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SOCIETY FOR INDUSTRIAL AND APPLIED MATHEMATICS PHILA--ETC F/6 12/1  
SUMMER RESEARCH CONFERENCE ON NUMERICAL AND STATISTICAL ANALYSIS--ETC(U)  
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Final Report  
SUMMER RESEARCH CONFERENCE ON  
NUMERICAL AND STATISTICAL ANALYSIS  
June 14-26, 1981

SIAM's second Summer Research Conference on Numerical and Statistical Analysis was held at the Clayton Hall Conference Center, University of Delaware, June 14-26, 1981. Both this conference and its predecessor were the first two of a series of such conferences SIAM is planning, to build a base of interdisciplinary research in numerical analysis and statistics, by bringing together established and fledgling researchers from both fields in an environment conducive to teaching, interaction, and exchange of ideas.

Long-term goals of the conferences are:

- o To build avenues of communication between senior people in both numerical analysis and statistics.
- o To stimulate interactive research projects between numerical analysis and statistics.
- o To educate a group of younger people in the problems common to numerical analysis and statistics.

The conference was organized around eight five-hour expository lecture series presented by eight senior researchers. These were augmented by four invited lectures of about an hour each, twenty-two shorter presentations solicited from the participants, and numerous impromptu technical conversations in between the formal sessions.

There were 47 registrants:

- o Ten from industry, seven from government, and 30 from academe.
- o Five came from outside the United States--The Netherlands, Mexico, England, Canada and West Germany.
- o Of the 47 registrants, 16 from the United States received partial reimbursement for their expenses.

The lecturers and the areas they addressed are in Attachment A. The registrants are in Attachment B.

Comparison of First and Second Conferences

At the first conference, numerical analysts and statisticians used dramatically different notational conventions, which reflected different ways of viewing similar problems and arriving at and interpreting similar concepts. At the second conference, the series lecturers were bilingual, which was apparent in their lectures and in their discussions with participants and with each other.

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| REPORT DOCUMENTATION PAGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                            | READ INSTRUCTIONS<br>BEFORE COMPLETING FORM                                             |
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| 1. REPORT NUMBER<br><b>AFOSR-TR- 82-0720</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 2. GOVT ACCESSION NO.<br><b>AD-A119164</b> | 3. RECIPIENT'S CATALOG NUMBER                                                           |
| 4. TITLE (and Subtitle)<br><br>SUMMER RESEARCH CONFERENCE ON<br>NUMERICAL AND STATISTICAL ANALYSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                            | 5. TYPE OF REPORT & PERIOD COVERED<br>FINAL, 1 APR 81-31 DEC 81                         |
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| 18. SUPPLEMENTARY NOTES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                            |                                                                                         |
| 19. KEY WORDS (Continue on reverse side if necessary and identify by block number)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                            |                                                                                         |
| 20. ABSTRACT (Continue on reverse side if necessary and identify by block number)<br><br>SIAM's second Summer Research Conference on Numerical and Statistical Analysis was held at the Clayton Hall Conference Center, University of Delaware, June 14-26, 1981. Both this conference and its predecessor were the first two of a series of such conferences SIAM is planning, to build a base of interdisciplinary research in numerical analysis and statistics, by bringing together established and fledgling researchers from both fields in an environment conducive to teaching, interaction, and exchange of ideas. |                                            |                                                                                         |

