R. and SUBRAMANIAM, A.*
Squeezed states, photon number distributions and U(1) invariance
J. Opt. Soc. Am. B. (in press)

FACK, V.*, VANDER JEUGT, J.* and SRINIVASA RAO, K.
Parallel computation of recoupling coefficients using transputers,
To appear in Computer Phys.Communs (1992)
Also Preprint IMSc-92/15 (Feb. 1992)

GADIYAR, G.H. and SHARATCHANDRA, H.S.
The missing link : Operators for labelling multiplicity in the Clebsch-Gordan series
J. Phys. A: Math. Gen. 25 (1992) L85

GATES Jr.,* JAMES, S.* and MAJUMDAR, P.*
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Phys. Lett. B 284 (1992) 71.

GNANAPRAGASAM, B.* and SHARATCHANDRA, H.S.
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GOVINDARAJAN, T.R., SHANKAR, R., SHAJI, N.* and SIVAKUMAR, M.*
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GOVINDARAJAN, Suresh, JAYARAMAN,T., JOHN, Varghese and MAJUMDAR, P.
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Modern Physics Letters A 7, (1992) p 1063 - 1077

HARIDASS, N.D. with PIERRE V. BAAL*
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Nucl. Phys. B 374 (1992)

INDUMATHI, D., MURTHY, M.V.N. and RAVINDRAN, V.
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JAGANNATHAN, R., SRIDHAR, R., VASUDEVAN, R., CHATURVEDI, S.*, KRISH-NAKUMARI, M.*, SHANTA, P.* and SRINIVASAN, V.*
On the number operators of multimode systems of deformed oscillators covariant under quantum groups
submitted to J. Phys. A: Math. Gen.

JANAKI, Balakrishnan and TOMS, D.J.*
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KHARE, A.*, MISHRA, A.K. and RAJASEKARAN, G.
Orthosupersymmetric quantum mechanics
IMSc Preprint 92/23

KHARE, A.*, MISHRA, A.K. and RAJASEKARAN, G.
Parasupersymmetric quantum mechanics and its infinite order limit.
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LAKSHMINARAYANAN, V.*, PARTHASARATHY, R. and DEVALOIS, K.K.*
A Generalized Perceptual Space
Proc.Nat.Acad.Sci(USA), to appear

LAKSHMINARAYANAN, V.* and VASUDEVAN, R.
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MATHEWS, Prakash and RAVINDRAN, V.
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To appear in IJMPA

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Z. Phys. C 53, (1992) 305

MISHRA, A.K. and RAJASEKARAN, G.
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MISHRA, A.K., BHATTACHARJEE, B.* and RANGARAJAN, S.K.*
Electron Transfer through Monolayers: Dependence of current of potential and coverage
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MUKUNDA, N.* and SIMON, R.
Quantum kinematic approach to the geometric phase-I : General formalism
Preprint IMSc. 91/34

MURTHY, M.V.N., LAW, J.*, BRACK, M.* and BHADURI, R.K.*
Quantum Spectrum of three anyons in a oscillator potential
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MURTHY, M.V.N., LAW, J.*, BRACK, M.* and BHADURI, R.K.*
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Phys. Rev. B 45 (1992) 4289

MUTHUKUMAR, V.N.
Superconducting instability of the RVB state
To appear in Phys. Rev. B

NELSON, P.*, SETH, D.L.* and VASUDEVAN, R.
An integro differential equation for two dimensional Kernel"
Applied Math and Computation Vol.49, p 1-18 (1992)

Ma, E.*, PANTALEONE, J.* and UMA SANKAR, S.
Is there a four quark state near the $B\overline{B}$ threshold?
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To be published in Physical Review D.

PARTHASARATHY, R. and VISWANATHAN, K.S.*
Bargmann Space Representation for q-Fermions
submitted to J.Phys.A. (Math and Gen)

PARTHASARATHY, R. and VISWANATHAN, K.S.*
Extrinsic Geometry of Strings and the Gauss Map of Surfaces in $I\!R^n$
Int.J.Mod.Phys. A7 (1992) 1819-1832

PARTHASARATHY, R. and VISWANATHAN, K.S.*
A Realization of W-Gravities in the Conformal Gauge through Generalized Gauss Maps.
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PRAKASH, J.S.* and SHARATCHANDRA, H.S.
Optimal boson calculus for SU(3) : Unique Resolution of the Weight Lattice by Random Integers.
IMSc Preprint 92/05 (submitted for publication)

RAJASEKARAN, G.
The future of High Energy Physics
Keynote address at WHEPP-II (Preprint IMSc -91/36)
(To appear in Proceedings of WHEPP-II)

RAJASEKARAN, G.
Two topics in Electroweak Physics : Radiative Corrections and
Baryon Number Violation (Report of Group IV)
To appear in Proceedings of WHEPP-II (Preprint IMSc 91/37)

RAMACHANDRAN, R.
Invited lecture XVI Conf. of IAGAR, Sardar Patel University, Vallabh Vidyonagar (to
be published)

RAMACHANDRAN, R.
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Current Science 61 (1991) 18

RAMACHANDRAN, R.
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IMSc. Preprint 92/01.

SANJAY KUMAR, M. and AGARWAL, G.S.*
Diagrammatic techniques for nonlinear response of systems dressed by resonant external
fields,
To appear in Physical Review A

SANJAY KUMAR, M., PONS, M.LI.* and J.H.EBERLY, J.H.*
Phase dependent line shapes in pump-probe interactions : A Floquet approach,
Phys. Rev. A 44, (1991) 1995

SANJAY KUMAR, M. and SIMON, R.
Characterization of Mueller matrices in polarization optics
Opt. Commun. (in press)

SEN, DIPTIMAN* and MURTHY, M.V.N.
Comment on Partition function of an anyon gas
IMSc. Preprint 92/18

SENGUPTA, S.* and MAJUMDAR, P.
Stringy Restrictions on Backgrounds in the Heterotic String Sigma Model
published in Mod. Phys. Lett. A7 (1992) 757

SHUXI-LI*, BHADURI, R.K.* and MURTHY, M.V.N.
Thomas-Fermi approximation for confined anyons
Phys. Rev.B (in press)

SIMON, R. and MUKUNDA, N.*
Hamilton's turns and geometric phase for two-level systems
submitted to J. Phys. A.

