International Workshop on Linear Models, Experimental Designs, and Related Matrix Theory

Monday 6 August – Wednesday 8 August 1990
Tampere, Finland

Proceedings to be published in special issues of the Journal of Statistical Planning and Inference and Linear Algebra and Its Applications.
Submission deadline: 31 October 1990.

Address for correspondence:
The Workshop Secretary, C123
Department of Mathematical Sciences
University of Tampere
P.O. Box 607
SF-33101 Tampere, FINLAND

Tel: (358-31) 156 288
(931) 156 288 (domestic)
Fax: (358-31) 134 473
Electronic mail: epl@uta.fi
Telex: 22263 tayk sf

27 July 1990
The idea of the Workshop is to gather together groups of scientists working on some joint problems. The Workshop will take place over three days and will comprise group meetings, invited talks, and a Keynote Address.

Opening Session

The Opening Session of the Workshop, chaired by Dr. Erkki P. Liski (University of Tampere) and Professor George P. H. Styan (McGill University), will be held in Room A I of the University of Tampere on Monday 6 August 1990, starting at 10:00 a.m.

Tarmo Pukkila, Rector of the University of Tampere:
"The Finnish Research Jubilee"

C. Radhakrishna Rao, Eberly Professor of Statistics at The Pennsylvania State University, University Park, and National Professor of India:
"Uncertainty, statistics and creation of new knowledge"

Plenary Session

On Wednesday 8 August 1990 (11:30–12:15) Professor C. Radhakrishna Rao, Eberly Professor of Statistics at The Pennsylvania State University, University Park, and National Professor of India, will present the Keynote Address entitled:

"Some recent contributions to estimation of parameters in a linear model"
Invited Speakers

Jerzy K. BAKSALARY, Tadeusz Kotarbiński Pedagogical University, Zielona Góra, Poland, and University of Tampere, Finland,
“Admissibility and sufficiency of linear estimators in the Gauss-Markov model”

R. Dennis COOK, University of Minnesota, St. Paul, Minnesota, USA,
“Dynamic graphics for linear models”

Yadolah DODGE, University of Neuchâtel, Switzerland,
“Least absolute deviation method for detection of leverage points in linear regression”

Shantl S. GUPTA, Purdue University, West Lafayette, Indiana, USA,
“On combining selection and estimation in the search for the largest binomial parameter”

SuJit Kumar MITRA, Indian Statistical Institute, New Delhi, India,
“Outer inverses: a richer source for developing matrix partial orders” (Joint work with Robert E. Hartwig)

Heinz NEUDECKER, University of Amsterdam, The Netherlands,
“Generalized Kronecker products with multivariate statistical applications”

Ingram OLKIN, Stanford University, California, USA,
“Interface between statistics and linear algebra”

Friedrich PUKELSHEIM, University of Augsburg, FRG,
“Rotatable experimental designs”

Jagdish N. SRIVASTAVA, Colorado State University, Fort Collins, Colorado, USA,
“Identification of the correct linear model”

George P. H. STYAN, McGill University, Montréal, Québec, Canada,
“More about canonical correlations in the three-way layout” (Joint work with Julie Bérubé)

Group Meetings

Group organizers have full freedom to choose their personal style in organizing their groups. For example, the group activity may consist of discussions only, without minute-by-minute schedule, if the group considers it fruitful. Of course, certain combinations of “classic” presentation of papers and discussions may still serve well.

The schedule for the group meetings appears in the middle pages of this booklet. The first-mentioned groups meet in Room A I, the second in C IX (except on Monday in the Main Auditorium), and the third in A III.

Two new groups, not previously announced, will be led by: Professor Ingram OLKIN on Gustav Elfving (1908–1984) and Professor Jagdish N. SRIVASTAVA on “Editorial policy in statistical journals and other publications”.

Further details, albeit preliminary, about the groups appear on pp. 6–11 and on p. 14. Each group can also organize additional sessions if needed. For the latest schedule please see the Workshop’s notice board.

Groups are also encouraged to hold informal and spontaneous meetings: such face-to-face discussions by the participants are the core of the Workshop.