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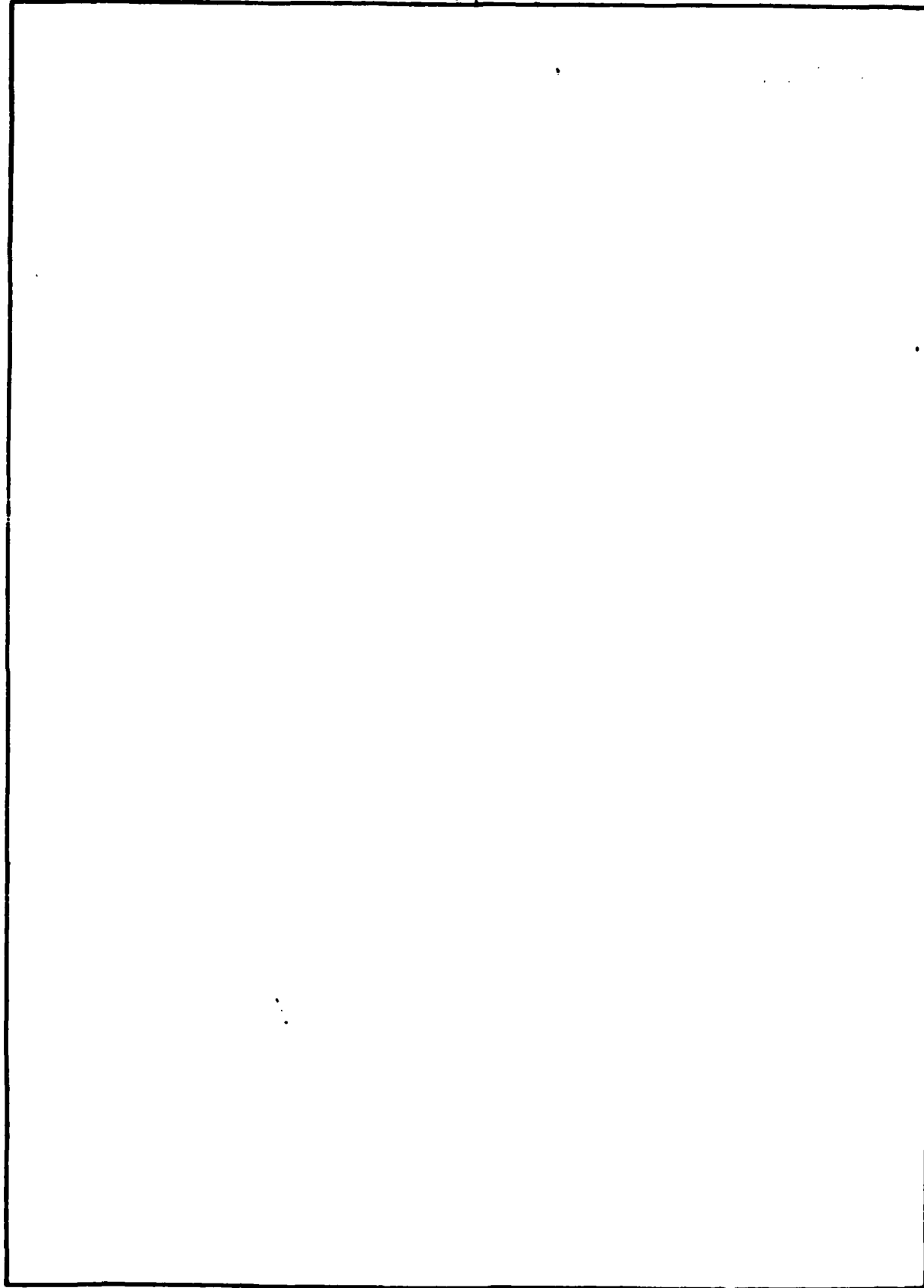
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At the first conference, G. W. Stewart lectured on numerical linear algebra with a "statistical flavor." In 1981 he applied perturbation results obtained by numerical analysis in a purely statistical setting.

At the first conference, there was substantial discussion of the EM algorithm, a slow but sure computational technique developed by statisticians to deal with nonlinear maximum likelihood estimation in a wide class of problems including missing values and mixture densities. At the second conference, J. E. Dennis devoted substantial time in his series of lectures on numerical optimization to put nonlinear maximum likelihood estimation in general and the EM algorithm in particular in that context.

SIAM experience with the first conference indicated that more opportunity should be afforded registrants to give short presentations of their own work. A solicitation for such presentations was made in preconference mailings and again at the onset of the conference, which resulted in 22 presentations. Undoubtedly this enhanced the interaction between lecturers and registrants and between the registrants. In one such presentation, a researcher from a major oil company gave a lucid presentation of a x-ray diffraction problem and asked for advice regarding the numerical solution of the constrained nonlinear least squares problem to which he had reduced it.

This researcher received considerable advice about particular software programs that could be used and also the suggestion that the problem was similar to the mixture-density problems discussed by J. E. Dennis. As a result, the researcher was put in touch with another registrant residing in the same city, who had recently written a thesis on numerical methods for mixture density estimation. It is from this kind of interchange that useful research can be developed rapidly.

#### Conference Evaluation

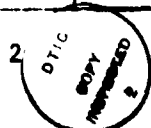
To help SIAM to evaluate the conference, each of the registrants was asked to complete a questionnaire (see Attachment C). Of the 47 registrants, 40 completed the questionnaire. A compilation of the results of the questionnaires is in Attachment D.