SIMON, R. and MUKUNDA, N.*
Iwasawa decomposition for SU(1,1) and the ü effect for squeezed states
submitted to Opt. Commun.

SIMON, R. and MUKUNDA, N.*
Twisted Gaussian Schell-model beams
J. Opt. Soc. Am. A. (in press)

SRINIVASA RAO, K. and RAJESWARI, V.
Generalized basic hypergeometric functions and q-analogues of 3-j and 6-j coefficients
J.Phys.A: Math. Gen. 24 (1991) 3761

SRINIVASA RAO, K., van der JEUGT, J.*, RAYNAL, J.*,
JAGANNATHAN, R. and RAJESWARI, V.
Group theoretical basis for the terminating $_3F_2(1)$ series
J.Phys. A: Math.Gen. 25 (1992) 861.

SRINIVASA RAO, K., SANTHANAM, T.S.* and RAJESWARI, V.
Multiplicative Diophantine Equations,
To appear in J.Num. Theory (1992)

SRINIVASA RAO, K. and RAJESWARI, V.
Note on the explicit forms for the Clebsch-Gordan coefficients of the Quantum Group SU_q (2)
Jour. of the Phys.Soc.Japan. 60 (1991) 3593.

SRINIVASA RAO, K., van der JEUGT, J.* and VANDEN BERGHE, G.*
On the algebra of coupled SO(3) tensors
J. Math. Phys.33 (1992) 15

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On Types of Multiplicative Diophantine Equations,
Ind. J. of Pure and Appl. Maths. 23, (1992) 171

SUDARSHAN, E.C.G.*, ANANDAN, J.* and GOVINDARAJAN, T.R.
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Phys. Letts. A V164, (1992) 133

CHOUDHURY, D.*, INDUMATHI, D., SONI, A.* and
UMA SANKAR, S.
Measuring $|V_{ub}|$ via non-leptonic decays of B-mesons
Physical Review D 45, (1992) 217

VASUDEVAN, R.
Stochastic Quantum Mechanics
Lecture notes in Econ & Math systems series No.370. Springer Verlag (1991)

VISWANATHAN, K.S.* and PARTHASARATHY, R.
Extrinsic Geometry of World Sheet Super symmetry through Generalized Gauss Maps
Int.J.Mod.Phys. A (in print)

VISWANATHAN, K.S.*, PARTHASARATHY, R. and
JAGANNATHAN, R.
Generalized q-Fermion Oscillators and q-Coherent states
J.Phys.A: (Math and Gen) (to appear)

WANG, W.*, SIMON, R. and WOLF, E.*
Changes in the coherence and spectral properties of partially coherent light reflected from
a dielectric slab
J. Opt. Soc. Am. A 9, (1992) 287

THEORETICAL COMPUTER SCIENCE

ESTIVILL-CASTRO, V.* and VENKATESH RAMAN
Visibility in Finitely Oriented Polygons, Technical Report CS 91-05,
York University, Canada*.

LODAYA, K. and RAMANUJAM, R.
Tense logics for local reasoning in distributed systems
FST & TCS/11, Lecture Notes in Computer Science 560,
December 1991, pp.71-88.

LODAYA, K. MUKUND, M. RAMANUJAM R. and THIAGARAJAN P.S.
Models and logics for true concurrency
Sadhana, Vol.17, Part 1, March 1992, pp.131-165.

LODAYA, K. PARIKH, R. RAMANUJAM R. and THIAGARAJAN, P.S.
A logical study of distributed transition systems,
IMSc Report 92/07, submitted for publication

LODAYA, K. RAMANUJAM, R. and THIAGARAJAN, P.S.*
Temporal logics for communicating sequential agents : I ,
To appear in International Journal of Foundation of Computer Science

IAN MUNRO and VENKATESH RAMAN
Fast stable In-place sorting with O(n) Data Moves,
FST & TCS ll, LNCS 560 (1991) 266-277

IAN MUNRO and VENKATESH RAMAN
Sorting Multisets and Vectors In-place,
Proceedings of the second workshop on Algorithms and Data Structures, LNCS, Springer
Verlag 519 (1991) 473-480*.

VENKATESH RAMAN
Finding the best set of paths for edge packing bound is NP-Complete
Journal of the combinational Mathematics and Combinatorial Computing V9 (1991) 91-96*.

---

* Work done entirely at the University of Waterloo, Canada

BASKARAN, G.
Strongly Correlated Electron Systems II,
ICTP, Trieste, Italy, 18th June - 27 July 1990
Progress in High Temperature Superconductivity Vol.29.
World Scientific, Singapore, Eds. G.Baskaran, A.E.Ruckenstein, E.Tosatti and Yu Lu.

BASKARAN, G., MISHRA, A.K., and SHANKAR, R.
Edited the proceedings of the "New Insights into Old Hubbard Model"
at IMSc 25 Feb - 1 March 91.
IMSc Report No: 114.

DATE, G. and GOVINDARAJAN, T.R.
Edited the proceedings of Matrix Models, Random Surfaces and 2-D Gravity
Workshop at IMSc.
November 19 - 23, 1990
IMSc Report No.113

HARI DASS, N.D.
Introduction to Lattice Theory (Monograph to be published by DST as SERC, THEP
School lecture notes)

MUKUNDA, N. and SIMON, R.
Group Theoretical and Phase Space Methods in Statistical Optics
monograph to appear in the Fundamental Theories of Physics series of Kluwer Academic
Publishers.

SRINIVASA RAO, K. and RAJESWARI, V. (1992)
Selected topics in Quantum Theory of Angular Momentum
Springer Tracts in Modern Physics and Narosa Publication (1992) (in press)

PARTICIPATION IN CONFERENCES AND
OTHER PROFESSIONAL ACTIVITIES OF
THE ACADEMIC STAFF

Visits to other Institutions in India and abroad

ANISHETTY, Ramesh   Department of Physics, Anna University,
February 3 - 5, 1992

BALASUBRAMANIAN, R.   Tata Institute of Fundamental Research, Bombay.
one month during Nov-Dec. 1991 and two weeks
in February 1992.