Workshop Proceedings

Both the Journal of Statistical Planning and Inference (JSPI) and Linear Algebra and Its Applications (LAA) will produce special issues of papers presented at the Workshop. The Special Editors of both these issues are Professors Jerzy K. BAKSALARY and George P. H. STYAN. The deadline for submission is 31 October 1990.

Manuscripts (4 copies) submitted for the JSPI special issue should be mailed to Prof. Jerzy K. BAKSALARY (Department of Mathematics, Tadeusz Kotarbiński Pedagogical University, Plac Stowiański 9, PL-65-069 Zielona Góra, Poland), and those submitted for LAA to Prof. George P. H. STYAN (Department of Mathematics and Statistics, McGill University, 805 ouest, rue Sherbrooke Street West, Montréal, Québec, Canada H3A 2K6).
Group Organizers and Topics

BAKSLARY, Jarzy K.
Zielona Góra, Poland
Tampere, Finland
Admissibility and sufficiency in linear models

CALINSKI, Tadeusz
Academy of Agriculture
Poznań, Poland
Balance, efficiency, and orthogonality concepts in experimental designs

COOK, R. Dennis
U of Minnesota
St. Paul, MN, USA
Dynamic graphical methods in linear models

FAREBROTH, R. W.
U of Manchester, UK
Statistical computing for linear models

FUJIKOSHI, Yasunori
Hiroshima U, Japan
Multivariate linear models

HETTMANSPERGER, Thomas P.
Penn State U
University Park, PA, USA
Nonparametric tests

KAGEYAMA, Sanpei
Hiroshima U, Japan
Combinatorics in experimental designs

KLEFFE, Jürgen
A of Sciences, Berlin, GDR
Variance components

MITRA, Sujit Kumar
Indian Statistical Institute
New Delhi, India
Matrix theory for linear models

MUSTONEN, Seppo
U of Helsinki, Finland
SURVO 84C

NEUDECKER, Heinz
U of Amsterdam
The Netherlands
Generalized Kronecker products and related concepts

PUKELSHEIM, Friedrich
U of Augsburg, FRG
Rotatable factorial designs

RISSANEN, Jorma
IBM Almaden Research Ctr.
San Jose, CA, USA
Stochastic complexity in linear models

SHAH, K. R.
U of Waterloo, Waterloo
Ontario, Canada
Optimal block designs and related topics

SRIVASTAVA, Jagdish N.
Colorado State U
Fort Collins, CO, USA
Identification of the correct linear model

STYAN, George P. H.
McGill U, Montréal
Québec, Canada
Matrix tricks for statistics

TRENKLER, Götz
U of Dortmund, FRG
Minimax estimation in linear models

WANG, Song-Gui
U of Science and Technology
Hefei, Anhui, PRC
Regression diagnostics

YANAI, Haruo
National Centre for University Entrance Examination, Tokyo, Japan
Canonical correlations

There will also be group meetings on Gustav Elfving (1908-1984), led by Ingram Olkin, and on “Editorial policy in statistical journals and other publications”, led by Jagdish N. Srivastava.
Further Details about the Groups

The following preliminary information about the group activities has been received from the group organizers. Changes are very probable—please see the notice board at the Workshop desk.

BAKSALARY, Jerzy K.
Tuesday: 9:30–11:30
Room C IX

Part 1: Gauss-Markov model

[based on the paper “A note on the concepts of sufficiency in the general Gauss-Markov model” by J. K. BAKSALARY & H. DRYGAS]

MARKIEWICZ, A.: “Admissible linear estimation with respect to an arbitrary quadratic risk function”
[based on the paper “Admissible linear estimation in the general Gauss-Markov model with respect to an arbitrary quadratic risk function” by J. K. BAKSALARY, A. MARKIEWICZ & C. R. RAO]

Part 2: General linear model

KŁONECKI, W.: “On the structure of unbiased admissible estimators”
[based on the paper with the same title by W. KŁONECKI & S. ZONTEK]

ZONTEK, S.: “Nonnegative admissible estimation of variance components in a one-way balanced random model”
[based on the paper “Strictly positive estimators for variance components” by A. WIGGINS & S. ZONTEK]