Overall, the reaction of the registrants was good. Most felt the level, quality, and amount of material was good. There was good interaction between the lecturers and the participants, and between participants. Compared to the first conference (June 1980), there seemed to be substantially more interaction and more involvement of the registrants in the discussions. There was some feeling that the quality of the registrants was higher than at the first conference, which could provide at least a partial explanation for the increased interaction.

Notwithstanding the excellence of the conference, the comments of the registrants identified several areas where improvements are possible (see Attachment D). These are summarized in the following paragraphs.

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MATTHEW J. KERPER  
Chief, Technical Information Division

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### Preconference Material

The lecture notes were well received by the registrants. Most of the notes had been completely reworked by the lecturers.

Lecture notes for each lecture series were distributed to the registrants at the beginning of the conference. Registrants would have a better opportunity to prepare for participation in the conference if the lecture notes were distributed, say, two weeks prior to the conference.

Because the production of the notes is a major chore for most lecturers, it may not always be possible to assure early distribution of the notes.

### Applications

There were several suggestions among the comments of the registrants that there should be case histories and examples to illustrate the theory. There were also some comments suggesting there be more "mixing" of statistical analysis and numerical analysis.

Some of the lecturers did in fact deal with such mixing. For example, G. W. Stewart discussed perturbation theory in linear regression and Richard Tapia provided background on statistics for numerical analysts. Tapia also discussed applications of optimization—theoretic results to probability density estimation.

### Amount of Material and Schedule

There were a few who felt they needed more time to digest presentations. One person suggested the time span of each lecture series should be shortened to make it easier to grasp the total presentation. There seemed to be some feeling there should be less formal presentation and more "stimulated" but informal interaction.

In considering the results of both the first and second conferences, there was some discussion among the lecturers that two weeks might be too long. This feeling has been indicated as well by a few of the registrants. Yet, a week of the second conference had elapsed before much of the interactive discussion had developed, which supports the idea that the conference period should remain at two weeks.

### Amount of Interaction

Notwithstanding there was an evident increase in interaction between lecturers and registrants at the second conference, there were still some complaints that this interaction was not enough. One way to stimulate interaction is to increase the number of scheduled events where lecturers and registrants are brought together, e.g. scheduled lunches, dinners, and workshops, in addition to the formal banquets and the coffee breaks. It is interesting to note the comments of several registrants that they themselves felt they should have made more effort in interacting with the lecturers and the other registrants.

### Some Unsolicited Comments

In Technical Report No. 648, September 1981, of the Department of Statistics of the University of Wisconsin, which is entitled "The Computation of LaPlacian Smoothing Splines with Examples," James G. Wendelberger comments in Acknowledgements:

- o The author wishes to express thanks to Grace Wahba for introducing this problem and providing guidance and encouragement, to Gene Golub who inspired this algorithm, and to the attendees of both the First and Second SIAM Summer Research Conference on Numerical and Statistical Analysis from whose comments this work has benefited.

In a letter to Professor Gene H. Golub, who was one of the series lecturers at the first conference, C. Kredler of the Technische Universität München comments, in connection with his work on relationships between weighted least square for categorical data and loglinear models:

- o I profited a lot by the lectures of Peter Huber at Delaware University and tried to apply some crucial theorems like that dealing with the asymptotic normality of the parameter estimates... Finally, I enclose some pictures of that wonderful time at Delaware University and hope to see you in the next years... Perhaps in the near future I can get deeper into the statistical properties of total least squares which—I am sure—are not easy to derive.

### Some Concerns

Our primary concern was the disappointing number of registrants from government and industry. Attendance at the 1981 conference was 60, contrasted to 70 at the 1980 conference. In both cases, the organizers expected more attendees. It appears the publicity was adequate, considering the diversity of registrants and the ways in which they found out about the conference.

In the initial mailing to promote attendance, there were approximately 69 people who indicated their interest in the conference and their desire to receive registration information. Follow-up telephone calls were made to those who had indicated interest but who had not submitted applications for attendance at the conference. The chief reason given for not attending was "no budget."

For the future, there seems to be an urgent need to bring together those problems involving "computational statistics" and "statistical computation" into a common methodology that can be effective in solving problems that are both numerical and statistical. It is this idea that must be firmly introduced into the structuring and implementation of the third conference.

### Postponement of the Third Conference

The organizers of the third conference agreed that the third conference should be postponed until June 1983:

- o It was their desire to digest the experience of the first two conferences before developing plans for the third.
- o It seemed wise to avoid competition that might develop between the third conference and SIAM's weeklong 30th anniversary meeting at Stanford University in July 1982.