BASKARAN, G.   International Centre for Theoretical Physics
Trieste, Italy
May - July, 1991

Institute for Solid State Physics
Tokyo University, Ropponji, Tokyo, Japan
August 4 - 11, 1991

Institute for Theoretical Physics
Kyoto Universitt, Kyoto, Japan
July 28 and August 3, 1991

ETH, Zurich, Switzerland
September 28 - October 4, 1991

National Physical Laboratory
New Delhi
3rd week of November, 1991

GOVINDARAJAN, T.R.   Center for Theoretical Studies,
Indian Institute of Science, Bangalore 560 012
Dec.'91 - one week

Department of Physics,
Cochin University, Cochin
March '91 - two days

HARIDASS, N.D.   University of Amsterdam, The Netherlands.
                 January 12, 1991 - January 31, 1992.

JAYARAMAN, T.   International Centre for Theoretical Physics,
                 Trieste, Italy.
                 April 10 - July 10, 1991.

LODAYA, Kamal   Birla Institute of Technology and Science, Pilani.
                 March 11, 1992.

MAJUMDAR, P.   University of Maryland, MD., USA
                 April 12 - May 31 ; July 1-31, 1991

                 FERMILAB, IL, USA
                 June 1 - 30, 1991

                 Institute of Physics, Bhubaneswar
                 September 20-23, 1992
                 January 2-5, 1992

                 S.N.Bose Center, Calcutta
                 December 26, 1991
                 January 1, 1992

MISHRA, A.K.   Central Electrochemical Research Institute,
                 Karaikudi.
                 September 6 - 14, 1991.

MURTHY M.V.N.   Department of Physics and Astronomy
                 Mc Master University,
                 Hamilton Canada.
                 15 Sept. 1990 - 10 July 1991

NAG, Subhashis   University of Helsinki, Finland.
                 (Finnish Mathematical Society Colloquium Lectures).
                 May 21 - 23, 1991.

                 University of Jyvaskyla, Finland.
                 May 23-26, 1991.

NAG, Subhashis	University of Amsterdam, Holland. June 2-8, 1991.
	Tata Institute of Fundamental Research, Bombay. January 6 - 14, 1992.
PARTHASARATHY, R.	Department of Physics, Simon Fraser University, Burnaby, Canada. September 1989 - August 1991.
RAJASEKARAN, G.	Jawaharlal Nehru University, New Delhi. April 10 - 13, 1991.
	Tata Inst. of Fundamental Research, Bombay. April 25 - 27, 1991.
	Institute of Physics, Bhubaneswar. April 29 - May 3, 1991.
	Saha Institute of Nuclear Physics, Calcutta. May 4, 1991 and December 14, 1991.
	Centre for Mathematical Sciences, Thiruvananthapuram, June 6, 1991.
	Pondicherry University, Pondicherry. February 14, 1992.
RAJESWARI, V.	S.N.Bose National Centre for Basic Sciences, Calcutta, November 12 - 14, 1991. (under TPSC scheme)
	Department of Physics, University of Gulbarga, Gulbarga, Dec 12 - 18, and Dec 31 - Jan 4.
RAMACHANDRAN, R.	Indian Institute of Technology, Kanpur. (DST project on Statistical Field Theory Methods in Gauge Theories and Strings). October 30 - November 6, 1991.

RAMANUJAM, R.   Tata Inst. of Fundamental Research, Bombav.
                 January 15 - 25, 1992.

SANJAY KUMAR, M. School of Physics, University of Hyderabad.
                  September 24 - 28, 1991.

SHANKAR, R.   Indian Institute of Science, Bangalore.
                 March 2 - 5, 1991.

                 Tata Inst. of Fundamental Research, Bombay.
                 September 15 - 19, 1991.

                 Indian Institute of Technology, Kanpur.
                 September 21 - 25, 1991.

                 Madurai Kamaraj University, Madurai.
                 January 21 - 22, 1992.

SRIDHAR, R.   Department of Physics
                 University of Gulbarga, Gulbarga
                 December 16-22, 1991

SRIKANTH, P.N.   Dept. of Mathematics, Univ. New England,
                 Armidale, NSW , Australia.
                 March 16 - April 16,1992.

SRINIVASA RAO, K. Duke University, Durham, N.C.,U.S.A.
                   September 1 - December 20, 1991.

                   Rijks University, Gent, Belgium.
                   August 25 - 30, 1991.

UMASANKAR, S.   University of California, Riverside,U.S.A.
                 February 4 - July 26, 1991.

                 Brookhaven National Lab, Upton, N.Y. U.S.A.
                 June 15 - 30 , 1991.

                 Physical Research Laboratory, Ahmedabad.
                 December 30, 1991 - January 11, 1992.

                 University of Bombay, Bombay.
                 February 10 - 13, 1992.

VENKATARAMAN, S.   Tata Inst. of Fundamental Research, Bombay.
                     June 1991.

VENKATESH RAMAN   I.I.T., Delhi. December 20, 1991.
                    St.Xavier's College, Palayamkottai, March 20,1992.

Participation in Conferences

ANISHETTY, R.   Thirtieth Anniversary of IMSc.
                                 Invited talk on Neural Networks

BALAKRISHNAN, Radha   Workshop on Geometric Phases in Physics, IMSc,
                       October 7 - 11, 1991.

                       Invited talk on Geometric phase associated with
                       a moving space curve.

                       Workshop on Nonlinear waves and Turbulence,
                       School of Physical Sciences, JNU, New Delhi.
                       December 23 - 29, 1991.

                       Invited talks on
                       (i) Solitons in $(1 + 1)$ D and
                       localized coherent structures in $(2 + 1)$D: some
                       applications.
                       (ii) A possible connection between
                       solitons and geometric phases.
                       Chaired the concluding session.

BASKARAN, G.   Organised an International Workshop on
                                 "Strongly Correlated electron Systems" at ICTP,
                                 Trieste, Italy
                                 July 1991

                                 Gordan Research Conference on
                                 "Organic Superconductors", Irsee, Germany
                                 September 23 - 27, 1991

BASKARAN, G	Invited talk: "Frontiers in Condensed Matter Physics", at TIFR, - Pune University Meeting, Pune October 21 - 23, 1991
	Invited talk at DAE Symposium on Solid State Physics, Banares Hindu University, December 21 - 24, 1991
	Invited talk at the Symposium on QFT and Statistical Mechanics at ISI, Calcutta January 27 - 31, 1992
	Invited talk at the International Conference on High Pressure Physics, Bangalore January 1992
	Invited talk: "Metal Nonmetal transition" at IISC., Bangalore February 5-6, 1992
BALASUBRAMANIAN, R.	Ramanujan Day conducted by Ramanujan Inst. for Advanced Mathematics, Madras. Some combinatorial Problems in Number Theory.
DATE, G.	Workshop on Physics and Mathematics of Anyons at Centre for Theoretical Studies, I.I.Sc., Bangalore, February 18 - 21,1992.
	Gave a talk on Exact solutions in many anyons quantum mechanics . Participated in IMSc workshop on Geometric Phases in Physics. October 7 -11, 1991.
GOVINDARAJAN, S.	Mini-Symposium on Topological Field Theory held at the Institute of Physics, Bhubaneswar- Invited talk on Semirigid Constructions for Topological Gravity and Supergravity.

