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FINAL REPORT

American Mathematical Society
Institute of Mathematical Statistics
Society for Industrial and Applied Mathematics

1991 Joint Summer Research Conferences in the Mathematical Sciences

University of Washington, Seattle
June 22 to August 2, 1991

Saturday, June 22 to Friday, July 5

* Graph minors

Neil Robertson (Ohio State University), Co-Chair
P.D. Seymour (Bell Communications Research), Co-Chair

Report prepared by the American Mathematical Society

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JOINT SUMMER RESEARCH CONFERENCES IN THE MATHEMATICAL SCIENCES

Saturday, June 22 to Friday, June 28
Stochastic modeling and statistical inference for selected problems in
biology

Charles Smith (North Carolina State University), Co-Chair
Grace L. Yang (University of Maryland, College Park), Co-Chair

Saturday, June 22 to Friday, July 5

* Graph minors

Neil Robertson (Ohio State University), Co-Chair
P.D. Seymour (Bell Communications Research), Co-Chair

Saturday, June 29 to Friday, July 5

**Theory and applications of multivariate time series analysis

Robert H. Shumway (University of California, Davis), Co-Chair
Ruey S. Tsay (University of Chicago), Co-Chair

Saturday, July 6 to Friday, July 12

Stochastic inequalities

Moshe Shaked (University of Arizona), Co-Chair
Y.L. Tong (Georgia Institute of Technology), Co-Chair

Saturday, July 6 to Friday, July 12

Biofluidynamics

A.Y. Cheer (University of California, Davis), Chair
C.P. van Dam (University of California, Davis), Co-Chair

Saturday, July 13 to Friday, July 19

No conference scheduled

Saturday, July 20 to Friday, August 2

Motives

Steven Kleiman (Massachusetts Institute of Technology), Co-Chair
Kari Vilonen (Brandeis University), Co-Chair

Saturday, July 20 to Friday, July 26

Mathematical aspects of classical field theory

Mark J. Gotay (United States Naval Academy), Co-Chair
Jerrold E. Marsden (University of California, Berkeley), Co-Chair
Vincent E. Moncrief (Yale University), Co-Chair

Saturday, July 27 to Friday, August 2

Systems of coupled oscillators

D.G. Aronson (University of Minnesota, Minneapolis), Chair

All Conferences are supported by a grant from the National Science Foundation. Conference marked with * is also supported by funding from the Office of Naval Research. The conference marked with ** is also supported by funding from the National Security Agency.



Final Report

1991 Joint Summer Research Conferences in the Mathematical Sciences

The Joint Summer Research Conferences were held at the University of Washington, Seattle, from June 22 to August 2. This marks the ninth installment in the conference series begun in 1982.

The topics and organizers for the series of conferences were selected by the AMS-IMS-SIAM Committee on Joint Summer Research Conferences in the Mathematical Sciences. The following committee members chose the topics for the 1991 conferences: John A. Burns, Fan R.K. Chung, Leonard Evens, Martin Golubitsky, Anthony W. Knap, Ingram Olkin, Emanuel Parzen, Stewart Priddy, Stephen Simpson and Gregg J. Zuckerman.

ORGANIZATION: A list of participants, program, and report on the distribution of travel and subsistence offered to participants is attached.

ABSTRACTS: Abstracts of lectures given at the conference were submitted and will appear in the November 1991 issue of the journal ABSTRACTS OF PAPERS PRESENTED TO THE AMERICAN MATHEMATICAL SOCIETY. Abstracts submitted after the deadline for the November issue will be published in the January 1992 issue.

PROCEEDINGS: Proceedings from the conference is scheduled to be published in the AMS series CONTEMPORARY MATHEMATICS.

SCIENTIFIC REPORTS: Attached is a copy of the Scientific Report received. This report is written by the chairman of the organizing committee on the scientific aspects of their conference.

CONFERENCE SITE: University of Washington, Seattle, Washington

The major lectures took place in Room 101, in Johnson Hall. The lecture room was equipped with two overhead projectors, and electronically controlled projection screens. Additional classrooms and audio visual equipment were available upon requests.

