FOCS '91

32nd Annual IEEE Conference on Foundations of Computer Science

October 1–4, 1991

San Juan, Puerto Rico

Sponsored by
IEEE Computer Society

In Cooperation with
ACM SIGACT

Registration for FOCS '91

The registration fees for FOCS '91 are listed below. To qualify for the early registration fee, your registration application must be postmarked by **Friday, August 23**. Refund requests will be honored until September 13. The non-student registration fee includes the Tuesday night reception, the Wednesday night business meeting, the Thursday night banquet, coffee breaks and lunches, and a copy of the proceedings. The student fee includes all of the above except the banquet.

Please fill out the form below and send it, along with a check or money order made payable to "FOCS '91," to:

Alok Aggarwal
ATTN: FOCS registration
Room 36-245, P.O. Box 218
IBM T.J. Watson Research Center
Yorktown Heights, NY 10598

Name_____

Affiliation_____

Street Address_____

City_____ State_____

ZIP or Country & Postal #_____

Email_____ Phone_____

Please circle one and fill in your membership number if appropriate: #_____

Category	**Fee**	**After 8/23**
ACM or SIGACT member	235	300
IEEE or EATCS member	235	300
Author or Program Committee member	235	300
Student	70	100
Other	300	360

Check your dietary preference.

Kosher_____ Vegetarian_____ No Restriction_____

Machtey Fund Contributions $_____

Extra Banquet Tickets ($40 each): _____

Hotel Reservations

The conference will be held at the San Juan Caribé Hilton. The rates for FOCS '91 are posted below and apply from Friday, September 27 through Sunday, October 6. Checkin time is 3pm and checkout is 12 noon. Please advise the hotel of late arrival.

Reservations should be made by **Friday, August 23**. Reservations made after that will be accepted on a rate and space availability basis. Refer to FOCS '91 when making your reservations to obtain the rates listed.

To make your reservations by phone, call (809) 721-0303 or (800) HILTONS. To make reservations by mail, fill out the form below and send it to the address below. A deposit in the form of a check or money order for one night's stay or credit card information must be included. When filling out the form, make sure that you list your name exactly as it appears on your check or credit card. The following credit cards are accepted: American Express, Diners Club, Visa, Mastercard, Eurocard, and Carte Blanche. Deposits will be refunded if the hotel is notified at least 24 hours before your specified arrival.

Caribé Hilton International
ATTN: FOCS '91 Reservations
P.O. Box 1872
San Juan, Puerto Rico 00903

Please check one:

Single $105 _____ Double $114 _____

Arrival Date: _____ Departure Date: _____

Please fill out:

Name_____

Address_____

_____ Phone_____

Sharing room with_____

If paying for deposit by credit card please complete:

Credit Card Type_____

Credit Card Number_____

Expiration Date_____

I authorize Hilton International to charge the above account for the amount equal to one night's stay as deposit.

Signature_____

WEDNESDAY, OCTOBER 2, 1991

Session IA

9:15 *Approximating Clique is Almost NP-complete*
U. Feige, *Weizmann;* S. Goldwasser, *MIT;* L. Lovász, *Princeton;* S. Safra, *MIT;* M. Szegedy, *U. Chicago*

9:40 *Fully Parallelized Multi Prover Protocols for NEXP-time*
Dror Lapidot, *Weizmann;* Adi Shamir, *Weizmann*

10:05 *On Proving versus Deciding*
R. Beigel, *Yale;* M. Bellare, *MIT;* J. Feigenbaum, *AT&T;* S. Goldwasser, *MIT*

Session IB

9:15 *An Optimal Convex Hull Algorithm and New Results on Cuttings*
B. Chazelle, *Princeton*

9:40 *The Art Gallery Theorem for Polygons with Holes*
F. Hoffmann, *Karl-Weierstraß-Institut;* M. Kaufmann, *Max-Planck-Institut;* K. Kriegel, *Karl-Weierstraß-Institut*

10:05 *Fat Triangles Determine Linearly Many Holes*
J. Matoušek, *Charles U. and Freie U.;* J. Pach, *NYU;* S. Sifrony, *Tel Aviv;* N. Miller, *Tel Aviv;* M. Sharir, *Tel Aviv;* Emo Welzl, *Freie U.*

10:25 Break

Session IIA

10:45 *Quantifying Knowledge Complexity*
O. Goldreich, *Technion;* E. Petrank, *Technion*

11:10 *Subquadratic Zero-knowledge*
J. Boyar, *Loyola U.;* G. Brassard, *U. Montréal;* R. Peralta, *U. Wisconsin*