GOVINDARAJAN, T.R. Workshop on Geometric Phases in Physics
Oct. 7 - 11, 1991

Workshop on Physics and Mathematics of Anyons
Feb. 18 - 21, 1992

JAGANNATHAN, R. Workshop on Geometric Phases in Physics, IMSc.
October 7 - 11, 1991.

Invited talk on On Berry Phase and Hannay Angle .

JAYARAMAN, T. Participated in Spring School on Superstrings
and Workshop, I.C.T.P., Trieste, Italy .
April 15 - 28, 1991.

Participated in the Workshop on Topological Field
Theories, Institute of Physics, Bhubaneswar, one
week in November 1991.

LODAYA, Kamal National Seminar on Theoretical Computer
Science, IMSc., Madras.
July 4 - 6, 1991.
(Chair, Organising Committee).

Foundations of Software Technology and
Theoretical Computer Science.,
Eleventh Conference & (FST and TCS 11)
New Delhi, India,
Dec 17 - 19, 1991.

Member, Program Committee and contibuted a paper
Tense logics for local reasoning in distributed
systems (with R.Ramanujam).

MADDALY, Krishna Conference on Harmonic Analysis held jointly
by the Indian Academy of Sciences and the
Indian Statistical Institute, in Bangalore during
March 11 - 13, 1992.

Gave a talk on Nature of Random potentials

MAJUMDAR, P.   State University of New York at Stony Brook,
April 1991
Strings '91

Institute of Physics, Bhubaneswar, Nov. 1991
Topological Field Theory.

MURTHY, M.V.N.   IMSc. Workshop on Geometric Phases in Physics.
Invited talk on Quantum Mechanics of
Many Anyons, Oct. 7-11, 1992,
Indian Institute of Science, Bangalore.

Discussion Meeting on Non-Accelerator
Particle Physics

Invited talk on Solar Neutrino Problem
Nov.17-21, 1991.

Workshop on Physics and Mathematics of Anyons at
CTS, Indian Institute of Science, Bangalore.
Invited talk on Review of Anyon Quantum Mechanics
Feb. 18-21, 1992.

NAG, Subhashis   International Symposium on Topological and
Geometrical Methods in Field Theory, Turku,
Finland, May 26 - June 1, 1991–
Invited Keynote Lecture in the opening Session
of the Conference. Title: $\mathrm{Diff}(S^1)$ and the
Teichmüller spaces: a connection via string
theory.

SPIC Mathematics Colloquium, Park Sheraton,
Madras, January 2 - 4, 1992, Chairman of
the second session.

TIFR International Colloquium,
Bombay,Jan 6 - 14, 1992,
Invited participant.

Symposium on Group Theory and Differential
Geometry in Physics, IMSc, Invited
lecture, March 3, 1992.

PARTHASARATHY, R.   Second International Conference on Particles,
Strings and Cosmology - 1991, PASCOS-91 at
Northeastern University, Boston, MA, U.S.A.,
March 25 - 30, 1991.
Invited talk on Geometry of Strings and
Generalized Gauss maps.

Workshop on Geometric Phases in Physics, IMSc,
October 7 - 11, 1991. Invited talk on
Geometric Phases and Higher Dimensions.

Chaired a session in
One day symposium on Group Theory and
Differential Geometry in Physics,
IMSc. March 23, 1992, and

Gave a talk on Generalized Kenmotsu equation,
representation theorm and Beltrami equation
in Gauss maps in R^n and super Gauss maps.

RAJASEKARAN, G.   VII SERC School in Theoretical High Energy
Physics, Physical Research Laboratory,
Ahmedabad, December 23 1991 - January 18, 1992.
Gave a course of 12 lectures on the
Standard Model of High Energy Physics.

Meeting on Non-Accelerator Particle Physics,
Indian Institute of Science, Bangalore,
November 17 - 21, 1991.
Invited talk on The Standard Model and Beyond.

Symposium on Quantum Field Theory and
Statistical Mechanics, Indian Statistical
Institute, Calcutta, January 27 - 31. 1992.
Invited talk on New Forms of Quantum Statistics

Workshop on Geometrical Phases in Physics, IMSc,
October 7 - 11, 1991. Chaired a session and
gave the concluding remarks.

INSA meeting (Madras Chapter), Madras University,
Guindy Campus, February 28, 1992. One of
the judges for a Science Debate.

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RAMACHANDRAN, R.	International Conf. on Gravitation and Cosmology. Ahmedabad, India. December 13 -18 1991. Chaired a session on Quantum Cosmology, String Theory.
	XVI Conference of Indian Association of General Relativity and Gravitation, Sardar Patel University, Vallabh Vidyanagar, December 10 -11, 1991. Invited Lecture on Strings and Gravity.
	Indian Association of Physics Teachers Sixth Annual Convention, Madurai, Nov. 19–21, 1991. Delivered the Inaugural Address (published in Bull. IAPT, 8 (1991) 357).
	Participated in the Indian Academy of Sciences Annual Meeting, Pune, November 8 - 10.
RAMAKRISHNAN, B.	Instructional Conference on Elliptic Curves, TIFR, Bombay. Sep. 30–Oct. 18, 1991. Attended.
RAMANUJAM, R.	National Seminar on Theoretical Computer Science, IMSc, Madras. July 4 - 6, 1991. (Member, Programme Committee).
	Conference on Foundations of Software Technology and Theoretical Science. New Delhi, Dec 17 - 19, 1991.
	Presented a paper on Tense logics for local reasoning in distributed systems (with Kamal Lodaya). Working Group 2.2 on Programming Methodology of International Federation for Information Processing, TIFR, Bombay. Feb 3-7, 1992. Gave a talk on Distributed Transition Systems.
SANJAY KUMAR, M.	Participated in the workshop on Geometric Phases in Physics held at IMSc. October 7 - 11, 1991.