BALANCE, efficiency, and orthogonality concepts in experimental designs

Caliński, Tadeusz
Monday: 16:15–17:45
Main Auditorium

Caliński, T.: “Balance, efficiency, and orthogonality concepts in block designs”
– First discussant K. Nordström

– First discussant J. A. John

Tjur, T.: “An algorithm for optimization of block designs”
– First discussant D. von Rosen

COOK, R. Dennis
Dynamic graphical methods in linear models
Tuesday: 9:30–11:30
Room A I (Further meetings in Room A IIb)

The graphics methods group will focus on the use of modern graphical methods in analyses based on linear models. Graphical methods will be demonstrated by using XLISP-STAT, a graphics programming environment developed recently by Luke Tierney (University of Minnesota). This environment allows easy access to virtually all of the modern graphical methods — high-dimensional rotation, animation, brushing, linking, identification, touring, slicing and so on. Workstations will be available in Room A IIb and all participants should have an opportunity to try various graphical methods, including those presented on Monday during the talk by R. Dennis Cook.

The format for the meeting will be informal. Statistical graphics is a relatively new area and discussion on how to make effective use of this new methodology in linear models will be encouraged. Near the end of the session Seppo Kaitala (University of Helsinki) will give a short presentation on “Graphical methods to analyze direct and carry-over effects in factorial crossover experiments”. 
FAREBROTHER, R. W.  
*Statistical computing for linear models*

1. Monday: 16:15-17:45.  
   Computed the distribution of a quadratic form in normal variables. Lead paper by R. W. FAREBROTHER.

   Estimation of ARMA models in the time and frequency domains. Lead paper by D. S. G. POLLOCK.

3. Tuesday: 12:45-14:15.  
   Autoregressive models with an additive white noise contamination. Lead paper by D. S. G. POLLOCK.

   L_1-estimation in simple linear models. Lead paper by R. W. FAREBROTHER.

5. Wednesday: 8:00-9:30.  
   Diagnostics for collinearity-influential points in linear regression. Lead paper by H. NYQUIST.

FUJIKOSHI, Yasunori  
*Multivariate linear models*  
Tuesday: 16:15-17:45  
Room A I

PYNNÖNEN, S.: “Testing for redundancy of variables in quadratic discriminant analysis”  
VON ROSEN, D.: “On maximum likelihood estimators in an extended growth curve model”  
FUJIKOSHI, Y.: “Asymptotic expansions for the standardized and Studentized estimates in the growth curve model”

Discussions: Some recent results on multivariate linear models and related unsolved problems.

KAGEYAMA, Sanpei  
*Combinatorics in experimental designs*  
Monday: 17:45–19:15  
Room C IX

KAGEYAMA, S.: “Combinatorial aspects of block designs”  
SHAH, K. R.: “Some combinatorial problems associated with row-column designs”  
GHOSH, S.: “Some recent developments in statistical design of experiments”

Discussions about some unsolved problems will be presented here. Any topics related to combinatorics are welcome from all participants.

KLEFFE, Jürgen  
*Variance components*  
Tuesday: 17:45–19:15  
Room C IX

MATHEW, T.: “Nonnegative estimation of variance components”  
SEIFERT, B.: “Testing hypotheses in mixed linear models”  
KLEFFE, J. (with J. N. K. RAO): “Inadmissibility but near optimality of the Beamer-Stokes estimator for correlated response variance”

Discussions on testing hypotheses for unbalanced models, computation of admissible estimators, new concepts for nonnegative estimation, nonlinear variance-covariance structures.

MITRA, Sujit Kumar  
*Matrix theory for linear models*  
Tuesday: 12:45–14:15  
Room A I

POLLOCK, D. S. G.: “An index notation for multivariate statistical analysis”  
PUNTANEN, S. (with S. K. MITRA): “Shorted operator statistically interpreted”  
VON ROSEN, D.: “Homogeneous matrix equations and multivariate linear models”  
WANSBEEK, T. J.: “Sum-constrained covariance matrices”
MUSTONEN, Seppo

SURVO 84C
Monday: 16:15–17:45
Room A I

MUSTONEN, S.: "SURVO 84C as a working environment for statisticians"
PUNTANEN, S.: "SURVO 84C in the teaching of statistics"

Demonstrations throughout the Workshop.

