

FOCS '92

**33rd Annual IEEE Conference
on Foundations of
Computer Science
October 25–27, 1992
Pittsburgh, Pennsylvania**

Sponsored by
IEEE Computer Society
In Cooperation with
ACM SIGACT

Registration for FOCS '92

The registration fees for FOCS '92 are listed below. To qualify for the early registration fee, your registration application must be postmarked by **Friday, October 2**. Refund requests will be honored until October 16. The non-student registration fee includes the Saturday night reception, the Sunday night business meeting, the Monday 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 "Carnegie Mellon University – FOCS '92," to:

Gary L. Miller
ATTN: FOCS registration
School of Computer Science
Carnegie Mellon University
Pittsburgh, Pennsylvania 15213-3890

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 10/2
ACM or SIGACT member	265	320
IEEE or EATCS member	265	320
Author or Program Committee member	265	320
Student	90	120
Other	330	400

Check your dietary preference.

Kosher _____ Vegetarian _____ No Restriction _____

Machtley Fund Contributions \$ _____

Extra Banquet Tickets (\$45 each): _____

Hotel Reservations

The conference will be held at the Westin William Penn Hotel. The rates for FOCS '92 are posted below and apply from Wednesday, October 21 through Friday, October 30. Check-in time is 3pm and check-out is 1 pm. Please advise the hotel of late arrival.

Reservations should be made by **Sunday, October 4**. Reservations made after that will be accepted on a rate and space availability basis. Refer to FOCS '92 when making your reservations to obtain the rates listed.

To make your reservations by phone, call (412) 553-5100 or 1-800-228-3000. 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, Discover, and Carte Blanche. Deposits will be refunded if the hotel is notified prior to 6:00 p.m. on the day of your specified arrival.

The Westin William Penn
ATTN: FOCS '92 Reservations
530 William Penn Place
Pittsburgh, Pennsylvania 15219

Please check one:

Single \$85 _____ Double \$95 _____

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 The Westin William Penn to charge the above account for the amount equal to one night's stay as deposit.

Signature _____

SUNDAY, OCTOBER 25, 1992

Session 1A

- 9:00** *Probabilistic Checking of Proofs*
Sanjeev Arora, *UC Berkeley*; Shmuel Safra, *Stanford and IBM Almaden*
- 9:25** *Proof Verification and Hardness of Approximation Problems*
Sanjeev Arora, *UC Berkeley*; Carsten Lund, *AT&T Bell Labs*; Rajeev Motwani, *Stanford*; Madhu Sudan, *UC Berkeley*; Mario Szegedy, *AT&T Bell Labs*
- 9:50** *Undirected Connectivity in $O(\log^{1.5} n)$*
Noam Nisan, *Hebrew Institute*; Endre Szemerédi, *Rutgers and Hungarian Academy of Sciences*; Avi Wigderson, *Princeton*
- 10:15** *An Oracle Relative to which the Isomorphism Conjecture Holds*
Stephen Fenner, *U. Southern Maine*; Lance Fortnow, *U. Chicago*; Stuart Kurtz, *U. Chicago*

Session IB

- 9:00** *Data Structural Bootstrapping, Linear Path Compression, and Catenable Heap Ordered Double Ended Queues*
Adam Buchsbaum, *Princeton*; Rajamani Sundar, *Princeton and DIMACS, Rutgers*; Robert Tarjan, *Princeton and NEC*
- 9:25** *Fully Dynamic Biconnectivity in Graphs*
Monika Rauch, *Princeton*
- 9:50** *Sparsification—A technique for speeding up dynamic graph algorithms*
David Eppstein, *UC Irvine*; Zvi Galil, *IBM T.J. Watson*; Giuseppe F. Italiano, *Columbia*; Amnon Nissenzweig, *Tel-Aviv*
- 10:15** *On Four-Connecting A Triconnected Graph*
Tsan-sheng Hsu, *U. Texas, Austin*

10:35 Break

Session IIA

- 10:55** *Dynamic Half-space reporting and minimum spanning trees*
Pankaj Agarwal, *Duke*; David Eppstein, *UC Irvine*; Jiri Matousek, *Charles U. and Freie U.*