SHANKAR, R.	Workshop on Anyons, CTS., I.I.Sc., Bangalore, February 1992. Gave a talk on O(3) non-linear σ model with the Hopf term.
SIMON, R.	International Conference on Emerging Optoelectronic Technologies, I.I.Sc, Bangalore, December 16 - 20, 1991. Chaired the session on Novel Optical Phenomena.
SRINIVASA RAO, K.	One day symposium on Group Theory and Differential Geometry in Physics, IMSc, March 23, 1992. Invited talk on Group Theory of Terminating $_3F_2(1)$ series.
SUBRAMONIAM, G.	XIII AIRAPT International Conference on High Pressure Science and Technology, Bangalore. October 7 - 11, 1991. Participated and presented a paper entitled Metallization and Possible Superconductivity in CsI at High Pressures.
UMASANKAR, S.	Miniworkshop on Phenomenology, University of Bombay, February 10 - 13, 1992. Delivered a talk entitled Issues in B-physics .
VARGHESE, John	Participated in Mini-Workshop on Topological Field Theory, Institute of Physics, Bhubaneswar, October 1991.
VENKATARAMAN, S.	Attended the Instructional Conference on Elliptic curves sponsored by NBHM, September 1991 Tata Institute of Fundamental Research, Bombay
VASUDEVAN, R.	Participated in the Workshop on Geometric Phases in Physics, October 7 - 11, 1991,. IMSc.
VENKATESH RAMAN	FST & TCS, 11th Conference, New Delhi, Dec.17–19, 1991. Contributed paper on Fast Stable In-place Sorting with O(n) Data Moves, with Ian Munro

Seminars/Lectures given outside the Institute

ANISHETTY, R.   Anna University, Neural Networks,
                  February 3 and 5, 1992.

BASKARAN, G.   ICTP, Trieste, Italy
                  June 1991

                  Institute for Solid State Physics
                  Tokyo University, Tokyo, Japan
                  August 8, 1991

                  Physics Department
                  Tokyo Institute of Technology
                  August 9, 1991.

                  ETH, Zurich, Switzerland
                  September 30, 1991.

                  RCA Labs., Zurich, Switzerland
                  October 1, 1991

                  IBM Research Lab., Zurich, Switzerland
                  October 2, 1991

                  National Physical Laboratory, New Delhi
                  November 1991

                  School of Physics
                  Jawaharlal Nehru University, New Delhi
                  November 1991

                  Department of Theoretical Physics
                  Madras University, Madras
                  December 1991

                  Institute of Physics, Bhubaneswar
                  January 28, 1992

                  S.N. Bose Institute, Calcutta
                  January 31, 1992

LODAYA, Kamal	BITS, Pilani. March 11, 1992, Developing Correct Programs.
GOVINDARAJAN, S.	Centre for Theoretical Studies, I.I.Sc., Bangalore. Physical states in $c < 1$ matter coupled to 2-d gravity. April 3, 1992.
GOVINDARAJAN, T.R.	Cochin University, Department of Physics Fractional Statistics in Physics, 7th March 1992
JAGANNATHAN, R.	Department of Physics, Mysore University, Mysore. UGC Refresher course in Physics for college teachers, September 23-26, 1991
	Four lectures on 'The Berry Phase', One lecture on 'Quantum Groups', Sep. 26, 1991.
JANAKI, Balakrishnan	Dept. of Physics, University of Newcastle-upon-Tyne, U.K. The Axial Anomaly for Parafermions from Stochastic Quantization. April 22, 1991.
	Department of Physics and Astrophysics, Delhi University, Delhi. (TPSC seminar). Gauge - independent effective action for quantum fields in curved space. March 23, 1992.
	Department of Physics, Indian Institute of Technology, Kanpur.(TPSC seminar). Same title as above. March 24, 1992.
JAYARAMAN, T.	Tata Institute of Fundamental Research, Bombay. States of non-zero ghost number in $c < 1$ matter coupled to 2-d gravity.
MURTHY, M.V.N.	Material Science Lab. IGCAR, Kalpakkam. Quantum Mechanics of Anyons. Aug. 28, 1991. IPA Colloquium "Neutrinos" February 1992

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MAJUMDAR, P.	Institute of Physics, Bhubaneswar Baryon Non-conservation in the Standard Model (Colloq.), September 1991.
	S.N. Bose Centre for Basic Sciences, Calcutta. Ghostly and Ghost-free states in $c < 1$ Matter coupled to 2d Gravity January 1992, (Seminar)
	IPA, Colloquium String Theory & Quantum Gravity February 1992.
NAG, Subhashis	University of Helsinki, Finland. May 22, 1991. A period mapping in Universal Teichmüller space Colloquium of the Finnish Mathematical Society.
	University of Jyvaskyla, Finland. May 24,1991. Colloquium on Explicit Holomorphic Sections over arbitrary Teichmüller Spaces.
	Department of Physics, University of Amsterdam, Holland, June 3, 1991. Seminar on Non-perturbative String Theory and the Diffeomorphism Group of the Circle.
PARTHASARATHY, R.	Physics Department, Simon Fraser University. Burnaby, Canada. Chromoelectric Fields in QCD and Confinement of Gluons.
	Physics Department, St.Joseph's College, Tiruchi. Changing Scenes in Particle Physics, Jan. 18,1992.
RAJASEKARAN, G.	School of Physical Sciences, Jawharlal Nehru University, New Delhi. Algebra for fermions with a new exclusion principle April 12,1991.
	Institute of Physics, Bhubaneswar. Algebra for fermions with a new exclusion principle. April 29,1991.

RAJASEKARAN, G.	Department of Physics, I.I.T., Madras New forms of quantum Statistics. Sept.26,1991.
RAJESWARI, V.	S.N.Bose National Centre for Basic Sciences, Calcutta, Quantum groups and q-generalizations of the angular momentum coefficients of $SU_q(2)$, Nov.14,1991. Dept. of Physics, Gulbarga University, Gulbarga. A course of 20 lectures on Nuclear Models and Nuclear Reactions Dec. 12-18,1991 and Dec.31,1991–Jan.4,1992. Dept. of Theoretical Physics, Madras University. A course of 10 lectures on Nuclear Reactor Theory. March 15-31,1992.
RAMANUJAM, R.	I.I.T., Madras. Bilattices and the semantics of logic programs April 1991. Tata Institute of Fundamental Research, Bombay. Decidability of a tense logic for n-trees Jan.21,1992. and 'Relating some models of concurrency via modal logic', Jan. 23. 1992.
SANJAY KUMAR, M.	School of Physics, University of Hyderabad. Characterization of Muller matrices in polarization optics. September 26, 1991.
SHANKAR, R.	Indian Institute of Science, Bangalore. O(3) non-linear σ-model. March 3, 1991. Tata Institute of Fundamental Research, Bombay. O(3) non-linear σ - model. September 17, 1991.