11:35 *Simulating BPP using a General Weak Random Source*
D. Zuckerman, *UC Berkeley*

12:00 *Checking the Correctness of Memories*
M. Blum, *UC Berkeley;* W. Evans, *UC Berkeley;* P. Gemmell, *UC Berkeley;* S. Kannan, *Rutgers;* M. Naor, *IBM Almaden*

Session IIB

10:45 *On-Line Scheduling in the Presence of Overload*
S. Baruah, *U. Texas at Austin;* G. Koren, *NYU;* B. Mishra, *NYU;* A. Raghunathan, *UC Davis;* L. Rosier, *U. Texas at Austin;* D. Shasha, *NYU*

11:10 *Dynamic Scheduling on Parallel Machines*
A. Feldmann, *Carnegie Mellon;* J. Sgall, *Carnegie Mellon;* S-H. Teng, *Carnegie Mellon*

11:35 *Optimal Prefetching via Data Compression*
J.S. Vitter, *Brown;* K. Parameshwaran, *Brown*

12:00 *Scheduling Parallel Machines On-line*
D.B. Shmoys, *Cornell;* J. Wein, *MIT;* D.P. Williamson, *MIT*

12:20 Lunch

Session IIIA

2:00 *Concentrated Regular Data Streams on Grids: Sorting and Routing Near to the Bisection Bound*
M. Kunde, *Institut für Informatik*

2:25 *Communication Complexity for Parallel Divide-and-Conquer*
I-C. Wu, *Carnegie Mellon;* H.T. Kung, *Carnegie Mellon*

2:50 *On Selecting a Satisfying Truth Assignment*
C.H. Papadimitriou, *UC San Diego*

3:15 *Exact Learning of Read-Twice DNF Formulas*
H. Aizenstein, *U. Illinois;* L. Pitt, *U. Illinois*

Session IIIB

2:00 *Randomized Multidimensional Search Trees: Lazy and Dynamic Shuffling*
K. Mulmuley, *U. Chicago*

2:25 *Dynamic Maintenance of Geometric Structures Made Easy*
O. Schwarzkopf, *Freie U.*

2:50 *Reporting Points in Halfspaces*
J. Matoušek, *Charles U.*

3:15 *Randomized Multidimensional Search Trees: Further Results in Dynamic Sampling*
K. Mulmuley, *U. Chicago*

3:35 Break

Session IVA

4:00 *Interactive communication: balanced distributions, correlated files, and average-case complexity*
A. Orlitsky, *Bell Labs*

4:25 *Amortized Communication Complexity*
T. Feder, *Bellcore;* E. Kushilevitz, *Technion;* M. Naor, *IBM Almaden*

4:50 *Communication Complexity Towards Lower Bounds on Circuit Depth*
J. Edmonds, *U. Toronto;* R. Impagliazzo, *U. Toronto;* S. Rudich, *Carnegie-Mellon;* J. Sgall, *Carnegie-Mellon*

Session IVB

4:00 *Distributed Program Checking: a Paradigm for Building Self-stabilizing Distributed Protocols*
B. Awerbuch, *MIT;* G. Varghese, *MIT*

4:25 *Local Checking and Correction for Interactive Protocols*
B. Awerbuch, *MIT;* B. Patt-Shamir, *MIT;* G. Varghese, *MIT*

4:50 *An Asynchronous Two-Dimensional Self-Correcting Cellular Automaton*
W. Wang, *National U. of Singapore*

5:10 Break

9:00 Business Meeting

THURSDAY, OCTOBER 3, 1991

Session IA

8:50 *Competitive Algorithms for Layered Graph Traversal*
A. Fiat, *Tel Aviv;* D.P. Foster, *U. Chicago;* H. Karloff, *U. Chicago;* Y. Rabani, *Tel Aviv;* Y. Ravid, *Tel Aviv;* S. Vishwanathan, *U. Chicago*

9:15 *How to Learn an Unknown Environment*
X. Deng, *Simon Fraser U.;* T. Kameda, *Simon Fraser U.;* C.H. Papadimitriou, *UC San Diego*

9:40 *Walking an Unknown Street with Bounded Detour*
R. Klein, *Universität-GH-Essen*

Session IB

8:50 *Better Bounds for Threshold Formulas*
J. Radhakrishnan, *Rutgers*

9:15 *Shrinkage of de Morgan Formulae Under Restriction*
U. Zwick, *U. Warwick;* M.S. Paterson, *U. Warwick*

9:40 *Size-Depth Tradeoffs for Algebraic Formulae*
N.H. Bshouty, *U. Calgary;* R. Cleve, *U. Calgary;* W. Eberly, *U. Calgary*