Attendance. There were 99 participants who registered for the conference. Some participants were accompanied by their spouse and children.

CONCLUSION: Carole Kohanski, with assistance from the AMS Meetings Department staff, made all the preliminary arrangements for the conferences at the University of Washington, Seattle. Carole served as Conference Coordinator during the conferences there.

Members of the Mathematics Department were very helpful and expressed interest in having the Joint Summer Research Conferences held there again.

List of Attachments

Distribution of funds
List of Registered Participants
Program
Scientific Report

Graph Miners
1991 Joint Summer Research Conference
Supported by the National Science Foundation
Office of Naval Research
June 22 to July 5
Neil Robertson, Co-Chair
October 1, 1991

Budget total \$38,000.00
Committed funds 38,688.20
 (688.20)

Participant	Attend	Subsistence	Travel	Total	Check
Abello, James	yes			0	
Aleksandrov, Ludmil G.	yes			0	
Alspach, Brian	yes			0	
Andreae, Thomas	no			0	
Armon, Degani	yes	451.20		451.20	
Bell, Allen D.	no			0	
Bienstock, Daniel	no			0	
Bixby, Robert	no			0	
Bodendiek, Rainer	no			0	
Bohme, Thomas	yes	2005.20		2,005.20	
Bondy, John Adrian	no			0	
Borodin, O. V.	yes	1051.20		1,051.20	\$980
Bouchet, Andre	yes	729.20		729.20	
Brown, Donna	no			0	
Burton, Grant	no			0	
Cameron, Kathie	yes			0	
Chandrasekharen, N.	no			0	
Chen, Jianer	yes	451.20		451.20	
Chilakamarri, Kiran B.	no			0	

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Participant	Attend	Subsistence	Travel	Total	Check
Conway, John	yes	697.97		697.97	
Cornell, Gary	no			0	
Coullard, Collette	yes			0	
Courcelle, Bruno	yes	550.00		550.00	\$530
de Verdiere, Yves Colin	no			0	
Dean, Nathaniel	yes			0	
Dejter, Italo J.	yes			0	
Dershowitz, Nachum	no			0	
Dharmatilake, Jack	yes	451.20		451.20	
Diestel, Reinhard	yes	950.00		950.00	\$830
Ding, Guoli	yes			0	
Djidjev, Hristo	no			0	
Duchet, Pierre	yes	879.20		879.20	
Edmonds, Jack	yes			0	
Fellows, Mike	yes			0	
Fiedler, Joseph R.	yes			0	
Fraisse, Roland	no			0	
Frank, Andras	yes	721.08		721.08	\$625
Friedman, Harvey M.	yes			0	
Gallier, Jean H.	yes			0	

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Participant	Attend	Subsistence	Travel	Total	Check
Gerards, Bert	yes			0	
Glover, Henry	no			0	
Goddard, Wayne	yes	460		460	
Goddyn, Luis A.	yes			0	
Gordeev, L.	yes	529.20		529.20	
Gross, Jonathan	no			0	
Grunbaum, Branko	yes			0	
Gupta, Arvind	yes			0	
Gustedt, Jens	yes	529.20		529.20	\$530
Haken, Wolfgang	no			0	
Hartsfield, Nora A.	yes			0	
Hedetniemi, Stephen	no			0	
Heinrich, Katherine	yes			0	
Huck, Andreas	yes	529.20		529.20	
Huneke, Philip	yes	290.00		290.00	
Hutchinson, Joan P.	yes	400.50		400.50	
Ille, Pierre	yes	451.20		451.20	
Impagliazzo, Russell	yes			0	
Jaeger, Francois	yes	644.47		644.47	
Johnson, Ellis	no			0	