11:20 *Randomized geometric algorithms and pseudo-random generators*
Ketan Mulmuley, *U. Chicago*

11:45 *A New Method for Planar Graph Drawings on a Grid*
Goos Kant, *Utrecht U.*

Session IIB

10:55 *Computing in solvable matrix groups*
Eugene M. Luks, *U. Oregon*

11:20 *Fast Algorithms for Matrix Normal Forms*
Mark Giesbrecht, *U. Toronto*

11:45 *Improved parallel polynomial division*
Dario Bini, *U. Pisa*; Victor Pan, *Columbia and Lehman College, CUNY*

12:30 Lunch

Session IIIA

2:15 *Randomized Consensus in Expected $O(n \log^2 n)$ Operations Per Processor*
James Aspnes, *Carnegie Mellon*; Orli Waarts, *Stanford*

2:40 *Fast PRAM Simulation on Fully Asynchronous Parallel System*
Yonatan Aumann, *Hebrew U.*; Michael Rabin, *Harvard*

3:05 *Fault-tolerant Wait-free Shared Objects*
Prasad Jayanti, *Cornell*; Tushar D. Chandra, *Cornell*; Sam Toueg, *Cornell*

Session IIIB

2:15 *Hierarchies in Transitive Closure Logic, Stratified Datalog, and Infinitary Logic*
Erich Grädel, *Universität Basel*; Gregory McColm, *U. Southern Florida*

2:40 *Back to the future: Towards a theory of timed regular languages*
Rajeev Alur, *AT&T Bell Labs*; Thomas Henzinger, *Cornell*

3:05 *The Complexity of the Hajos Construction*
Toniann Pitassi, *U. Toronto*; Alasdair Urquhart, *U. Toronto*

3:35 Break

Session IVA

4:00 *A Decomposition Theorem and Bounds for Randomized Server Problems*
Avrim Blum, *Carnegie Mellon*; Howard Karloff, *U. Chicago*; Yuval Rabani, *Tel-Aviv*; Michael Saks, *Rutgers and UC San Diego*

4:25 *Markov Paging*
A. Karlin, *DEC*; S. Phillips, *Stanford*; P. Raghavan, *IBM T.J. Watson*

4:50 *On-line Load Balancing*
Yossi Azar, *DEC*; Andrei Z. Broder, *DEC*; Anna R. Karlin, *DEC*

Session IVB

4:00 *Improved Lower Bounds for Shellsort*
C. Greg Plaxton, *U. Texas, Austin*; Torsten Suel, *U. Texas, Austin*; Bjorn Poonen, *UC Berkeley*

4:25 *The Asymptotic Complexity of Merging Networks*
Peter Bro Miltersen, *Aarhus U.*; Mike Paterson, *U. Warwick*; Jun Tarui, *U. Warwick*

4:50 *Truly Alphabet-Independent Two-Dimensional Pattern Matching*
Kunsoo Park, *U. London*; Zvi Galil, *Columbia and Tel-Aviv*

5:10 Break

9:00 Business Meeting

MONDAY, OCTOBER 26, 1992

Session IA

9:00 *Amplification and Percolation*
Moshe Dubiner, *Tel-Aviv*; Uri Zwick, *Tel-Aviv*

9:25 *Algebraic decision trees and Euler characteristics*
Andrew C. Yao, *Princeton*

9:50 *Separating the Communication Complexities of MOD m and MOD p Circuits*
Vince Grolmusz, *Max-Planck-Institut and Eötvös*

10:15 *Lower bounds on the depth of monotone arithmetic computations*
Don Coppersmith, *IBM T.J. Watson*; Baruch Schieber, *IBM T.J. Watson*

Session IB

- 9:00** *On the Second Eigenvalue and Linear Expansion of Regular Graphs*
Nabil Kahale, *MIT*
- 9:25** *Quadratic Dynamical Systems*
Yuri Rabinovich, *Hebrew U.*; Alistair Sinclair, *U. Edinburgh and DIMACS*; Avi Wigderson, *Hebrew U. and Princeton*
- 9:50** *On the Bit Extraction Problem*
Joel Friedman, *Princeton*
- 10:15** *A mildly exponential approximation algorithm for the permanent*
Mark Jerrum, *U. Edinburgh*; Umesh Vazirani, *UC Berkeley*
- 10:35** **Break**

