SESSIONS

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Monday, 16th February
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7:00 - 9:00 REGISTRATION & RECEPTION

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Day 1: Tuesday, 17th February 1998
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08:15-8:30 Opening Remarks

Terry Cole, Chief Technologist, Jet Propulsion Laboratory, Pasadena, CA, USA.

Leon Alkalai, Center Lead, CISM, Jet Propulsion Laboratory, Pasadena, CA, USA.

08:30-09:30 Keynote speaker:

"Quantum Information: Transmission and Processing"

Charles Bennett, IBM Thomas J. Watson Research Center, Yorktown Heights, NY, USA

09:30-09:45 Coffee Break

09:45-11:45 Surprises of Quantum Computing

Chair: J. Preskill, California Institute of Technology, Pasadena, CA, USA

Speakers: "Quantum Effects in Algorithms",
R. Jozsa, University of Plymouth, Plymouth, UK

"Topological Quantum Computation"
J. Preskill, California Institute of Technology, Pasadena, CA, USA

"Multi-particle entanglement via 2-particle entanglement"
G. Brassard and T. Mor, University of Montreal, CANADA

"Quantum Computers for Fluid Simulations",
J. Yepez, Air Force Research Laboratory, Hanscom AFB, MA,

USA

11:45-01:00 CONFERENCE LUNCHEON

01:00-01:30 **"NASA Initiative in Integrated Space Microsystems"**
Leon Alkalai, CISM, Jet Propulsion Laboratory, Pasadena, CA, USA

01:30-02:00 **"DOD/NSA Perspective on Quantum Computing"**
Keith Miller, National Security Agency, Fort Meade, MD, USA

02:00-03:00 Advances in Quantum Circuits

Chair: A. Ekert, University of Oxford, Oxford, UK

Speakers: "From quantum interferometers to quantum algorithms",
A. Ekert, University of Oxford, Oxford, UK

"Quantum Wavelet Transforms",
A. Fijany and C.P. Williams, Jet Propulsion laboratory, Pasadena, CA, USA

03:00-03:15 Tea/Coffee Break

03:15-04:15 Quantum Networks

Chair: Alvin DeSpain, Information Sciences Institute, University of Southern California, Los Angeles, CA USA

Speakers: "Quantum Recurrent Networks",
M. Zak & C.P. Williams, Jet Propulsion laboratory, Pasadena, CA, USA

"Correlation Between Correlations: Process and Time in Quantum Networks",
G. Mahler & Kim, University of Stuttgart, GERMANY

04:15-05:45 Quantum Information Theory

Chair: N. Cerf, California Institute of Technology, Pasadena, CA, USA

Speakers: "Quantum Generalization of Conditional Entropy and Information"
L.B. Levitin, Boston University, Boston, MA, USA

"Quantum Cryptography, Eavesdropping and Unsharp Spin Measurement"

S. Roy & G. Kar, Indian Statistical Institute, Calcutta, INDIA

"Physical Reality and Quantum Paradoxes",
C. Adami and N. Cerf, California Institute of Technology, Pasadena, CA, USA

"Strengthened Lindblad Inequality: Applications in Non-equilibrium Thermodynamics & Quantum Information Theory"
A. Saakian & D.B. Allahverdyan, Yerevan Physics Institute, ARMENIA

"Entanglement of Assistance",
A. Thapliyal, University of California at Santa Barbara, CA, USA

05:45- Pool/Spa/Tennis/Golf/Tram Ride/Sightseeing

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Day 2: Wednesday, 18th February 1998
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08:30-10:00 Quantum Algorithms for NP-Complete Problems: Possibilities and Impossibilities

Chair: C.P. Williams, Jet Propulsion laboratory, Pasadena, CA, USA

Speakers: "On the Power of Quantum Computation",
U. Vazirani, University of California at Berkeley, CA, USA

"Quantum Search on Structured Problems",
L Grover, Bell Labs, Murray Hill, NJ, USA

"Nonlinear Quantum Mechanics Implies Polynomial Time Solution for NP-Complete & #P Problems",
D.S. Abrams and S. Lloyd, Massachusetts Institute of Technology, Boston, MA, USA

10:00-10:15 Coffee Break

10:15-11:45 Quantum Communication

Chair: R. Cleve, University of Calgary, CANADA

Speakers "Quantum Entanglement and the Communication Complexity of the Inner Product Function",