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Participant	Attend	Subsistence	Travel	Total	Check
Jorgensen, Leif K.	yes			0	
Jung, Heinz A.	yes	529.20		529.20	
Kada, Khalid	yes	532.70		532.70	
Kalai, Gil	no			0	
Karzanov, A. V.	no			0	
Kauffman, Louis H.	no			0	
Kelmans, Alexander K.	yes	968.70		968.70	
Kezdy, Andre	yes	451.20		451.20	
Kinnersley, Nancy	yes			0	
Kirousis, L. M.	no			0	
Kitakubo, Shigeru	yes	451.20		451.20	
Klawe, Maria	no			0	
Klee, Victor	yes			0	
Korach, Ephraim	yes	529.20		529.20	
Kratochvil, Jan	yes	550.00		550.00	\$530
Kung, Joseph P.	yes			0	
Kuo, Yueh-er	no			0	
Lagergren, Jens	yes			0	
Lai, Hong-Jian	no			0	
Langston, Mike	yes			0	

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Participant	Attend	Subsistence	Travel	Total	Check
Las Vergnas, Michel	no			0	
Lautemann, Clemens	no			0	
Laver, Richard	no			0	
Lawler, Eugene	no			0	
Li, Boyu	yes	451.20		451.20	
Lins, Sostenes	no			0	
Lipman, Marc	no			0	
Lipton, James B.	no			0	
Lovasz, Laszlo	yes	734.22		734.22	
Mader, Wolfgang	yes	529.20		529.20	
Marcotte, Odile	no			0	
Mathias, John	no			0	
Matousek, Jiri	no			0	
McCuaig, William	yes			0	
McGuinness, Patrick	yes	451.20		451.20	
Melter, Robert A.	no			0	
Menasco, William	no			0	
Milner, Eric	no			0	
Motwani, Rajeev	no			0	
Mull, Bruce	yes			0	

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Participant	Attend	Subsistence	Travel	Total	Check
Murthy, Chet	no			0	
Murty, U. S. R.	yes			0	
Nash-Williams, C. St. J. A.	yes	108.07		108.07	
Negami, Seiya	yes	880.00		880.00	
Nesetril, Jaroslav	no			0	
Nishizeki, Takao	no			0	
Okada, Mitsuhiro	yes	600.00		600.00	
Okamura, Haruko	yes	1200.00		1,200.00	
Oporowski, Bogdan	yes			0	
Oxley, James	yes			0	
Parker, Robert G.	no			0	
Pfeiffer, H.	yes	529.20		529.20	
Pippenger, Nicolas	no			0	
Poljak, Svatopluk	yes	1129.20		1,129.20	
Proskurowski, Andrzej	yes	500.00		500.00	\$250
Pruesse, Gara	yes			0	
Przytcki, Jozef	yes	510.00		510.00	
Przytycka, Teresa	yes	750.00		750.00	
Randby, Scott	yes	451.20		451.20	
Reed, Bruce	yes	247.58		247.58	

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Participant	Attend	Subsistence	Travel	Total	Check
Reid, Talmage J.	yes			0	
Reif, John	no			0	
Richter, Bruce	no			0	
Robertson, Neil	yes			0	
Russo, Larry	no			0	
Sanders, Daniel	yes			0	
Saran, Huzur	no			0	
Scharlemann, Martin G.	no			0	
Schmitt, William	no			0	
Schrijver, Alexander	yes	239.24		239.24	
Sebo, Andras	yes	850.00		850.00	\$830
Seese, Detlef	no			0	
Seress, Akos	yes	529.20		529.20	
Seymour, Paul	yes			0	
Wang, Shang-Zhi	yes	451.20		451.20	
Shih, Ching-Hsien	no			0	
Simpson, Stephen	yes			0	
Siran, Josef	yes	640.00		640.00	\$640
Soares, Jose	yes	451.20		451.20	
Steger, Angelika	yes	600.00		600.00	

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Participant	Attend	Subsistence	Travel	Total	Check
Sweedyk, Elizabeth	yes			0	
Tahhan, Elias	no			0	
Tarjan, Robert	no			0	
Telle, Jan-Arne	yes			0	
Thistlethwaite, Morwen	no			0	
Thomas, Robin	yes	800.00		800.00	
Thomason, Andrew	yes	1000		1,000	
Thompson, Abigail	no			0	
Tompa, Martin	no			0	
Tutte, W. T.	yes	870.47		870.47	
Vanderhoeven, Joris	yes	451.20		451.20	
Vertigan, Dirk	yes	529.20		529.20	
Vince, Andrew	no			0	
Vitray, Richard P.	yes	470.00		470.00	
Wachter, Ralph	no			0	
Wagner, Don	yes			0	
Wagner, Klaus	yes	880.00		880.00	\$880
Warnow, Tandy	yes	460.00		460.00	\$460
Welsh, Dominic	yes	1200.00		1,200.00	
West, Doug	yes			0	