Session IIA

- 10:55** *Competitive Analysis of Financial Games*
R. El-Yaniv, *U. Toronto*; A. Fiat, *Tel-Aviv*; R. Karp, *UC Berkeley*; G. Turpin, *U. Toronto*
- 11:20** *Lower Bounds on the Competitive Ratio for Mobile User Tracking and Distributed Job Scheduling*
Noga Alon, *Tel-Aviv*; Gil Kalai, *Hebrew U.*; Moty Ricklin, *Tel-Aviv*; Larry Stockmeyer, *IBM Almaden*
- 11:45** *The distributed k-Server problem—A Competitive Distributed Translator for k-Server Algorithms*
Adi Rosén, *Tele-Aviv*; Yair Bartal, *Tele-Aviv*

Session IIB

- 10:55** *Undecidability of the Horn-Clause Implication Problem*
Jerzy Marcinkowski, *U. Wroclaw*; Leszek Pacholski, *Polish Academy of Science*
- 11:20** *Efficient Inference of Partial Types*
Dexter Kozen, *Cornell*; Jens Palsberg, *Aarhus U.*; Michael I. Schwartzbach, *Aarhus U.*
- 11:45** *On the Completeness of Object-Creating Query Languages*
Dirk Van Gucht, *Indiana*; Jan Van den Bussche, *U. Antwerp*; Marc Andries, *Leiden U.*; Marc Gyssens, *U. Limburg*

12:30 **Lunch**

Session IIIA

- 2:15** *Enumerating the k closest pairs optimally*
Hans-Peter Lenhof, *Max-Planck-Institut für Informatik*; Michiel Smid, *Max-Planck-Institut für Informatik*
- 2:40** *Safe and Effective Determinant Evaluation*
Kenneth L. Clarkson, *AT&T Bell Labs*
- 3:05** *On Minimum and Maximum Spanning Trees of Linearly Moving Points*
Naoki Katoh, *Kobe U.*; Takeshi Tokuyama, *IBM Tokyo*; Kazuo Iwano, *IBM Tokyo*

Session IIIB

- 2:15** *Towards a Computational Theory of Statistical Tests*
Manuel Blum, *UC Berkeley*; Oded Goldreich, *Technion*
- 2:40** *On Witnesses for Boolean Matrix Multiplications and for Shortest Paths*
Noga Alon, *Tel-Aviv*; Zvi Galil, *Tel-Aviv*; Oded Margalit, *Tel-Aviv*; Moni Naor, *IBM Almaden*
- 3:05** *Non-Interactive Zero-Knowledge Proofs of Knowledge*
Giuseppe Persiano, *Harvard*; Alfredo De Santis, *Università di Salerno*
- 3:35** **Break**

Session IVA

- 4:00** *Fast Unimodular Reductions: Planar Integer Lattices*
Chee Yap, *Courant Inst.*
- 4:25** *How to denest Ramanujan's nested radicals*
Johannes Blömer, *Freie U.*
- 4:50** *On Efficient Band Matrix Arithmetic*
Wayne Eberly, *U. Calgary*

Session IVB

- 4:00** *A Subexponential Algorithm for Abstract Optimization Problems*
Bernd Gärtner, *Freie U.*
- 4:25** *The Algorithmic Aspects of the Regularity Lemma*
N. Alon, *Tel-Aviv*; R.A. Duke, *Georgia Inst. of Tech.*; H. Lefmann, *Universität Bielefeld*; V. Rödl, *Emory*; R. Yuster, *Tel-Aviv*

4:50 *On the Randomized Complexity of Volume and Diameter*
László Lovász, *Eötvös Loránd U. and Princeton*;
Miklós Simonovits, *Hungarian Academy of Science*