Currently we are preparing to mail an outline of the proposed 1983 conference to a list of industrial and government statisticians and solicit their suggestions for the next conference.



John E. Dennis, Jr.  
Conference Director



I. Edward Block  
Managing Director, SIAM

May 28, 1982

Attachments: A. Lecturers  
B. Conference Attendees  
C. Sample Questionnaire  
D. Answers to SIAM Questionnaire Distributed at 1981 Conference



FINAL SCHEDULE  
SECOND SUMMER RESEARCH CONFERENCE  
on  
NUMERICAL AND STATISTICAL ANALYSIS

CLAYTON HALL  
Room 101B

CONFERENCE LECTURERS

|                     |                                       |                                                                              |
|---------------------|---------------------------------------|------------------------------------------------------------------------------|
| Peter Bloomfield    | Princeton University                  | "Time Series and Data Analysis with Applications"                            |
| John E. Dennis, Jr. | Rice University                       | "Unconstrained Optimization"                                                 |
| Peter J. Huber      | Harvard University                    | "Minimax Aspects of Bounded Influence Regression"                            |
| Virginia C. Klema   | Massachusetts Institute of Technology | "Background of Mathematical Software--Past Experience and Future Directions" |
| Burton H. Singer    | Columbia University                   | "Fitting Stochastic Models to Longitudinal Data"                             |
| G.W. Stewart        | University of Maryland                | "Perturbation Theory in Linear Regression"                                   |
| Richard A. Tapia    | Rice University                       | "Density Estimation as a Constrained Optimization Problem"                   |

James H. Wilkinson

National Physical  
Laboratory, England

"An Introduction to Mathematical Statistics"

"Rounding Errors and Perturbation Theory"

INVITED SPEAKERS

Peter M. Bentler

University of California  
Los Angeles

"Some Numerical Issues in Statistical Estimation of Linear Structural Equation Models"

Alan Cline

University of Texas  
Austin

"Curve Fitting Using Splines Under Tension"

Jerry Friedman

Stanford University

"Recursive Partitioning Classification and Regression"

Carl N. Morris

University of Texas  
Austin

"Statistical and Computing Issues in Experimental Design"

Roy E. Welsch

Massachusetts Institute  
of Technology

"Nonlinear Statistical Modeling"

The conference is being jointly administered by SIAM and the Massachusetts Institute of Technology's Laboratory for Information and Decision Systems. It is being supported by grants from the Air Force Office of Scientific Research, the Army Research Office, the National Science Foundation, and the Office of Naval Research.

SECOND SUMMER RESEARCH CONFERENCE

on

NUMERICAL AND STATISTICAL ANALYSIS

June 14-26, 1981  
University of Delaware  
Newark, DE

LIST OF ATTENDEES

I. CONFERENCE LECTURERS:

|                     |                                              |
|---------------------|----------------------------------------------|
| BLOOMFIELD, PETER   | DEPT. OF STATISTICS, PRINCETON UNIVERSITY    |
| DENNIS, JOHN E.     | DEPT. OF MATHEMATICAL SCIENCES, RICE UNIV.   |
| HUBER, PETER J.     | DEPT. OF STATISTICS, HARVARD UNIV.           |
| KLEMA, VIRGINIA C.  | ELEC. SYSTEMS LAB., MIT                      |
| SINGER, BURTON H.   | DEPT. OF STATISTICS, COLUMBIA UNIV.          |
| STEWART, G. W.      | DEPT. OF COMPUTER SCIENCE, UNIV. OF MARYLAND |
| TAPIA, RICHARD A.   | DEPT. OF MATHEMATICAL SCIENCES, RICE UNIV.   |
| WILKINSON, JAMES H. | NATIONAL PHYSICAL LAB., ENGLAND              |

II. INVITED SPEAKERS:

|                   |                                                   |
|-------------------|---------------------------------------------------|
| BENTLER, PETER M. | DEPT. OF PSYCHOLOGY, UNIV. OF CALIFORNIA, LA      |
| CLINE, ALAN       | DEPT. OF COMPUTER SCIENCE, UNIV. OF TEXAS, AUSTIN |
| FRIEDMAN, JERRY   | SLAC, STANFORD UNIVERSITY                         |
| WELSCH, ROY       | SLOANE SCHOOL OF MANAGEMENT, MIT                  |