10:00 Break

Session IIA

10:20 *A New Characterization of Mehlhorn's Polynomial Time Functionals*
B. Kapron, *Carnegie Mellon;* S.A. Cook, *U. Toronto*

10:45 *A Theory of Using History for Equational Systems with Applications*
R.M. Verma, *U. Houston*

11:10 *Progress Measures for Complementation of ω-Automata with Applications to Temporal Logic*
N. Klarlund, *IBM Yorktown Heights*

11:35 *Tree Automata, Mu-Calculus and Determinacy*
E.A. Emerson, *U. Texas at Austin;* C.S. Jutla, *IBM Yorktown Heights*

Session IIB

10:20 *Lower Bounds for Polynomial Evaluation and Interpolation Problems*
V. Shoup, *U. Toronto;* R. Smolensky, *U. Toronto*

10:45 *Efficient Exponentiation in Finite Fields*
J. von zur Gathen, *U. Toronto*

11:10 *Explicit Construction of Natural Bounded Concentrators*
M. Morgenstern, *U. British Columbia*

11:35 *Better Expansion for Ramanujan Graphs*
N. Kahale, *MIT*

11:55 Break

Afternoon open for sightseeing (NO LUNCH)

Session IIIA

4:00 *A General Approach to Removing Degeneracies*
I. Emiris, *UC Berkeley;* J. Canny, *UC Berkeley*

4:25 *A Quadratic Time Algorithm for the MinMax Length Triangulation*
H. Edelsbrunner, *U. Illinois at Urbana-Champaign;* T.S. Tan, *U. Illinois at Urbana-Champaign*

4:50 *Discrepancy and ϵ-approximations for Bounded VC-dimension*
J. Matoušek, *Charles U.;* E. Welzl, *Freie U.;* L. Wernisch, *Freie U.*

5:15 *On Better Heuristic for Euclidean Steiner Minimum Trees*
D.-Z. Du, *Princeton;* Y.-J. Zhang, *Southern Methodist*

Session IIIB

4:00 *Asymptotically Optimal PRAM Emulation on Faulty Hypercubes*
Y. Aumann, *Hebrew U.;* M. Ben-Or, *Hebrew U.*

4:25 *Fault-tolerant Computation in the Full Information Model*
O. Goldreich, *Technion;* S. Goldwasser, *MIT;* N. Linial, *Hebrew U.*

4:50 *Highly Fault-Tolerant Sorting Circuits*
T. Leighton, *MIT;* Y. Ma, *MIT;* C.G. Plaxton, *U. Texas at Austin*

5:15 *Efficient Algorithms for Dynamic Allocation in a Distributed Memory*
T. Leighton, *MIT;* E.J. Schwabe, *MIT*

5:35 Break

Session IVA

5:50 *Polynomial Algorithms for LP Over a Subring of the Algebraic Integers with Applications to LP with Circulant Matrices*
I. Adler, *UC Berkeley;* P.A. Beling, *UC Berkeley*

6:15 *Dynamic Three-Dimensional Linear Programming*
D. Eppstein, *UC Irvine*

6:40 *Fast Approximation Algorithms for Fractional Packing and Covering Problems*
S.A. Plotkin, *Stanford;* D.B. Shmoys, *Cornell;* É. Tardos, *Cornell*

Session IVB

5:50 *The Maintenance of Common Data in a Distributed System*
B. Awerbuch, *MIT;* L.J. Schulman, *MIT*

6:15 *Optimal File Sharing in Distributed Networks*
M. Naor, *IBM Almaden;* R.M. Roth, *IBM Almaden and Technion*

6:40 *Low Contention Linearizable Counting*
M. Herlihy, *DEC;* N. Shavit, *MIT;* O. Waarts, *Stanford*

7:00 Break

8:00 Banquet

FRIDAY, OCTOBER 4, 1991

Session IA

8:50 *A Unified Geometric Approach to Graph Separators*
G.L. Miller, *Carnegie Mellon;* S.-H. Teng, *Carnegie Mellon;* S.A. Vavasis, *Cornell*

9:15 *A Linear Time Algorithm for Triconnectivity Augmentation*
T.-S. Hsu, *U. Texas at Austin;* V. Ramachandran, *U. Texas at Austin*

9:40 *Finding the Hidden Path: Time Bounds for All-Pairs Shortest Paths*
D.R. Karger, *Stanford;* D. Koller, *Stanford;* S.J. Phillips, *Stanford*

10:05 *On the Exponent of the All Pairs Shortest Path Problem*
N. Alon, *Tel Aviv;* Z. Galil, *Tel Aviv and Columbia;* O. Margalit, *Tel Aviv*