5:10 **Break**

8:00 **Banquet**

TUESDAY, OCTOBER 27, 1992

Session IA

9:00 *Apple Tasting and Nearly One-Sided Learning*
Philip Long, *UC Santa Cruz*; David Helmbold,
UC Santa Cruz; Nicholas Littlestone, *NEC*

9:25 *Reconstructing Algebraic Functions from Mixed Data*
Sigal Ar, *Princeton*; Richard J. Lipton, *Mathushita Info. Tech.Labs*; Ronitt Rubinfeld, *Hebrew U.*; Madhu Sudan, *UC Berkeley*

9:50 *On the Exact Learning of Formulas in Parallel*
Nader Bshouty, *U. Calgary*; Richard Cleve, *U. Calgary*

10:15 *Read-Thrice DNF is Hard to Learn With Membership and Equivalence Queries*
Howard Aizenstein, *U. Illinois*; Lisa Hellerstein,
Northwestern; Leonard Pitt, *U. Illinois*

Session IB

9:00 *Efficient self-embedding of butterfly networks with random faults*
Hisao Tamaki, *U. Toronto*

9:25 *On the Unexpected Fault-Tolerance of Some Popular Bounded-Degree Network*
Tom Leighton, *MIT*; Bruce Maggs, *NEC*; Ramesh Sitaraman, *Princeton*

9:50 *Exact Analysis of Hot-Potato Routing*
Uri Feige, *IBM T.J. Watson*; Prabhakar Raghavan, *IBM T. J. Watson*

10:15 *A theory of wormhole routing in parallel computers*
Eli Upfal, *IBM Almaden*; Sergio Felperin, *IBM Almaden*; Prabhakar Raghavan, *IBM T.J. Watson*

10:35 **Break**

Session IIA

10:55 *Computing a Shortest k -Link Path in a Polygon*
Joseph Mitchell, *Applied Mathematics, SUNY*;
Christine Piatko, *Cornell*; Esther Arkin, *Applied Mathematics, SUNY*

11:20 *Efficient Minimum Cost Matching Using Quadrangle Inequality*
A. Aggarwal, *IBM T.J. Watson*; A. Bar-Noy, *IBM T.J. Watson*; S. Khuller, *U. Maryland*; D. Kravets, *MIT*; B. Schieber, *IBM T.J. Watson*

11:45 *Optimal Parallel Hull Construction for Simple Polygons in $O(\log \log n)$ Time*
Hubert Wagener, *Technische Universität Berlin*

Session IIB

10:55 *Tighter Bounds on the Exact Complexity of String Matching*
Richard Cole, *Courant Inst.*; Ramesh Hariharan, *Courant Inst.*

11:20 *Tiling a polygon with rectangles*
Claire Kenyon, *LIP*; Richard Kenyon, *UFR de Mathématiques, Institute Fourier*

11:45 *Mick Gets His (The Odds Are On His Side)*
V. Chvátal, *Rutgers*; B. Reed, *Institut für Diskrete Math., Universität Bonn*

12:30 **Lunch**

Session IIIA

2:15 *Waste makes Haste: Tight Bounds for Loose Parallel Sorting*
Torben Hagerup, *Max-Planck-Institut für Informatik*; Rajeev Raman, *Max-Planck-Institut für Informatik*

2:40 *The Complexity of Parallel Prefix Problems on Small Size Domains*

Shiva Chaudhuri, *U. Waterloo*; Jaikumar Radhakrishnan, *Tata Institute*

3:05 *Approximate max flow on small depth acyclic networks*

Edith Cohen, *AT&T Bell Labs*

Session IIIB

2:15 *Newton's method for fractional combinatorial optimization*

Tomasz Radzik, *Stanford*

2:40 *A Class of Logical Inference Problems Solvable by Linear Programming*

Michele Conforti, *Università di Padova*; Gérard Cornuéjols, *Carnegie Mellon*

3:05 *Maximizing non linear concave functions in fixed dimension*

Sivan Toledo, *MIT*

3:35 **Break**

Session IVA

4:00 *Halvers and Expanders*

Miklós Ajtai, *IBM Almaden*; János Komlós, *Rutgers*; Endre Szemerédi, *Rutgers and Hungarian Academy of Sciences*