R. Cleve, W. van Dam & A. Tapp, University of Calgary, CANADA

"Quantum Communication in Quantum Networks",
Van Enk, Briegel, Dur, Cirac, Zoller, Kimble, & Mabuchi, California Institute of Technology, Pasadena, CA, USA

"On the Existence of Nonadditive Quantum Codes",
V.P. Roychowdhury & F. Vatan, University of California at Los Angeles, CA, USA

11:45-01:00 Lunch

01:00-01:30 **"NASA Deep Space Communications"**
Leslie Deutsch, Telecommunications, Mission and Operations Directorate, Jet Propulsion Laboratory, Pasadena, CA, USA

01:30-02:00 **"DOD/ARO Activities in Quantum Computing"**
Henry Everitt, Army Research Office, Research Triangle Park, NC, USA

02:00-03:30 Quantum Channels

Chair: R. Hughes, Los Alamos National Laboratory, Los Alamos, NM, USA

Speakers: "Quantum Enhanced Classical Communication",
C. Fuchs, California Institute of Technology, Pasadena, CA, USA

"Practical free-space quantum cryptography."
R. Hughes, Los Alamos National Laboratory, Los Alamos, NM, USA

"Capacities of Quantum Channels and Quantum Coherent Information"
M. Westmoreland & B. Schumacher, Denison University, OH, USA

"Multi-access Channels in Quantum Information Theory"
A. Allahverdyan & D.B. Saakian, Yerevan Physics Institute, ARMENIA

03:30-03:45 Tea/Coffee Break

03:45-05:15 Combatting, Eliminating or Harnessing Decoherence

Chair: D. DiVincenzo, IBM Thomas J. Watson Research Center,

Yorktown Heights, NY, USA

Speakers: "What is needed to build a quantum computer?",
D. Di Vincenzo, IBM Thomas J. Watson Research Center,
Yorktown Heights, NY, USA

"Decoherence Control for Optical Qubits",
Vitali & Tombesi, University of Camerino, ITALY

"Decoherence and Limitations on Ion Trap Quantum Computers",
P. Knight, Imperial College, University of London, UK

"Quantum Error Correction with Spatially Correlated Decoherence",
L. Duan & G. Guo, University of Science and technology, Heifeili, CHINA

05:15-06:30 Pool/Spa/Tennis/Golf/Tram Ride/Sightseeing

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Day 3: Thursday, 19th February 1998
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08:30-10:00 Potentially Exploitable Quantum Phenomena

Chair: J. Kimble, California Institute of Technology, Pasadena, CA, USA

Speakers: "Implementing Quantum Logic and Communication in Optical Physics",
J. Kimble, California Institute of Technology, Pasadena, CA, USA

"An Optical Approach to Quantum Computing",
J.D. Franson & T.B. Pittman, Johns Hopkins University, MD, USA

"Adiabatic Controlled-NOT Gate for Quantum Computation",
D. Averin, State University of New York at Stony Brook, NY, USA

"Optical Quantum Computers",
C. Adami, California Institute of Technology, Pasadena, CA, USA

10:00-10:15 Coffee Break

10:15-11:45 Alternate Models of Quantum Computation

Chair: E. Knill, Los Alamos National Laboratory, Los Alamos, NM, USA

Speakers: "Fault-Tolerant Computation with Higher-Dimensional Systems"
D. Gottesman, California Institute of Technology, Pasadena, CA, USA

"Quantum Resonance for Analog Computing",
M. Zak, Jet Propulsion laboratory, Pasadena, CA, USA

"A Diakoptic Approach to Quantum Computation",
G. Castagnoli & D. Monti, University of Genova, ITALY

11:45-01:00 Luncheon

01:00-01:30 **"NASA Onboard Autonomy for Space Exploration"**
Richard Doyle, Autonomy & Information Management, Jet Propulsion Laboratory, Pasadena, CA, USA

01:30-02:00 **"DARPA Activities in Quantum Computing"**
Sonny Maynard, DARPA, Innovative Technology Office/Ultrascale Computing, Arlington, VA, USA

02:00-03:30 Quantum Computability & Complexity

Chair: G. Brassard, University of Montreal, CANADA

Speakers: "Computability and Quantum Transforms"
P. Hoyer, IMADA, Odense University, DENMARK

"Quantum Computer Cannot Speed Up Iterated Applications of a Black Box"
Y. Ozhigov, Moscow State University, - "Stankin", Moscow, RUSSIA