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Participant	Attend	Subsistence	Travel	Total	Check
Yamashita, Satoshi	yes	451.20		451.20	
Yu, Xingxing	yes	529.20		529.20	
Zaslavsky, Thomas	no			0	
Zha, Xiaoya	yes	451.20		451.20	
Zhang, Cun-Quan	yes	529.20		529.20	
Zhao, Yue	yes	451.20		451.20	\$460
Total		38,688.20		38,688.20	

Registered List of Participants
as of
October 1, 1991

Graph Minors

June 22 to July 5, 1991

Neil Robertson (Ohio State University). Co-Chair
P. D. Seymour (Bell Communications Research). Co-Chair

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Haruko Okamura
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Angelika Steger
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Dirk Vertigan
Mathematical Institute
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email: rvitray@rollins
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Don Wagner
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Arrival: 6-21-91
Departure: 7-4-91

Cun-Quan Zhang
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West Virginia University
Morgantown, WV 26505
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Arrival: 6-22-91
Departure: 7-5-91

Yue Zhao
Department of Mathematics
Ohio State University
Columbus, OH 43210
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Arrival: 6-22-91
Departure: 7-5-91

Graph Minors
Neil Robertson (Ohio State University), Co-Chair
S. E. Seymour (Bell Communications Research), Co-Chair
Joint Summer Research Conference
Supported by a grant from the National Science Foundation
and
The Office of Naval Research

Schedule of Speakers
Room 101, Johnson Hall

Sunday, June 23

Surface separators

9:00 - 10:00 a.m.	Paul Seymour, Bellcore "Computing the branch-width of a planar graph"
10:00 - 10:15	Break
10:15 - 11:00	Mike Langston, University of Tennessee "Practical algorithms for VLSI"
11:00 - 12:00 p.m.	Brunch
1:00 - 2:00	Alexander Schrijver, Math. Centrum, C.W.I., The Netherlands "Graphs on the torus and the geometry of numbers"
2:00 - 2:30	Lyudmil Aleksandrov, Bulgarian Academy of Sciences, Bulgaria. "A separator theorem for graphs of bounded genus"
2:30 - 3:00	Coffee Break
3:00 - 4:00	Bruce Reed, University of Waterloo "Linear time algorithm for disjoint paths on a surface"
4:30 - 6:00	<u>Dinner</u>

8:00 - 10:00

Wine & Cheese Party
Patio, McMahon Hall

Monday, June 24

Tree-width

9:00 - 10:00 a.m.

Mike Fellows, University of Victoria
"Constructivising complexity
consequences of the GMT"

10:00 - 10:30

Break

10:30 - 11:00

Bruno Courcelle, Universite Bordeaux
"Context-free graph grammars"

11:00 - 11:30

Andrzej Proskurowski, University of
Oregon
"An algebraic theory of graph
reduction"

11:30 - 1:00 p.m.

Lunch

1:00 - 1:30

Jens Lagergren, The Royal Institute
of Technology, Sweden
"Generating the excluded minors for
graphs of tree-width at most k"

1:30 - 2:00

Bruce Reed
"Estimating tree-width"

2:00 - 2:30

PROBLEMS

4:15 - 5:15

Joseph Kung
"Extremal Matroid Theory"

5:30 - 7:00

Dinner

Tuesday, June 25

Subgraphs

9:00 - 10:00 a.m.