SHAH, K. R.
Optimal block designs
Wednesday: 8:00–9:30
Room A I

JOHN, J. A.: "Construction of cyclic designs using integer programming"

GNIT, S.: "Best estimation of variance components with arbitrary kurtosis in mixed models corresponding to block designs"

WONG, W. K.: "Heteroscedastic optimal designs"

TRUR, T.: "Connection between block designs and electrical networks"

BAKSALARY, J. K. (with F. PUKELSHEIM): "Adjusted orthogonality properties in multi-way block designs"

SRNASTAVA, Jagdish N.
Identification of the correct linear model
Tuesday: 14:15–15:45
Room A I

GHOSH, S. "Understanding interactions using search designs"

STYAN, George P. H.
Matrix tricks for statistics
Tuesday: 17:45–19:15
Room A I

OLKIN, I.: "Some comments on Samuelson’s inequality"
BÉRUBÉ, J.: "Decomposable three-way layouts"
STYAN, G. P. H. (with J. K. BAKSALARY): "Around a formula for the rank of a matrix product"

Participation expected by:
H. V. HENDERSON, J. K. MERIKOSKI, S. PUNTANEN, et al.

TRENKLER, GÖTZ
Minimax estimation in linear models

1. Tuesday: 8:00–9:30.
   Room A I
   HEILIGERS, B. (with N. GAFFKE): "Linear Bayes- and minimax estimation in linear models with restricted parameter space"
   MATIAR, R. (with N. GAFFKE): "Linear minimax estimation under restricted parameter space, Bayes L-optimal design, and computational algorithms"
   PILZ, J.: "Admissible improvements over nonadmissible linear estimators through minimax estimation"
   SCHIPP, B.: "Approximate minimax estimators in the simultaneous equations model under partial and complete restrictions"
   STAHLECKER, P. & TRENKLER, G.: "Minimax estimation in linear regression with singular covariance structure and convex polyhedral constraints"

2. Tuesday: 16:15–17:45.
   Room A III
   LAUTERBACH, J. & STAHLECKER, P.: "A numerical method for an approximate minimax estimator in linear regression"
   LISKI, E. P.: "On a relationship between minimax-linear and admissible linear estimators in regression"
   SCHIPP, B., STAHLECKER, P. & TRENKLER, G.: "Assessing inclusion probabilities for approximative minimax estimators with respect to interval restrictions"
   SCHMIDT, K. & STAHLECKER, P.: "On the performance of some inequality-restricted estimators in linear regression"
   TOUTENBURG, H.: "MSE-comparisons of minimax and least squares estimators in case of misspecified prior regions"
# International Workshop on Linear Models, Experimental Designs & Related Matrix Theory

**6–8 August 1990, University of Tampere, Tampere, Finland**

## Monday, 6 August

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
</table>
| 10:00–10:45 | **Opening Session:**  
Tarmo PUKKILA  
Chair: E.P. Liski  
C. Radhakrishna RAO  
Chair: G.P.H. Styan  
**Invited Talk:**  
Ingram OLKIN  
Chair: J.K. Baksalary |
| 10:45–11:30 | Lunch  
**Invited Talks:**  
Sujit Kumar MITRA  
R. Dennis COOK  
Chair: F. Pukelsheim |
| 11:30–12:45 | Coffee  
**Group Meetings:**  
Gustav Elfving: 1908–1984  
Mustonen Caliński Farebrother-1  
Rissanen Kageyama Farebrother-2 |
| 14:15–15:45 | Coffee  
**Group Meetings:**  
Fujikoshi Pukelsheim Trenkler-2  
Styan Kleffe Neudecker |
| 16:15–17:45 | Lunch  
**Group Meetings:**  
Heinz NEUDECKER  
Friedrich PUKE\$ELSHIE\$  
George P. H. STYAN  
Jerzy K. BAKSALARY  
Chair: T. Pukkila |