4:25 *Fault tolerant graphs, perfect hash functions and disjoint paths*

M. Ajtai, *IBM Almaden*; N. Alon, *Tel-Aviv*; J. Bruck, *Tel-Aviv*; R. Cypher, *Tel-Aviv*; C.T. Ho, *Tel-Aviv*; M. Naor, *Tel-Aviv*; E. Szemerédi, *Rutgers and Hungarian Academy of Science*

Session IVB

4:00 *Linear Time Approximate Evaluation of a Polynomial at Real Points*

Victor Pan, *Columbia and Lehman College, CUNY*; John Reif, *Duke*

4:25 *Processor-Efficient Parallel Solution of Linear Systems II*

The Positive Characteristic and Singular Cases
Erich Kaltofen, *Rensselaer Polytechnic Institute*; Victor Pan, *Columbia and Lehman College, CUNY*

4:50 *Communication on Noisy Channels: A Coding Theorem for Computation*

Leonard J. Schulman, *MIT*

5:10 **END**

General Information

Location: All conference events will take place at the Westin William Penn, Pittsburgh, Pennsylvania.

Registration: The registration desk will be open from 7:00pm until 10:00pm on Saturday, October 24, and during the day on Sunday through Tuesday.

Accommodations: A block of 600 rooms has been reserved at the Westin William Penn, but reservations must be received by the hotel at least 35 days prior to arrival.

Transportation: Airlines Transportation shuttles leave from the Greater Pittsburgh International Airport every half-hour, Monday - Friday and every hour, Saturday and Sunday. The trip from the Airport takes about one-half hour. The shuttle stops at all major hotel in the downtown area. The cost is \$10.00 per person one way. Taxi's are also available at the airport. The cost is about \$25.00 not including tip.

Pittsburgh can be reached by air from most major cities. For domestic flights, USAir is offering a 35% discount off full coach fare, and a 5% discount off any other fare. For travel from Canada, the discounts are 35% off full coach with a minimum of two nights stay or 30% off with no minimum. When ordering tickets with USAir (800-334-8644), refer to GOLD file # 95550027. For best possible fares, we suggest you contact Forum Travel at 1-800-888-4099 or FAX (412) 687-6766. If you need a rental car Forum Travel may be able to get you a discount rate.

Climate: The weather in Pittsburgh in October is unpredictable. Daytime temperatures average 52 degrees. It could be sunny and warm or cold and rainy. Bring an umbrella and jacket just in case.

Things To Do: The Westin William Penn in Pittsburgh is a Grand Hotel it is situated in the heart of Pittsburgh's Golden Triangle. Just steps from the city's corporate and convention centers, theaters, restaurants, sports arenas and shops. Point State Park, Mount Washington, the Civic Arena, Three Rivers Stadium, Station Square and the new Carnegie Science Center are just a few sites available within the city. More information will be available when you check in at the conference.

Conference Events: A reception will be held in the Westin William Penn Grand Ballroom from 8pm until 11pm on, October 24. Drinks and hors d'oeuvres will be served at the reception until 11pm. There will be a business meeting on Sunday, October 25, at the William Westin Penn, refreshments will be served. The banquet will be held in the hotel Grand Ball Room on Monday at

8:00pm. Lunches will be served in the hotel on Sunday, Monday, and Tuesday.

Proceedings: Additional copies of the proceedings will be sold on Monday – Tuesday 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: Gary L. Miller, School of Computer Science, Carnegie Mellon University, Pittsburgh, PA 15213-3890, (412) 268-2631, FAX (412) 681-5739.

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

Program Committee Chair: Michael Luby, International Computer Science Institute, 1947 Center Street, Berkeley, CA 94704-1105 USA.

Program Committee: Paul Beame, Allan Borodin, Anne Condon, Cynthia Dwork, Harold Gabow, Russell Impagliazzo, Ravi Kannan, Nati Linial, Michael Luby, Milena Mihail, Gary Miller, David Peleg, Ron Rivest, Micha Sharir, Moshe Vardi.