Andras Frank, Universitaet Bonn
"Circuit-independent subgraphs"

10:00 - 10:30	Break
10:30 - 11:00	Nathaniel Dean, Beloit College "f-factors"
11:00 - 11:30	Philip Huneke, Ohio State University "Examples of graphs"
11:30 - 1:00 p.m.	Lunch
1:00 - 1:30	Andre Bouchet, Carleton University "Circle-graph obstructions"
1:30 - 2:00	Jan Kratochvíl, Prague, Czechoslovakia "A survey of complexity induced minors and related problems"
2:00 - 2:30	Angelika Steger, Bonn "Almost all Berge graphs are perfect"
4:15 - 5:15	Andrew Thomason, University of Cambridge "The achromatic number"

Wednesday, June 26

Infinite graphs

9:00 - 10:00 a.m.	Reinhard Diestel, Siegfried University "A proof of the bounded graph conjecture"
10:00 - 10:30	Break
10:30 - 11:30	Robin Thomas, Georgia Institute of Technology "Finite descriptions and infinite minors"
11:30 - 1:00 p.m.	Lunch
1:00 - 1:30	Bohdan Oporowski, Louisiana State University

"Minor equivalence of infinite graphs"

1:30 - 2:00

Heinz Jung, Technische
Universitaet Berlin, Germany
"Fibers in locally finite graphs"

2:00 - 2:30

Josef Siran, Carleton University
"Regular maps from voltage
assignments"

4:15 - 5:15

Crispin Nash-Williams, University
of Reading, United Kingdom
"Detachments of graphs"

7:00 -

Salmon Bake
Patio, McMahon Hall

Thursday, June 27

Logic

9:00 - 10:00 a.m.

Guoli Ding, Rutgers University
"The immersion relation on webs"

10:00 - 10:30

Break

10:30 - 11:00

Jens Gustedt, Technische
Universitaet, Berlin
"Well-quasi-ordering finite posets"

11:00 - 11:30

Khalid Kada, Universite Paris VI and
CNRS, France
"On the injective reducibility of
Borel sets"

11:30 - 1:00 p.m.

Lunch

1:00 - 1:30

L. Gordeev, Universitaet Tuebingen,
Germany
"Quasi-ordinals and proof theory"

1:30 - 2:00

Mitsuhiko Okada, Japan
"Tree embedding, term rewriting, and
proof-theoretic ordinals"

2:00 - 2:30

H. Pfeiffer, Germany

EXTENSION OF KRULL'S THEOREM AND
ORDINAL NOTATION

4:15 - 5:15

HARVEY M. FRIEDMAN, OHIO STATE
UNIVERSITY
"THE LOGIC OF WQO THEORY"

FRIDAY, JUNE 28

EXCURSION TO MOUNT RAINIER

SATURDAY, JUNE 29

PATHS

9:00 - 10:00 A.M.

ANDREAS HUCK, UNIVERSITAET HANNOVER
"EDGE-DISJOINT PATHS"

10:00 - 10:30

BREAK

10:30 - 11:00

PIERRE DUCHET, LSDD-IMAG, FRANCE
"TREE MINORS"

11:00 - 11:30

ARVIND GUPTA, UNIVERSITY OF WATERLOO
"COMPUTING PLANAR INTERTWINES"

11:30 - 1:00 P.M.

LUNCH

1:00 - 1:45

SVATOPLUK POLJAK, UNIVERSITAET BONN
"DIRECTED CIRCUITS THROUGH EDGES
IN ORDER"

1:45 - 2:30

HARUKO OKAMURA, JAPAN
"CYCLES THROUGH TWO SPECIFIED EDGES
IN A $(2K + 1)$ -CONNECTED GRAPH"

4:15 - 5:15

WOLFGANG MADER, UNIVERSITAET
HANNOVER
"ON VERTICES OF DEGREE n IN MINIMALLY
 n -EDGE-CONNECTED GRAPHS"