## Tuesday, 7 August

- **Group Meetings:**
  - 8:00–9:30: Trenkler-1 Wang, Hettmansperger
  - 9:30–11:30: Cook Baksalary
  - 11:30–12:45: Lunch
  - 12:45–14:15: Mitra Farebrother-3
  - 14:15–15:45: Srivastava Yanai Farebrother-4
  - 15:45–16:15: Coffee
  - 16:15–17:45: Fujikoshi Pukelsheim Trenkler-2
  - 17:45–19:15: Styan Kleffe Neudecker
  - 20:30–: Sauna Party

## Wednesday, 8 August

- **Group Meetings:**
  - 8:00–9:30: Shah Farebrother-5
  - 9:30–11:00: Editorial Policy in Statistical Journals
  - 11:00–11:30: Coffee
  - 11:30–12:15: Keynote Address: C. Radhakrishna RAO  
Chair: T. Caliński
  - 12:15–13:30: Lunch
  - 13:30–14:00: Jagdish N. SRIVASTAVA
  - 14:00–14:30: Shanti S. GUPTA
  - 14:30–15:00: Yadolah DODGE  
Chair: T.P. Hettmansperger
  - 15:00–15:30: Coffee
  - 15:30–16:00: Heinz NEUDECKER
  - 16:00–16:30: Friedrich PUKE\$ELSHIE\$  
Chair: N.R. Draper
  - 16:30–17:00: Coffee
  - 17:00–17:30: George P. H. STYAN  
17:30–18:00: Jerzy K. BAKSALARY  
Chair: T. Pukkila

The first-mentioned groups meet in Room A I, the second in C IX (except on Monday in the Main Auditorium), and the third in A III.
WANG, Song-Gui  Regression diagnostics
Tuesday: 8:00–9:30
Room C IX

LISKI, E. P. (with S.-G. WANG): “Effects of observations on the eigensystem of a sample covariance matrix”

NYQUIST, H.: “A note on the score test and local sensitivity transformation diagnostics”

WANG, S.-G.: “On centering, standardizing and measuring multicollinearity”

YANAI, Haruo  Canonical correlations
Tuesday: 14:15–15:45
Room C IX

14:25–14:45  YANAI, H. (with Y. TAKANE): “Canonical correlation analysis with linear constraints”

Workshop Fee
There is no workshop fee for invited speakers and group organizers. For other participants the fee is:

Full participants:          FIM 750
Students:                  FIM 150

The workshop fee includes entrance to all sessions, the Monday-evening reception, and coffee. For full participants daily lunches and the Sauna Party on Tuesday evening are also included (if reservation is indicated on the application form).

Accommodation
Blocks of rooms are reserved at the following hotels. All prices (subject to changes) are in Finnish marks.

<table>
<thead>
<tr>
<th>Hotel</th>
<th>Single</th>
<th>Double</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ilves</td>
<td>530</td>
<td>680</td>
</tr>
<tr>
<td>Cumulus</td>
<td>370–380(250$^w$)</td>
<td>460</td>
</tr>
<tr>
<td>Victoria</td>
<td>360(210$^w$)</td>
<td>460</td>
</tr>
<tr>
<td>Tampere</td>
<td>355(270$^w$)</td>
<td></td>
</tr>
<tr>
<td>Domus</td>
<td>130(180$^w$)</td>
<td>180(240$^s$)</td>
</tr>
</tbody>
</table>

* weekends  $ with shower

Approximate Exchange Rates
US$1.00 = FIM 3.8, C$1.00 = FIM 3.3,
NZ$1.00 = FIM 2.3, DM 1.00 = FIM 2.2,
UK£1.00 = FIM 7.0, NLG1.00 = FIM 2.1,
JP¥1.00 = FIM 0.025, SEK 1.00 = FIM 0.65,
DKK 1.00 = FIM 0.62.