SHANKAR, R.	I.I.T., Kanpur. t-J Model and High T_c superconductivity September 23, 1991.
	Madurai Kamaraj University. Same topic as above on January 22, 1992.
	IGCAR, Kalpakkam. Material Science Division, Same topic as above. January 11, 1992.
SRIDHAR, R.	Dept. of Physics, Gulbarga University, Gulbarga. Recent Developments in Physics of Superfluids. December 20, 1991.
	A course of lectures on Group Theory was given in the same Department.
SRIKANTH, P.N.	I.I.T., Madras. Nonlinear Functional Analysis and applications Feb. 1992.
	University of New England, Armidale, Australia. On uniqueness, exactness of the number of solutions for a class of nonlinear differential equations.
SRINIVASA RAO, K.	Ramanujan Institute for Advanced Study in Mathematics, University of Madras. A course of lectures (6 hours) in the Applications of Lie algebras in Physics in August 1991.
	Physics Dept., Duke University, Durham, U.S.A. Seminar on Recent developments in Quantum theory of angular momentum September 11, 1991.
	Mathematics Dept., Pennsylvania State University Pennsylvania, U.S.A. Seminar on Multiplicative Diophantine equations Novemner 14, 1991.

SRINIVASA RAO, K.   Physics Department, St.Louis University,
                     St.Louis,U.S.A.
                     Colloquim on Life and work of Srinivasa
                     Ramanujan, December 2, 1991.

                     Physics Department, Rensselaer Polytechnic
                     Institute, Troy, N.Y., U.S.A., Colloquim on
                     Ramanujam–Life, work and relevance to Physics,
                     December 11, 1991.

                     Duke University, Durham, N.C., U.S.A.,
                     Maths-Physics seminar on Ramanujan –
                     his life and work. Dec.16,1991.

                     Ramanujan Inst. for Advanced Study in Mathematics,
                     University of Madras, on Multiplicative
                     Diophantine Equations in Ramanujan
                     Symposium 91-92, January 29-30, 1992.

UMASANKAR, S.   Brookhaven National Laboratory, Seminar on
                     Measuring $| V_{ub} |$ via
                     non-leptonic B-decays.

VENKATESH RAMAN   I.I.T., Madras. Selection and Sorting with Minimum
                     Data Movement. September 3, 1991.

                     I.I.T., Delhi. Selection from Read-Only Memory
                     and Sorting with Optimum Data Movement
                     December 20, 1991.

                     St.Xavier's College, Palayamkottai.
                     $P \overset{?}{=} NP$ problem, March 20, 1992.

OTHER PROFESSIONAL ACTIVITIES

PROF.BALASUBRAMANIAM, R.
Member, Sectional Committee for Mathematics in Indian National Science Academy.
Member, Sectional Committee for Mathematics in Indian Academy of Sciences.
Member, INSA Committee for I.M.U.
Member, Expert Committee on Mathematics and Statistics, CSIR.
Member, Board of Studies, Department of Mathematics, Pondicherry University.

DR. BALAKRISHNAN, Radha has been appointed as a Senior Associate of the International Centre for Theoretical Physics, Trieste, Italy from 1st January '92 to 31st December 1997.

DR.GOVINDARAJAN, T.R. Secretary, Indian Physics Association, Madras Chapter.

PROF.NAG, S. was elected on the Advisory Board of the Mathematics Journal of the Indian National Science Academy by the Council of the Academy from January 1992. Also served the UGC/CSIR Examination Board in certain capacities, by invitation.

PROF.RAJASEKARAN, G. is a member of the Governing Councils of a number of National Institutions and Committees and is the Chairman of the committee on the DST-SERC Schools on Theoretical High Energy Physics.

PROF.RAMACHANDRAN, R. Vice President - Indian Physics Association
Member, Scientific Advisory Committee IUCAA, Pune
Member, Board of Studies, School of Physics, University of Hyderabad
Member, Board of Studies, Indira Gandhi National Open University
Member, Academic Council, Anna University, Madras
Regional Representative in Asia of ICTP, Trieste External Activities
Senior Associate, ICTP, Trieste

Awards and Honours

PROF.BASKARAN, G. was elected as Fellow of the Indian National Science Academy, India in 1991.

PROF.RAJASEKARAN, G. received (with PROF.S.K.JOSHI) the 1990 Award for Physical Sciences including Mathematics, from the Federation of Indian Chambers of Commerce and Industry. Also was elected as Fellow of National Academy of Sciences, India in 1991.

Ph.D's from the Institute during 1991-92

MR.SUKUMAR DAS ADHIKARI received Ph.D Degree in Mathematics from the University of Madras. He had submitted his Thesis entitled "Some ω theorems and related questions in number theory" under the guidance of R.BALASUBRAMANIAN.

MR.BISWAJIT CHAKRABORTY received Ph.D Degree in Physics from the University of Madras. He had submitted his Thesis entitled "Studies in Kaluza-Klein Approach to Unification" under the guidance of R.PARTHASARATHY.

MR.MANU MATHUR has submitted his thesis entitled "A Manifestly lorentz covariant local Quantum Field Theory of Dyons" to the University of Madras, under the guidance of H.S.SHARATCHANDRA.