III. PARTICIPANTS

|                     |                                                               |
|---------------------|---------------------------------------------------------------|
| ANDREATTA, GIOVANNI | CCREMS - MIT                                                  |
| AUSTRIA, NIEVES H.  | DEPT. OF MATHEMATICS & STATISTICS, UNIV. OF<br>SOUTH CAROLINA |
| BAKER, FREDERICK D. | STATISTICAL RESEARCH DIV., U.S. DA                            |
| BALASOORIYA, UDITHA | DEPT. OF STATISTICS, UNIV. OF MANITOBA                        |
| BOSWELL, STEVEN B.  | DEPT. OF MATHEMATICAL SCIENCES, RICE UNIV.                    |

PARTICIPANTS (cont.)

|                      |                                                                           |
|----------------------|---------------------------------------------------------------------------|
| DEVOS, ROBERT        | DEPT. OF MATHEMATICS, VILLANOVA UNIV.                                     |
| DONGARRA, JACK       | APPLIED MATHEMATICS DIV., ARGONNE NATL. LAB.                              |
| EICKER, F.           | UNIVERSITAT DORTMUND, W. GERMANY                                          |
| ESTRADA, JESUS LOPEZ | FACULTAD DE CIENCIAS, UNIVERSIDAD NACIONAL<br>AUTONOMA DE MEXICO          |
| FRITSCH, FRED N.     | MATHEMATICS & STATISTICS DIV., LAWRENCE<br>LIVERMORE LABORATORY           |
| GARDINER, DONALD A.  | MATHEMATICS & STATISTICS DIV., UNION CARBIDE                              |
| GLAZ, JOSEPH         | DEPT. OF STATISTICS, UNIV. OF CONNECTICUT                                 |
| GOLLWITZER, HERMAN   | DEPT. OF MATHEMATICS, DREXEL UNIVERSITY                                   |
| HAND, MICHAEL L.     | APPLIED STATISTICS & INFO. SYSTEMS, WILLAMETTE<br>UNIV.                   |
| BOLT, WILLIAM R.     | MATHEMATICAL STATISTICIAN, DEPT. OF THE ARMY                              |
| KEARFOTT, BAKER      | DEPT. OF MATHEMATICS, UNIV. OF SOUTHWESTERN<br>LOUISIANA                  |
| KENYON, JAMES R.     | EAST HARTFORD, CT                                                         |
| KOBIALKA, EDWARD J.  | FEDERAL AVIATION ADM. TECHNICAL CTR.                                      |
| KOKO, FRANK W. JR.   | DEPT. OF CHEMICAL ENGG., BUCKNELL UNIV.                                   |
| LEE, TZE-SAN D.      | DEPT. OF MATHEMATICS, WESTERN ILLINOIS UNIV.                              |
| LEIGH, STEFAN        | STATISTICAL ENGG. DIV., NATIONAL BUREAU OF<br>STANDARDS                   |
| LINES, LARRY R.      | AMOCO PRODUCTION RES. CENTER                                              |
| MARTIN, ALVIN        | VERBEX, A DIVISION OF EXXON ENTERPRISE                                    |
| MELVIN, WILLIAM R.   | LOS ALAMOS NATIONAL LABORATORY                                            |
| MOORTGAT, LUKE       | DE LA SALLE UNIVERSITY- STATISTICAL ASSISTANCE<br>FOR RESEARCH DEPT.      |
| MCDONALD, JOHN       | DEPT. OF STATISTICS, STANFORD UNIV.                                       |
| NICKEL, RONALD H.    | CURRICULUM IN OPERATIONS RES. & SYS. ANALYSIS,<br>UNIV. OF NORTH CAROLINA |
| MODERA, TAKASHI      | DEPT. OF MATHEMATICS, KEIO UNIVERSITY                                     |

PARTICIPANTS (Cont.)

