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

Statement A per telecon Andre Van Tilborg
ONR/Code 1133
Arlington, VA 22217-5000

NWW 12/15/93
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 22 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
Biofluiddynamics
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. Knapp, 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 Minors
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 38,688.2C
(688.20)

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## Graph Minors

**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)

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Budget total $38,000.00
Committed funds 38,688.20
(688.20)
**Graph Minors**

1991 Joint Summer Research Conference

Supported by the National Science Foundation
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June 22 to July 5

Neil Robertson, Co-Chair
October 1, 1991

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Total: 38,688.20

Budget total: $38,000.00
Committed funds: 38,688.20

(688.20)
Registered List of Participants
as of
October 1, 1991

Graph Minors
June 22 to July 5, 1991

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Departure: 7-5-91

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Arrival: 6-22-91
Departure: 7-5-91

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CANADA
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Arrival: 6-21-91
Departure: 7-5-91
Xiaoya Zha  
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Columbus, OH 43210  
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Arrival: 6-21-91  
Departure: 7-4-91  

Cun-Quan Zhang  
Department of Mathematics  
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Arrival: 6-22-91  
Departure: 7-5-91  

Yue Zhao  
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email:  
Arrival: 6-22-91  
Departure: 7-5-91
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 Dinner
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"
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>10:00 - 10:30</td>
<td>Break</td>
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<tr>
<td>10:30 - 11:00</td>
<td>Nathaniel Dean. Bell, e. &quot;f-factors&quot;</td>
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<tr>
<td>11:00 - 11:30</td>
<td>Philip Huneke, Ohio State University. &quot;Examples of graphs&quot;</td>
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<tr>
<td>11:30 - 1:00 p.m.</td>
<td>Lunch</td>
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<tr>
<td>1:00 - 1:30</td>
<td>Andre Bouchet. Carleton University. &quot;Circle-graph obstructions&quot;</td>
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<tr>
<td>1:30 - 2:00</td>
<td>Jan Kratochvil. Prague. Czechoslovakia. &quot;A survey of complexity induced minors and related problems&quot;</td>
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<tr>
<td>2:00 - 2:30</td>
<td>Angelika Steger. Bonn. &quot;Almost all Berge graphs are perfect&quot;</td>
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**Wednesday, June 26**

**Infinite graphs**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>9:00 - 10:00 a.m.</td>
<td>Reinhard Diestel. Bielefeld University. &quot;A proof of the bounded graph conjecture&quot;</td>
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<tr>
<td>10:00 - 10:30</td>
<td>Break</td>
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<tr>
<td>10:30 - 11:30</td>
<td>Robin Thomas. Georgia Institute of Technology. &quot;Finite descriptions and infinite minors&quot;</td>
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<tr>
<td>11:30 - 1:00 p.m.</td>
<td>Lunch</td>
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<tr>
<td>1:00 - 1:30</td>
<td>Bodan Oporowski. Louisiana State University</td>
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<tr>
<td>Time</td>
<td>Speaker</td>
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<tr>
<td>1:30 - 2:00</td>
<td>Heinz Jung, Technische</td>
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<td>Josef Siran, Carleton University</td>
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<td>4:15 - 5:15</td>
<td>Crispin Nash-Williams, University</td>
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<td>7:00 -</td>
<td>Salmon Bake</td>
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**Thursday, June 27**

**Logic**

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<thead>
<tr>
<th>Time</th>
<th>Speaker</th>
<th>Institution</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00 - 10:00 a.m.</td>
<td>Guoli Ding, Rutgers University</td>
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<td>&quot;The immersion relation on webs&quot;</td>
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<tr>
<td>10:00 - 10:30</td>
<td>Break</td>
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<tr>
<td>10:30 - 11:00</td>
<td>Jens Gustedt, Technische</td>
<td>Universitaet Berlin</td>
<td>&quot;Well-quasi-orderings finite posets&quot;</td>
</tr>
<tr>
<td>11:00 - 11:30</td>
<td>Khalid Kada, Universite Paris VI</td>
<td>CNRS, France</td>
<td>&quot;On the injective reducibility of Borel sets&quot;</td>
</tr>
<tr>
<td>11:30 - 1:00 p.m.</td>
<td>Lunch</td>
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<tr>
<td>1:00 - 1:30</td>
<td>L. Gordeev, Universitaet Tuebingen, Germany</td>
<td>&quot;Quasi-ordinals and proof theory&quot;</td>
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<tr>
<td>1:30 - 2:00</td>
<td>Mitsuhito Okada, Japan</td>
<td></td>
<td>&quot;Tree embeddings, term rewriting, and proof-theoretic ordinals&quot;</td>
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<tr>
<td>2:00 - 2:30</td>
<td>H. Pfeiffer, Germany</td>
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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
SPEAK