Lecture Courses for Ph.D students during 1991-92

PHYSICS

(i) For 1st year students:

I SEMESTER (August'91 - December 1992)

Mathematical Physics	T.R.GOVINDARAJAN
Electromagnetic Theory	A.K.MISHRA
Classical Mechanics	R.SHANKAR
Quantum Mechanics	RAHUL BASU

II SEMESTER (Jan'92 - May 1992)

Mathematical Physics (Lie Groups)	R.SIMON
Mathematical Physics (Diff. Geom)	G.DATE
Statistical Mechanics	BALAKRISHNAN, Radha
Field Theory	R.PARTHASARATHY

MATHEMATICS

Algebraic Number Theory (I Semester)	R.BALASUBRAMANIAN
Topology and Geometry (Aug.'91-Dec.'91)	S.NAG
Reading Course in Real Analysis (I Semester)	P.N.SRIKANTH & M.KRISHNA
Topics in Geometry and Complex Analysis (Jan.'92-May'92)	S.NAG
Elementary ODE & PDE (II Semester)	P.N.SRIKANTH

THEORETICAL COMPUTER SCIENCE

Topics in Algorithms (Jan.'92-March'92)	VENKATESH RAMAN

Conferences/Workshops/Schools Sponsored/Cosponsored by the Institute

(1) A National Seminar on Theoretical Computer Science (jointly organised by the School of Mathematics, Spic Science Foundation and IMSc.) was held at the Institute from 4th July '91 to 6th July '91.
Dr.K.Lodaya Chaired the Organising Committee. The Seminar had about 90 participants.

(2) A Workshop on "Geometric Phases" was held at the Institute during October 7 - 11, 1991. About 30 participants took part in the workshop.
(Organising Committee: Prof.R.Simon, Prof.N.Mukunda and Prof.V.Srinivasan)

(3) A one day programme on Physics of Complex Fluids and Polymers was organised on 26.11.91 along with IPA (Madras Chapter).

(4) An International Conference on Gravitation and Cosmology was held at the Physical Research Laboratory, Ahmedabad from 13th to 18th December 1991. The conference was cosponsored by the Institute.

(5) The Thirtieth Anniversary Symposium (in honour of Prof.R. Vasudevan) was held at the Institute premises on 10th January 1992.

(6) The Indian Physics Association Organised along with IGCAR Centre, Kalpakkam on 29.2.92 and the same was cosponsored by the Institute of Mathematical Sciences, Madras 600 113.

(7) A one day Symposium was held at the Institute in honour of Prof.K.H.Mariwalla on 23rd March 1992.

LIBRARY

During the year the institute library added 1353 Books and Bound volumes of periodicals on physics, mathematics and theoretical computer science to the main collection. Presently the number of volumes as on date is about 28,000 and we hope to increase its holdings substantially in the years to come. The Library receives 260 Journals by subscription and about 50 Journals and Lecture notes on exchange basis many of which arrive by Airmail. The fully air-conditioned Library is well utilized by the members of the institute and research workers coming from different parts of the country. 2410 Research scholars utilised the library during this year. Our Institute Library has lent as well as borrowed several books from other libraries on Inter Library Loan basis. Good number of xeroxed research articles were sent to other institutes on reciprocal basis. 3650 Preprints have been received during the year from similar institutions from India and abroad. Valuable books were received as gratis during the year and we would like to thank the following for this kind gesture.

Prof. Keppelmann, E. (U.S.A.), Bhaduri, R.K. (U.S.A).
Profs. Balasubramaniam, R., Lodaya, K., Baskaran, G.
Ramachandran, R. of our Institute.

Mr.G.Venkatesan (Assistant Librarian) was deputed to attend the short term course on Computer applications in Library Information Management during 8-20 July, 1991 conducted by I.I.T. Central Library, Kanpur.

Mr.K.S.Santhanagopalan (Librarian) and Mr.G.Venkatesan (Assistant Librarian) were deputed by the Institute to attend a three day Advanced Course on Library Networking held at NCRT, Bombay during January 22-24, 1992.

SEMINARS/COLLOQUIA AT THE INSTITUTE

MATHEMATICS

16.4.91	HEMA SRINIVASAN University of Missouri	Pfaffians and Multiplicative Structures on Resolutions.
21.6.91	RAMANAN, S. TIFR, Bombay	Polarised Abelian Varieties and Moduli of Vector Bundles
11.7.91	KEPPELMANN, E. Dept. of Mathematics University of Texas, A & M	Fixed Points, Periodic Points and Coincidences
5.8.91	KRISHNASWAMY ALLADI University of Florida	Partition Identities and Ramanujan continued Fractions
6.8.91	KRISHNASWAMY ALLADI University of Florida	Partition Identities and Ramanujan continued Fractions
13.8.91	DAVID SINNOU University of Paris VI	The recent works of Masser Wustholz on the endomorphism rings of abelian varieties.
29.8.91	RAMASWAMI, V. Bellcore, NJ USA	Algorithmic Methods in Applied Probability
11.9.91	PRAMATHANATH SASTRY TIFR Bombay	Residues & Duality
17.9.91 & 18.9.91	VARADARAJAN, V.S. Univ. of California Los Angeles	Moduli problems for ordinary Differential Equations
26.9.91	VARADARAJAN, K. University of Calgary	Necklace Rings
19.11.91	TILAK BHATTACHARYA Indian Statistical Institute New Delhi	A new Poincare inequality and its application to regularity of minimizers

23.12.91 & 24.12.91	KANNAN, V. University of Hyderabad	Contributions of Hausdorff in various branches such as Set theory, Topology Measure theory, analysis etc.
6.1.92	RAM MURTY, M. Mcgill Univ. Canada	Recent developments on Ramanujan conjectures for Maass forms
6.1.92	HOFFSTEIN, J. Broom Univ.	Some ramblings on Ramanujam conjectures
7.1.92	HOFFSTEIN, J. Broom Univ.	Generalized Theta function on GL(2)
7.1.92	KUMAR MURTY, V. Univ. of Toronto Canada	Nonvanishing of L-functions
13.1.92	WALDSCHMIDT, M. Univ. of Paris	A proof of Baker's transcendence results on linear forms in logarithms
16.1.92	WALDSCHMIDT, M. Univ. of Paris	A proof of Baker's transcendence results on linear forms in logarithms
16.1.92	VARADHAN, S.R.S. Courant Institute New York, USA	On the behaviour of large systems of interacting particles
27.1.92	SHIOTA, T. Research Institute of Mathematical Sciences Kyoto University	The Novikov conjecture for period matrices
27.1.92	MARTIN KRUSKAL Princeton University USA	Surreal Numbers
29.1.92	DRELAUD University of Poittiers France	Plancharel's formula for homogeneous space of Nilpotent groups