Bank Accounts
The bank account numbers of the Workshop are:
KOP-Tampere-Yliopisto 145350-561 and
OKOBANK-Tampere-Koskikeskus 573196-1800.
List of Participants

98 participants 27 July 1990

ARJAS, Elja, U of Oulu, Finland
BAKSAI,L, Jerzy K., Tampere and Zelona Góra, Poland
BÉRUBÉ, Julie, McGill U, Montréal, Québec, Canada
BOUCELHAM, Jamel, U of Helsinki, Finland
CALIŃSKI, Tadeusz, A of Agriculture in Poznań, Poland
COOK, R. Dennis, U of Minnesota, St. Paul, MN, USA
DODGE, Yadolah, U of Neuchâtel, Switzerland
DOL, Wietse, Groningen, Netherlands
DRAPE, Norman R., U of Wisconsin, Madison, WI, USA
FAREBROTHER, R. W., U of Manchester, UK
FELLMA, Johan, Swedish S of Econ, Helsinki, Finland
FUKAKOHI, Yasunori, Hiroshima U, Japan
GHILAGABER, Gebrenegus, Uppsala U, Sweden
GHOSH, Subir, U of California at Riverside, CA, USA
GNOT, Stanisław, A of Agriculture in Wrocław, Poland
GUPTA, Shanti S., Purdue U, West Lafayette, IN, USA
HAUKE, Jan, A of Agriculture in Poznań, Poland
HEILIGERS, Berthold, RWTH Aachen, FRG
HELMA, Heikki, Union Bank of Finland, Helsinki, Finland
HENDERSON, Harold V., Ruakura Agr C, Hamilton, NZ
HETTMANSPERGER, Thomas P., Penn State U, PA, USA
HIETALA, Paula, U of Tampere, Finland
HUIHTANEN, Pentti, U of Tampere, Finland
JOHN, J. A., U of Waikato, Hamilton, New Zealand
KAGEYAMA, Sanpei, Hiroshima U, Japan
KAITALA, Seppo, U of Helsinki, Finland
KALLIEN, Arto, U of Tampere, Finland
KLEFFE, Jürgen, A of Sciences, Berlin, GDR
KŁONECKI, Witold, A of Sciences, Wrocław, Poland
KNIF, Johan, Swedish S of Economics, Vaasa, Finland
KOLLO, Tomu, U of Tartu, Estonia
KONING, Ruud H., U of Groningen, Netherlands
KOREISHA, Sergio, U of Oregon, Eugene, OR, USA
KORHONEN, Pasi, U of Helsinki, Finland

LAWERBACH, Jörg, Hannover, Germany
LEHTONEN, Risto, KELA, Helsinki, Finland
LEPPÄLÄ, Raija, U of Tampere, Finland
LISKI, Erkki P., U of Tampere, Finland
LUCKE, Bernd, Free U of Berlin, FRG
MAKELAINEN, Timo, U of Helsinki, Finland
MANNINEN, Pentti, U of Tampere, Finland
MARKIEWICZ, Augustyn, A of Agriculture in Poznań, Poland
MATHAR, Rudolf, RWTH Aachen, FRG
MATHIEU, Thomas, U of Maryland, Catonsville, MD, USA
MÉRIKOSKI, Jorma Kaarlo, U of Tampere, Finland
MILO, Władysław, U of Łódź, Poland
MISRA, Chandra, Indian I of Management, Lucknow, India
MITRA, Sujit Kumar, Indian Statist. I, New Delhi, India
MUSTONEN, Seppo, U of Helsinki, Finland