|                       |                                                                    |
|-----------------------|--------------------------------------------------------------------|
| POTHEN, ALEX          | CENTER FOR APPLIED MATHEMATICS, CORNELL UNIV.                      |
| REDNER, RICHARD A.    | DEPT. OF MATHEMATICAL SCIENCES, UNIV. OF TULSA                     |
| REEVE, CHARLES P.     | STATISTICAL ENG'G. DIV., NATIONAL BUREAU OF<br>STANDARDS           |
| ROBERTAZZI, THOMAS G. | DEPT. OF ELECT. ENG'G. & COMPUTER SCIENCE,<br>PRINCETON UNIVERSITY |
| ROMERO, REBECA        | LAGO MURTIZ 62, MEXICO 17 DF MEXICO                                |
| ROTH, ROBERT          | VERBEX, A DIVISION OF EXXON ENTERPRISE                             |
| SHEEHAN, KATHERINE M. | DATA RESOURCES, INC.                                               |
| TANNER, MARTIN A.     | DEPT. OF STATISTICS, UNIV. OF CHICAGO                              |
| THOMSON, STEVE        | COMPUTING CENTER, UNIV. OF KENTUCKY                                |
| TRITCHLER, DAVID      | MEMORIAL SLOAN-KETTERING CANCER CENTE                              |
| TROSSET, MICHAEL W.   | DEPT. OF STATISTICS, UNIV. OF CALIFORNIA, BERKELEY                 |
| VASICEK, DANIEL J.    | COMPUTING RESEARCH, AMOCO PRODUCTION CO.                           |
| VERBEEK, ALBERT       | SOCIOLOGISCH INSTITUT, RIJKSUNIVERSITEIT UTRECHT                   |
| WALKER, HOMER F.      | DEPT. OF MATHEMATICS, UNIV. OF HOUSTON                             |
| WENDELBERGER, JIM     | DEPT. OF STATISTICS, UNIV. OF WISCONSIN                            |
| WEYRICH, ORVILLE R.   | DEPT. OF CHEMISTRY, UNIV. OF TENNESSEE                             |
| WINSLOW, JAMES        | DEPT. OF COMPUTER SCIENCE, SUNY-PLATTSBURGH                        |
| WHITAKER, RICK        | MCDONNELL DOUGLAS AUTOMATION                                       |
| WORLEY, PATRICK B.    | DEPT. OF COMPUTER SCIENCE, STANFORD UNIVERSITY                     |

IV. VISITORS

|               |                             |
|---------------|-----------------------------|
| BARNES, BRUCE | NATIONAL SCIENCE FOUNDATION |
| HAYES, ANNIE  | OFFICE OF NAVAL RESEARCH    |



SOCIETY for INDUSTRIAL and APPLIED MATHEMATICS

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EVALUATION FORM

The lecturers and the organizers of the Second Summer Research Conference on Numerical and Statistical Analysis request your assistance in evaluating the lecturers and the lecture notes presented here. We want to build on the experience gained during these two weeks to organize subsequent summer research conferences in the areas of numerical and statistical analysis. We thank you in advance for your help, and we will appreciate your comments on the following topics:

1. Was the content of the material what you expected?

☐ Yes

☐ No

If not, what was missing? \_\_\_\_\_

2. Was the combination of lectures and lecture notes a reasonable mix of numerical analysis and statistics?

☐ Yes

☐ No

If not, what would you have preferred? \_\_\_\_\_

3. Was the rate (the pacing) of the lectures satisfactory?

☐ Yes

☐ No

If not, in what way should the rate be adjusted? \_\_\_\_\_

4. Was the level of the material presented (check one for each lecturer) --

|                  | <u>Too High?</u> | <u>Too Low?</u> | <u>Just Right?</u> |
|------------------|------------------|-----------------|--------------------|
| P. Bloomfield    | _____            | _____           | _____              |
| J.E. Dennis, Jr. | _____            | _____           | _____              |
| P.J. Huber       | _____            | _____           | _____              |
| V.C. Klema       | _____            | _____           | _____              |
| B.H. Singer      | _____            | _____           | _____              |
| G.W. Stewart     | _____            | _____           | _____              |
| R.A. Tapia       | _____            | _____           | _____              |
| J.H. Wilkinson   | _____            | _____           | _____              |

(over)

5. Was the level of the material presented (check one for each lecturer) --

|                  | <u>Too Much?</u> | <u>Too Little?</u> | <u>Just Right?</u> |
|------------------|------------------|--------------------|--------------------|
| P. Bloomfield    | _____            | _____              | _____              |
| J.E. Dennis, Jr. | _____            | _____              | _____              |
| P.J. Huber       | _____            | _____              | _____              |
| V.C. Klema       | _____            | _____              | _____              |
| B.H. Singer      | _____            | _____              | _____              |
| G.W. Stewart     | _____            | _____              | _____              |
| R.A. Tapia       | _____            | _____              | _____              |
| J.H. Wilkinson   | _____            | _____              | _____              |

6. Was your interaction with the lecturers

☐ Good?