"The Relationship Between Finding Unknown Abelian Subgroups and Estimating the Eigenvalues of Operators"
M. Mosca, University of Oxford, Oxford, UK

03:30-03:45 Tea/Coffee Break

03:45-05:15 Quantum Copying & Quantum Coding

Chair: Peter Knight, Imperial College, University of London. UK

Speakers: "Universal Optimal Cloning of Qubits and Quantum Registers",
V. Buzek & Hillery, Slovak Academy of Sciences, SLOVAKIA

"Entropically Uniform Quantum States"
N. Cerf, California Institute of Technology, Pasadena, CA, USA

"Quantum Convolutional Error Correction Codes"
H.F. Chau, University of Hong Kong, Hong Kong, CHINA

06:30-08:00 Conference Banquet

08:00-08:30 Banquet Speech

Speaker, Tony Spear, Jet Propulsion Laboratory, Pasadena, CA, USA

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Day 4: Friday, 20th February 1998
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08:30- 09:30 Simulating Quantum Computers

Chair: C. Adami, California Institute of Technology, Pasadena, CA, USA

Speakers: "Automated Quantum Circuit Design",
C.P. Williams & A. Gray, Jet Propulsion laboratory, Pasadena, CA, USA

"Simulating the Effect of Decoherence and Inaccuracies on a Quantum Computer",
K. Obenland & A. DeSpain, University of Southern California, Los Angeles, CA, USA

09:30 - 10.30 Breakthrough Quantum Technologies

Chair: D. Wineland, National Institute of Standards and Technology, MD, USA

Speakers: "Quantum Logic with Trapped Atomic Ions"
D. Wineland, National Institute of Standards and Technology, MD, USA

"Electron-Nuclear-Double-Resonance Quantum Computer",
J. Dowling & Bowden, U.S. Army Missile and Aviation Command, Huntsville, AL, USA

10:30-10:35 Coffee Break

10:45-11:45 Next Generation Quantum Algorithms

Chair: R. Jozsa, University of Plymouth, Plymouth, UK

Speakers: "Generalized Grover Search Algorithm for Arbitrary Initial Amplitude Distribution",
D. Biron, O. Biham, E. Biham, M. Grassl & D.A. Lidar, Hebrew University of Israel, ISRAEL

"Quantum Database Search by a Single Query",
D.P. Chi & J. Kim, Seoul National University, Seoul, S. KOREA

11:45-01:00 Luncheon

01:00-01:50 "NASA Interferometry: Imaging Planets in Other Solar Systems"
Plenary Talks: M. Shao, Interferometery Center for Excellence/JPL

"NASA Advances in Molecular Nanotechnology"
Plenary Talk: Meyya Mayyappan, NASA Ames Research Center

01:50-03:10 Implemented Quantum Circuits

Chair: I. Chuang, IBM, Almaden Research Center, San Jose, CA, USA

Speakers: "Quantum circuits and the Greenberger-Horne-Zeilinger effect",
I. Chuang, IBM, Almaden Research Center, San Jose, CA, USA

"NMR-based Quantum Computing",
E. Knill, Laflamme, Los Alamos National Laboratory, Los Alamos, NM, USA

"Multi-atom Quantum Bits and Cavity Dark States for Quantum Computing in Spectral Holeburning Media",
M.S.Shahriar (MIT), J. Bowers (MIT), S. Lloyd (MIT), A. Craig (AFRL),
P. R. Hemmer (Air Force Research Lab)

03:10-03:25 Tea/Coffee Break

03:25-04:55 Towards Realizable Quantum Computers

Chair: C.H. Bennett, IBM T.J. Watson Research Center, USA

Speakers: "Trapped Ion Quantum Computer Research at Los Alamos",

D. James, P.G. Kwiat, Los Alamos National Laboratory, Los Alamos, NM, USA

"Arrays of Elliptical Ion Traps for Parallel Quantum Computing",
R. DeVoe, IBM Almaden, San Jose, CA, USA

"Dynamics of Quantum Control-NOT Gate at Room Temperature",
G.P.Berman, G.D.Doolen (Los Alamos National Laboratory, USA), G.V.Lopez (University of Guadalajara, MEXICO) and V.Tsifrinovich (Polytechnic University, NY, USA)

"Spatiotemporal Dynamics of Quantum Computing Solid Dipole-Dipole Block Systems",
H. Matsueda, Kochi University, Kochi, JAPAN

04:55-05:00 Closing Remarks

C.H. Bennett, IBM T.J. Watson Research Center, NY, USA