10:30 - 11:00
PIERRE DUCHET, LSGD-IMAG, FRANCE
"TREE MINORS"

11:00 - 11:30
ARPIND 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 IN MINIMALLY N-EDGE-CONNECTED GRAPHS"

SUNDAY, JUNE 30

SURFACE EMBEDDINGS
9:00 - 11:00 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 SPANKO 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  TEREZA 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 FUR MATHEMATIK, ILLENAL, GERMANY  "CHARACTERIZING GRAPHS EMBEDDABLE IN
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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</thead>
<tbody>
<tr>
<td>11:30 - 1:00</td>
<td>Lunch</td>
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<tr>
<td>1:00 - 2:00</td>
<td>Dominic Welsh, Universitaet Bonn, Germany</td>
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<td></td>
<td>&quot;Knots and their complexity&quot;</td>
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<tr>
<td>2:00 - 2:30</td>
<td>PROBLEMS</td>
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<tr>
<td>4:15 - 5:15</td>
<td>Jack Edmonds, University of Waterloo</td>
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<td>&quot;Piecewise linear cell complexes&quot;</td>
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</tbody>
</table>

**Tuesday, July 2**

**Polynomials**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>9:00 - 10:00</td>
<td>Francois Jaeger, IMAG, France</td>
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<td>&quot;Strongly regular graphs &amp; spin models for the Kauffman polynomial&quot;</td>
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<tr>
<td>10:00 - 10:30</td>
<td>Break</td>
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<tr>
<td>10:30 - 11:00</td>
<td>Brian Alspach, Simon Fraser University</td>
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<td>&quot;Hamilton connected Cayley graphs on dihedral groups&quot;</td>
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<tr>
<td>11:00 - 11:30</td>
<td>Jozef Przytycki, University of California, Riverside</td>
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<td>&quot;Subexponentially computable truncations of link invariants&quot;</td>
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<tr>
<td>11:30 - 1:00</td>
<td>Lunch</td>
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<tr>
<td>1:00 - 2:00</td>
<td>James O.ley, Louisiana State University</td>
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<td></td>
<td>&quot;Tutte polynomials of polymatroids&quot;</td>
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<tr>
<td>2:00 - 2:30</td>
<td>Dirk Vertigan, Merton College, Oxford, United Kingdom</td>
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<td></td>
<td>&quot;Minor classes&quot;</td>
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<tr>
<td>Time</td>
<td>Session</td>
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<tr>
<td>9:00 - 10:00 a.m.</td>
<td>Andras Sebo, I.M.A.G. Artemis, France</td>
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<tr>
<td>10:00 - 10:30</td>
<td>Break</td>
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<tr>
<td>10:30 - 11:30</td>
<td>Luis A. Goddyn, Simon Fraser University</td>
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<tr>
<td>11:30 - 1:00 p.m.</td>
<td>Lunch</td>
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<tr>
<td>1:00 - 1:45</td>
<td>Cun-Quan Zhang, West Virginia University</td>
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<tr>
<td>1:45 - 2:30</td>
<td>Bert Gerards, CWI, The Netherlands</td>
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<tr>
<td>4:15 - 5:15</td>
<td>William McCuaig, University of Victoria</td>
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**Thursday, July 4**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Speaker</th>
<th>Location/Institution</th>
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</thead>
<tbody>
<tr>
<td>9:00 - 10:00 a.m.</td>
<td>Laszlo Lovasz, Princeton University</td>
<td>&quot;Conductivity&quot;</td>
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<tr>
<td>10:00 - 10:50</td>
<td>Break</td>
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<tr>
<td>10:50 - 11:50</td>
<td>Collette Courtois, Northwestern University</td>
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</tbody>
</table>
University:
“Decomposition of 5-connected graph”

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  
5-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, RAGEDA University  
“Strong embeddings of graphs”

4:15 - 5:15
Sleva Negami, Yokohama National University  
“Projective planar graphs with duals”

Friday, July 5

Departure