☐ Fair?

☐ Poor?

How could it have been improved? \_\_\_\_\_  
\_\_\_\_\_

7. Was your interaction with the other participants

☐ Good?

☐ Fair?

☐ Poor?

How could it have been improved? \_\_\_\_\_  
\_\_\_\_\_

8. What specific suggestions do you have for improving the organization and content of the material?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

What topics would you like to have added? \_\_\_\_\_  
\_\_\_\_\_

What topics would you like to have deleted? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

9. (Optional)

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

TELEPHONE \_\_\_\_\_

Attachment D  
Final Report  
May 26, 1982

ANSWERS TO SIAM QUESTIONNAIRE DISTRIBUTED AT SECOND SUMMER RESEARCH  
CONFERENCE ON NUMERICAL AND STATISTICAL ANALYSIS, UNIVERSITY OF DELAWARE, 1981

1. Was the content of the material what you expected?

32 Yes

3 No

3 Yes and No

2 No Answer

No:

Couldn't understand Huber's robust analysis because there was no introductory material either in the lectures or in the notes.

Better than I expected.

Application of the theory - perhaps a case study or two illustrating application of a specific theory would be helpful.

Yes:

This conference was excellent and every speaker did a fine job. I would not hesitate recommending it to anyone.

For the most part...not very much missing.

The combination of analysis, theory, and packages was fantastic. Stochastic Processes was missing, but everything cannot be included.

After I had read the information mailed to participants, the content of the material was what I expected. Before this, I thought there would be more applied statistics.

Perhaps more emphasis on statistics than expected.

Yes and No

80% yes; 20% no. Didn't really know exactly what to expect.

More of an overview of NA than was presented. (Answer to "what was missing?")

No Answer

I had very little prior information about the statistical aspect of this conference, and hence quite did not know what to expect. I was pleased by what I found, though!

I had expected each presentation to be a mixture of numerical and statistical analysis.

May , 1982

2. Was the combination of lectures and lecture notes a reasonable mix of numerical analysis and statistics?

37 Yes

2 No

1 No Answer

Yes

It was an excellent mix.

Perhaps a slight tendency toward statistics.

But I would like to have seen more exposition of the numerical problems that occur in statistical computations.

Would prefer all notes to be available from all speakers so that full attention can be placed on the concept being presented rather than distracted by note taking (also reference lists are very valuable for future interests).

No

More mixture; numerical analysts working on statistics; statisticians using numerical analysis.

Too much of a statistics slant.

No Answer

Applied statistics - rather than applying mathematics to a data set.

3. Was the rate (the pacing) of the lectures satisfactory?

33 Yes

4 No

1 Yes and No

2 No Answer

Yes

Since the 8:30 AM to 5:00 or 6:00 PM days leave people exhausted, perhaps one day at the beginning of the second week could end at 2:30, so people could check over the material.

Several different lecturers gave some of the best lectures I have ever heard.

The lunch hour (90 minutes) could be shortened (in my opinion) to provide each lecturer with about 5 extra minutes to answer questions and give a summary of lecture with a commentary.

In the future you might consider sending elementary material in statistics and numerical analysis to participants prior to the conference so less time would be needed at the conference to cover it.

Huber started too fast, slowed later.

No

Prefer a lecture series relatively compact, if it's on a single topic - one loses the thread if they're spread over 2 weeks.



A little too fast for me due to my weak background in numerical analysis.

I found more material coming at me at once than I could absorb. I didn't have much time to study the lecture notes. I don't know if any solution.....All the material was worthwhile and interesting.

#### Yes and No

This question should have been a table, like items 4 and 5.

#### No Answer

(In what way should the rate be adjusted?) Outline of presentations and relationships to notes (which should contain the proofs-NOT the lectures).

#### 4. Was the level of the material presented--

|                   | <u>Too High</u> | <u>Too Low</u> | <u>Just Right?</u> |
|-------------------|-----------------|----------------|--------------------|
| P. Bloomfield     | 1               | 3              | 35                 |
| J. E. Dennis, Jr. |                 |                | 40                 |
| P. J. Huber       | 19              |                | 20                 |
| V. C. Klema       |                 | 11             | 27                 |
| B. H. Singer      | 8               |                | 30                 |
| G. W. Stewart     | 4               |                | 35                 |
| R. A. Tapia       | 2               |                | 37                 |
| J. H. Wilkinson   | 3               | 1              | 36                 |

The level of Huber's material was too high for me due to my rather inadequate training in statistics.