SUNDAY, JUNE 30

SURFACE EMBEDDINGS

9:00 - 10:00 A.M.	ALEXANDER KELMANS, RUTGERS UNIVERSITY "GRAPH PLANARITY AND RELATED TOPICS"
10:00 - 10:15	BREAK
10:15 - 11:00	OLEG BORODIN, ACADEMY OF SCIENCES OF THE U.S.S.R. "FOUR PROBLEMS ON PLANAR GRAPHS RAISED BY BRANKO GRUNBAUM"
11:00 - 12:00 P.M.	BRUNCH
1:00 - 1:30	XIAOYA ZHA, OHIO STATE UNIVERSITY "ON THE SIMPLE CIRCUIT EMBEDDING CONJECTURE"
1:30 - 2:00	NORA HARTSFIELD, WESTERN WASHINGTON UNIVERSITY "QUADRANGULAR EMBEDDINGS OF COMPLETE K-PARTITE GRAPHS"
2:00 - 2:30	TERESA PRZYTYCKA, UNIVERSITY OF CALIFORNIA, RIVERSIDE "EMBEDDINGS OF GRAPHS WITHOUT SHORT NONCONTRACTIBLE CYCLES"
3:00 - 4:00	NEIL ROBERTSON, OHIO STATE UNIVERSITY "SURFACE EMBEDDING PROBLEMS"

MONDAY, JULY 1

SPATIAL EMBEDDINGS

9:00 - 10:00 A.M.	JOHN CONWAY, PRINCETON UNIVERSITY TBA
10:00 - 10:30	BREAK
10:30 - 11:30	THOMAS BOEHME, INSTITUT FUER MATHEMATIK, ILMENAU, GERMANY "CHARACTERIZING GRAPHS EMBEDDABLE IN

3-space without linked circuits"

11:30 - 1:00 p.m.

Lunch

1:00 - 2:00

Dominic Welsh, Universitaet Bonn,
Germany

"Knots and their complexity"

2:00 - 2:30

PROBLEMS

4:15 - 5:15

Jack Edmonds, University of Waterloo
"Piecewise linear cell complexes"

Tuesday, July 2

Polynomials

9:00 - 10:00 a.m.

Francois Jaeger, IMAG, France

"Strongly regular graphs
& spin models for the Kauffman
polynomial"

10:15 - 10:30

Break

10:30 - 11:00

Brian Alspach, Simon Fraser
University

"Hamilton connected Cayley graphs on
dihedral groups"

11:00 - 11:30

Jozef Przytycki, University of
California, Riverside

"Subexponentially computable
truncations of link invariants"

11:30 - 1:00 p.m.

Lunch

1:00 - 2:00

James Oxley, Louisiana State
University

"Tutte polynomials of polymatroids"

2:00 - 2:30

Dirk Vertigan, Merton College
Oxford, United Kingdom

"Minor classes"

4:15 - 5:15

W. Tutte.
"Survey of chromatic polynomial and
unimodality"

Wednesday, July 3

Circuit packing and covering

9:00 - 10:00 a.m.

Andras Sebo, I.M.A.G. Artemis,
France
"Undirected multiflow problems: cones
and lattices of paths"

10:00 - 10:30

Break

10:30 - 11:30

Luis A. Goddyn, Simon Fraser
University
"Cycle covers and Petersen graph
minors"

11:30 - 1:00 p.m.

Lunch

1:00 - 1:45

Qun-Quan Zhang, West Virginia
University
"The Petersen graphs, K5, cycle covers
and decomposition"

1:45 - 2:30

Bert Gerards, CWI, The Netherlands
"Odd cycles with the weak max-flow
min-cut property"

4:15 - 5:15

William McQuaran, University of
Victoria
"Interocyclic diagraphs"

Thursday, July 4

Decomposition and flexibility

9:00 - 10:00 a.m.

Laszlo Lovasz, Princeton University
"Conductivity"

10:00 - 10:30

Break

10:30 - 11:00

Collette Coulland, Northwestern

	University "Decomposition of k -connected graphs"
11:00 - 11:30	Don Wagner, "Vertex 2-isomorphism"
11:30 - 1:00 p.m.	Lunch
1:00 - 1:30	Shigeru Kitakubo "The number of embeddings of k -connected projective planar graphs"
1:30 - 2:00	Richard Vitray, Rollins College, Florida "Flexibility and representativity of projective plane embeddings"
2:00 - 2:30	Satoshi Yamashita, WASEDA University "Strong embeddings of graphs"
4:15 - 5:15	Sieva Negami, Yokohama National University "Projective planar graphs with even duals"

Friday, July 5

Departure