NEENONEN, Erkki, KELA, Helsinki, Finland
NECK, Richard, U of Amsterdam, Netherlands
NINIMA, Ahti, U of Oulu, Finland
NORSTROM, Kenneth, U of Helsinki, Finland
NUMMI, Tapio, U of Tampere, Finland
NURHONEN, Markku, U of Tampere, Finland
NYBLOM, Jukka, U of Tampere, Finland
NYQUIST, Hans, U of Umeå, Sweden
ÖVERSTEN, Jukka, Agric Res Ctr, Jokioinen, Finland
OJA, Hannu, U of Oulu, Finland
OLKIN, Ingram, Stanford U, CA, USA
PARRING, Anne-Mai, U of Tartu, Estonia
PIZ, Jürgen, Bergakademie Freiberg, GDR
POLLOCK, D. S. G., Queen Mary College, London, UK
PORDZIK, Paweł, A of Agriculture in Poznań, Poland
PUKELSHEIM, Friedrich, U of Augsburg, FRG
PUKILA, Tarvo, U of Tampere, Finland
PUNTANEN, Simo, U of Tampere, Finland
PURANEN, Juha, U of Helsinki, Finland
PYNNÖNEN, Seppo, U of Vaasa, Finland
RAHUNEN, Väinö, U of Joensuu, Finland
RAJALA, Mikko, Neste Oy, Porvoo, Finland
RADO, C., Penn State U, University Park, PA, USA
RISSANEN, Jorma, IBM Research Ctr, San Jose, CA, USA
RITA, Hannu, U of Helsinki, Finland
ROSENQVIST, Gunnar, Swedish S of Economics, Helsinki
SAARIHO, Matti, U of Tampere, Finland
SALORANTA, Seppo, U of Tampere, Finland
SCHIPP, Bernd, U of Dortmund, FRG
SCHMIDT, Karsten, U of Mainz, FRG
SEIFERT, Burkhardt, A of Sciences, Berlin, Germany
SHAH, K. R., U of Waterloo, Ontario, Canada
SHIGEMASU, Kazuo, Tokyo I of Tech, Yokohama, Japan
SRIVASTAVA, J. N., Colorado State U, Fort Collins, USA
STAHLECKER, Peter, U of Mainz, FRG
STIAN, George P. H., McGill U, Montréal, Québec, Canada
TJUR, Tue, U of Copenhagen, Denmark
TOURENSBURG, Helge, U of Dortmund, FRG
TRENKLER, Götz, U of Dortmund, FRG
VALTONEN, Esko, U of Joensuu, Finland
VATTULAINEN, Kimmo, U of Tampere, Finland
VON ROSEN, Dietrich, U of Stockholm, Sweden
WANG, Song-Gui, Hefei, Anhui, PR China
WANSBEKE, Thomas J., U of Groningen, Netherlands
WAX, Mati, RAFAEL, Haifa, Israel
WONG, Weng Kee, U of California, Los Angeles, USA
YANAI, Haruo, Nat Ctr for U Entr Exam, Tokyo, Japan
ZMYSLONY, Roman, A of Sciences, Wrocław, Poland
ZONTIK, Stefan, A of Sciences, Wrocław, Poland

98 PARTICIPANTS FROM:

<table>
<thead>
<tr>
<th>Country</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finland</td>
<td>37</td>
</tr>
<tr>
<td>USA</td>
<td>12</td>
</tr>
<tr>
<td>FR Germany</td>
<td>10</td>
</tr>
<tr>
<td>Poland</td>
<td>10</td>
</tr>
<tr>
<td>Japan</td>
<td>4</td>
</tr>
<tr>
<td>Netherlands</td>
<td>4</td>
</tr>
<tr>
<td>Canada</td>
<td>3</td>
</tr>
<tr>
<td>German DR</td>
<td>3</td>
</tr>
<tr>
<td>Sweden</td>
<td>3</td>
</tr>
<tr>
<td>Estonia</td>
<td>2</td>
</tr>
<tr>
<td>India</td>
<td>2</td>
</tr>
<tr>
<td>New Zealand</td>
<td>2</td>
</tr>
<tr>
<td>UK</td>
<td>2</td>
</tr>
<tr>
<td>Denmark</td>
<td>1</td>
</tr>
<tr>
<td>Israel</td>
<td>1</td>
</tr>
<tr>
<td>PR China</td>
<td>1</td>
</tr>
<tr>
<td>Switzerland</td>
<td>1</td>
</tr>
</tbody>
</table>

THE UNIVERSITY OF TAMPERE

with more than 10,000 students, is one of the largest universities in Finland. The University's five faculties (Social Sciences, Economics and Administration, Education, Humanities, and Medicine) and three vocational sections are the foundation for a wide-ranging program of teaching and research, in which the viewpoints of both society and science have traditionally played an important role. The Department of Mathematical Sciences belongs to the Faculty of Economics and Administration and comprises three subjects: Mathematics, Philosophy, and Statistics.