Session IB

8:50 *Search Problems in the Decision Tree Model*
L. Lovász, *Princeton and Eötvos Loraánd U.;* M. Naor, *IBM Almaden;* I. Newman, *DIMACS and Hebrew U.;* A. Wigderson, *Princeton and Hebrew U.*

9:15 *A Parallel Algorithmic Version of the Local Lemma*
N. Alon, *Tel Aviv*

9:40 *Lower Bounds for the Complexity of Reliable Boolean Circuits with Noisy Gates*
A. Gál, *U. Chicago*

10:05 *Reliable Computation with Noisy Circuits and Decision Trees – A General n log n Lower Bound*
R. Reischuk, *Technical U. Darmstadt;* B. Schmeltz, *Technical U. Darmstadt*

10:25 Break

Session IIA

10:45 *A Lower Bound for the Dictionary Problem under a Hashing Model*
R. Sundar, *NYU*

11:10 *Lower Bounds for Data Structure Problems on RAMs*
A.M. Ben-Amram, *Tel Aviv;* Z. Galil, *Tel Aviv and Columbia*

11:35 *Ambivalent Data Structures for Dynamic 2-edge-connectivity and k Smallest Spanning Trees*
G.N. Frederickson, *Purdue*

12:00 *Faster Uniquely Represented Dictionaries*
A. Andersson, *U. Lund;* T. Ottmann, *U. Freiburg*

Session IIB

10:45 *On the Complexity of Computing the Homology Type of a Triangulation*
B.R. Donald, *Cornell;* D.R. Chang, *Cornell*

11:10 *An Approximation Algorithm for the Number of Zeros of Arbitrary Polynomials over $GF[q]$*
D. Grigoriev, *Max-Planck Institute of Mathematics;* M. Karpinski, *U. Bonn*

11:35 *Computing Sums of Radicals in Polynomial Time*
J. Blömer, *Freie U.*

12:00 *Efficient Algorithms for the Riemann-Roch Problem and Addition in the Jacobian of a Curve*
M.-D. Huang, *U. Southern California;* D. Ierardi, *U. Southern California*

12:20 Lunch

Session IIIA

1:50 *Connected Components in $O(lg^{3/2}|V|)$ Parallel Time for the CREW PRAM*
D.B. Johnson, *Dartmouth College;* P. Metaxas, *Dartmouth College*

2:15 *Some Nearly-Constant Time Randomized Parallel Algorithms*
J. Gil, *U. British Columbia;* Y. Matias, *U. Maryland;* U. Vishkin, *U. Maryland*

2:40 *Using Approximation Algorithms to Design Parallel Algorithms that May Ignore Processor Allocation*
M.T. Goodrich, *Johns Hopkins*

3:05 *A Deterministic Parallel Algorithm for Planar Graphs Isomorphism*
H. Gazit, *Duke*

Session IIIB

1:50 *Approximate Representation Theory of Finite Groups*
L. Babai, *U. Chicago and Eötvös U.;* K. Friedl, *U. Chicago and Hungarian Academy of Sciences*

2:15 *Finding a k-Cut within Twice the Optimal*
H. Saran, *Indian Institute of Technology;* V.V. Vazirani, *Indian Institute of Technology*

2:40 *How to Pack Better than Best Fit: Tight Bounds for Average-Case On-Line Bin Packing*
P.W. Shor, *AT&T Bell Labs*

3:05 *Adaptive Dictionary Matching*
A. Amir, *U. Maryland;* M. Farach, *U. Maryland*

3:25 Break

Session IVA

3:45 *On the Computational Power of Sigmoid versus Boolean Threshold Circuits*
W. Maass, *U. Illinois;* G. Schnitger, *Penn State;* E.D. Sontag, *Rutgers*

4:10 *Variation Ranks of Communication Matrices and Lower Bounds for Depth Two Circuits Having Symmetric Gates with Unbounded Fan-In*
M. Krause, *Humboldt-U. zu Berlin;* S. Waack, *Karl-Weierstraß-Institut*

4:35 *On ACC*
R. Beigel, *Yale;* J. Tarui, *U. Rochester*

Session IVB

3:45 *On-Line Maintenance of the Four-Connected Components of a Graph*
A. Kanevsky, *Texas A&M;* R. Tamassia, *Brown;* J. Chen, *Texas A&M;* G. Di Battista, *U. di Roma*

4:10 *Computing Planar Intertwines*
A. Gupta, *U. Waterloo;* R. Impagliazzo, *U. Toronto*

4:35 *Applications of a Poset Representation to Edge Connectivity and Graph Rigidity*
H.N. Gabow, *U. Colorado*

4:55 END

General Information

Location: All conference events will take place at the Caribé Hilton in San Juan, Puerto Rico.