30.1.92	MIKA SEPPALA Finland and Helsinki Univ.	Moduli Spaces of Stable Real Algebraic Curves
4.2.92	MIKA SEPPALA Finland and Helsinki Univ.	Computation of period Matrices for Riemann Surfaces
20.2.92	HABOUSH, W.J. Univ. of Illinois USA	Algebraic actions on affine spaces
21.2.92	RUF, B. Univ. of Milano	An Application of Singularity theory to a Nonlineon partial Differential Equations
10.3.92	LOGACHEV, D. Institute for Applied Mathematics, Khabarovsk USSR	Kolyvagin's Theorem on Finiteness of Tate-Shafarevich Groups
12.3.92	LOGACHEV, D. Institute for Applied Mathematics, Khabarovsk USSR	Kolyvagin's Theorem on Finiteness of Tate-Shafarevich Groups
27.3.92	SRINIVASU, P.D.N. Satya Sai Institute	Existential and numerical study of implicit differential equations

PHYSICS

1.4.91	BASKARAN, G. The Institute of Mathematical Sciences, Madras 600 113	The Theory of High T_c Superconductivity
5.4.91	SRINIVASU, P.D.N. Satya Sai Institute for Higher Learning	Non-Standard ordinary Differential Equations
19.4.91	IVANOV, V. Inst. of Inorganic and Physical Chemistry, Academy of Sciences USSR, MOSCOW	Ordered and Disordered Valence States in Transition Metal Oxides

20.4.91	IVANOV, V. Inst. of Inorganic and Physical Chemistry, Academy of Sciences USSR, MOSCOW	Strong and weak Ferromagnetism in the system of strongly correlated electrons
22.4.91	GAITONDE, D.M. Inst. of Physics Bhubaneswar	Anyons in Solid State Systems
23.4.91	DILEEP JATKAR Inst. of Physics Bhubaneswar	Anyons and Gaussian conformal Field Theories
6.5.91	PASUPATHY, J. CTS Bangalore	B Meson Decay and Heavy Flavor symmetry
8.5.91	RINDANI, S.D. PRL Ahmedabad	Leptonic CP Violation
10.5.91	RINDANI, S.D. PRL Ahmedabad	Neutrino Masses and Mixings with Exact conservation law
15.5.91	BALAKRISHNAN, V. Dept. of Physics I.I.T. Madras	Randon walk on Disordered Fractals
23.5.91	PROSEZIAN, K. Dept. of Physics Bharathidasan University	On the integrability of the radially symmetric Heisenberg spin system
25.6.91	JAYANTA BHATTACHARJEE I.I.T. Kanpur	Convective Turbulence
26.6.91	BALACHANDRAN, A.P. Syracuse University	Conformal Edge States of Chern-Simons Dynamics

1.7.91	JAGANNATHAN, R. IMSc. Madras 600 113	Quantum Algebras
3.7.91	AMITABHA MUKHERJEE Delhi University	Cellular Automata; Numerical Studies
5.7.91	SONI, S.K. Khalsa College New Delhi	Quantised conductance and 1+1 Anomaly
8.7.91	AMITABHA MUKHERJEE Delhi University	Theoretical Bounds on Higgs Boson and Top Quark Masses
10.7.91	SONI, S.K. Khalsa College New Delhi	Differential Calculus on Quantum Planes
12.7.91	BEHARA, N. Physics Department I.I.Sc., Bangalore	Correlators of some conformal Field Theories from characters on Higher Genus surfaces
17.7.91	RALPH PUDRITZ McMaster University CANADA	The origin of Jets in Young Stellar objects and Galactic Nuclei
7.8.91	BHADURI, R.K. McMaster University Canada	Quantum Mechanics of Anyons
9.8.91	SIMON GEORGE California State University at Long Beach, USA	Infrared Fourier Transform Spectroscopy
9.8.91	RAVISHANKAR, K. SUNY, NEWPALTZ USA	Shocks in Asymmetric Exclusion Automata
12.8.91	MANU MATHUR IMSc., Madras 600 113	Manifestly Lorentz coveriant and Local QFT of Dyons

26.8.91	NANDAKUMARAN, V.M. Cochin University	Dynamics of He^4 Films
28.8.91	RAJASEKARAN, G. IMSc., Madras 600 113	New Forms of Quantum Statistics
29.8.91	SWAPNA MAHAPATRA TIFR	Physical States in $C < 1$ Theory
30.8.91	SWAPNA MAHAPATRA TIFR	Physical States in $C < 1$ Theory
9.9.91	KRISHNAKUMAR, B. Dept. of Mathematics I.I.T., Madras	On population Dynamics
11.9.91	SHIBAJI ROY Univ. of Rochester USA	Integrable Models and 2D Gravity
18.9.91	PARTHASARATHI, R. IMSc., Madras	Extrinsic Geometry of String World Sheet and Generalised Gauss Map
19.9.91	VARADARAJAN, V.S. U.C.L.A.	Quantization & Deformations
30.9.91	SURESH GOVINDARAJAN IMSc., Madras 600 113	Semirigid constructions for Topological Gravity and Super Gravity in 2D
3.10.91	DHRUV RAINA NISTADS, DELHI	Ramachandra and Indian Science in the 19th Century
14.10.91	RADHAKRISHNAN, V. IMSc., Madras 600 113	On Davidov's Equation
11.11.91	SOUMYA CHAKRAVARTY College of Science Pomona, California USA	Spin Excitations in Nuclii by Pions

12.11.91	BANDYOPADHYAY, K. Visva-Bharati University	CP Violation in a Two Generation $U(1)_H$ Horizontal Gauge Model
12.11.91	KAMAL BHATTACHARYYA Dept. of Chemistry Burdwan University West Bengal	Pedestrian Approach to handle some Divergent Sequences
13.11.91	SATEESH, K.S. University of Massachussets Amherst	Diquark in Quark-gluon plasma
25.11.91	RAMAKRISHNAN, T.V. IISc., Bangalore	Mixed Phases in High T_c Superconductors : Solids, Liquids and Glasses.
25.11.91	ASIT K.DE AACHEN West Germany	Some aspects of the standard Model of Electroweak interactions on the Lattice
2.12.91	UMA MAHANTA CTS, Bangalore	Constraints on a composite Higgs Model from Electric Dipole Moment of the Electron
4.12.91	UMA MAHANTA CTS, Bangalore	Effective Lagrangian for Finely Tuned Technicolor and Extended Technicolor
5.12.91	RANGARAJAN, G. Lawrence Berkely Laboratory Univ. of California Berkeley, USA	Applications of Algebraic Techniques to Hamiltonian systems
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