Registration: The registration desk will be open from 7:00pm until 10:00pm on Tuesday, October 1, and during the day on Wednesday through Friday.

Accomodations: A block of 300 rooms has been reserved at the Caribé Hilton, but reservations must be received by the hotel at least 35 days prior to arrival.

Transportation: The Caribe Hilton is located nearby the Candado district in San Juan. The hotel can be reached by van or taxi from the San Juan International Airport. The trip takes 15-30 minutes and costs about $5 per person in a van and about $12 per carload in a taxi. There is no hotel shuttle service to the airport.

San Juan can be reached by air from most major cities. For domestic flights, American airlines is offering a 40% discount off full coach fare, and a 5% discount off any other fare. For travel from Canada, the discounts are 35% and 5%, respectively. American will also offer a discount on international travel, but the amount is determined by the sales office of the departure city. The discounts apply for travel from September 27 through October 6, 1991. When ordering tickets with American Airlines (800-433-1790), refer to STAR file # S0191AJ. For the best possible fares, we suggest that you contact Omega Travel at (800) 777-7279. Ask for Chris Lacey, Felix Lena or Nancy Schram. If you need a rental car in San Juan, Omega Travel may be able to get a discount rate for you.

Climate: The weather in Puerto Rico is tropical. Daytime temperatures in October should be in the 70's or 80's, with slightly cooler evenings. Bring your swimwear and a sweater.

Things To Do: The hotel is located within a 5-minute taxi ride of Old San Juan and the Candado district. Old San Juan features numerous historic sites, good restaurants, and shopping. The Candado features more restaurants, casinos, and more shopping. The hotel has several excellent (but expensive) restaurants, bars, pools, a large private beach, a casino, tennis courts, squash courts, a gym, and lots of other extras.

San Juan is within a couple hours drive of many other sites on the island, including a tropical rainforest, and some very beautiful beaches. Puerto Rico is also a short plane ride away from several exotic Carribean islands.

Detailed information concerning hotel and island activities will be included in the conference registration packets. You can also contact the Caribé Hilton for more information and for help in planning your visit.

Conference Events: A reception will be held in the Hilton Gardens from 7pm until 11pm on Tuesday, October 1. Drinks and a wide selection of hor d'oeuvres will be served at the reception until 10pm. There will be a business meeting on Wednesday, October 2 at 9pm in Ballroom B. Beer, soda and fruit will be served. The banquet will be held in the Hilton Gardens on Thursday at 8:00pm. Lunches will be served in the Hilton Gardens on Wednesday and Friday. Lunch will not be served on Thursday since the afternoon is being left open for attendees to do as they please. In case of rain, all outdoor events will be held in Ballroom B. All regular sessions will be held in Ballrooms A and C.

Proceedings: Additional copies of the proceedings will be sold on Wednesday – Friday at the registration desk.

Machtey Award: The Machtey Award is presented for the most outstanding paper (or papers) written by a student or collaboration of students, as judged by the Program Committee. The award includes a grant to help defray expenses incurred in attending the FOCS Symposium. Please consider making a donation to the Machtey Award Fund so that this award tradition can be sustained. All donations should be made payable to the Machtey Award Fund on a separate check and sent with the Advance Registration Form.

Acknowledgements: Students' meals were made possible by a grant ¿from the industrial affiliates of SIGACT.

Local Arrangements Chairs: Alok Aggarwal, Room 36-245, P.O. Box 218, IBM T.J. Watson Research Center, Yorktown Heights, NY 10598, (914) 945-2027, and Tom Leighton, MIT, 545 Technology Square, Cambridge, MA 02139, (617) 253-5876.

Technical Committee Chair: Manuel Blum, Department of Electrical Engineering and Computer Sciences, Computer Science Division, University of California, Berkeley, CA 94720

Symposium Coordinator: Alok Aggarwal, Room 36-245, P.O. Box 218, IBM T.J. Watson Research Center, Yorktown Heights, NY 10598

Program Committee Chair: Michael Sipser, MIT, 545 Technology Square, Cambridge, MA 02139

Program Committee: Ravi Boppana, Michael Fredman, Andrew Goldberg, Richard Karp, Michael Kearns, Maria Klawe, Jeffrey Lagarias, John Mitchell, Noam Nisan, David Peleg, Charles Rackoff, Prabhakar Raghavan, John Reif, Raimund Seidel