Re V. C. Klema's material, I would have found a small compendium of computer science jargon to be helpful.

J. H. Wilkinson's level was too low because it needed "the big picture."

Some of the material was at too high a level for me. I'm sure most of the participants have a stronger background in statistics and numerical analysis than I do.

I had trouble following B. H. Singer's lectures. I'm not sure why.

#### 5. Was the amount of the material presented--

|                   | <u>Too Much</u> | <u>Too Little</u> | <u>Just Right?</u> |
|-------------------|-----------------|-------------------|--------------------|
| P. Bloomfield     |                 | 5                 | 34                 |
| J. E. Dennis, Jr. |                 |                   | 40                 |
| P. J. Huber       | 6               | 2                 | 28                 |
| V. C. Klema       | 1               | 15                | 21                 |
| B. H. Singer      | 6               | 1                 | 29                 |
| G. W. Stewart     | 7               | 2                 | 29                 |
| R. A. Tapia       | 2               |                   | 37                 |
| J. H. Wilkinson   | 3               | 1                 | 34                 |

Re: B. H. Singer--A more structured approach would be beneficial to

non-statisticians. Perhaps the introductory lecture could provide a unified view of the remaining material.

I am grateful for Stewart's and Tapia's notes.

6. Was your interaction with the lecturers—

30 Good

8 Fair

1 Poor

Good

The lecturers could not have made a more sincere effort to serve the audience; interaction was uniformly excellent, within the lectures themselves, in the planning of open session short talks, and in personal conversations.

"How could it have been improved?" Info about the lecturers and their areas of research.

I should have made more effort.

I wonder if the SIAM group could have gotten together for suppers in the evenings and for informal chit chats about our research.

I would like to see more discussion of research strategies and views on the directions being taken for current and future research.

I think it is very important that the lecturer make an effort to approach students and resist the temptation of mingling among themselves.

I would have liked to have had more informal contact with the main lecturers. Listening to informal discussions has been most valuable to me.

(Answers to #6 and #7) An assigned lunch area with prepurchased meal tickets for continued random meetings with lecturers and participants. Common "hang-out" places. Common fridge for beer which participants contribute to and share. An open snack bar with alcohol in evenings.

Staff might wish to consider "lunching" or "dining" with participants in dining commons slightly more frequently.

Fair

I could have pushed more to talk with the lecturers; they seemed very approachable, although at the banquets it would be better if they wouldn't all sit together which happened a couple of times.

It could have been improved if I had been less shy.

7. Was your interaction with the other participants

37 Good

3 Fair

0 Poor

Good

Excellent interaction.

Excellent.

I liked very much several of the talks by participants (mainly practical applications).

Interaction with the other participants could have been improved possibly by scheduling more free (i.e. unstructured) time—certainly scheduling more lectures would have decreased participant interaction.

Perhaps participant talks could have been organized more formally. Say 20-30 minute time limit and one page summaries and a schedule of these talks available at the start.

It was fine.

I think the coffee breaks are a good idea and they help a lot toward this end, so please don't cancel them next year!

Maybe a little wider participation in contributed talks would stimulate more discussion.

Interaction left absolutely nothing to be desired. Everyone was very kind and courteous and friendly.

Interaction could have been improved only if I were personally more gregarious.

#### Fair

Use names of participants when they have questions; call on them by name at first; ask them to identify themselves if necessary.

#### 8 (a). What specific suggestions do you have for improving the organization and content of the materials?

The notation used by the statisticians was unfamiliar to me. A more precise statement of the problems would have been helpful.

(1) Try to get some computer science algorithm types. (2) Have SIAM reimburse the center (U. Del) directly for the rooms, grad students don't have large liquid assets. (3) Provide better directions from the train in Wilmington to the Newark bound bus.

(1) I would like to have seen more exposition of the numerical problems that occur in statistical computations. (2) I would like to see more of the sort of flavor that came out in J. Wilkinson's lectures: historical perspective on various methods, approaches, etc. (3) More overt attempts to point out relationships among the various lecture topics. (Admittedly, a difficult task!)

Would like to see a "theme," or two, for the entire conference, e.g. regression from a statistical and numerical analysis point of view; it would be more valuable to explore a few topics in depth from both sides rather than touring the universe of problems.

I would like to have seen more controversy. Get statisticians and numerical

analysts to discuss conflicts at the interface.

Let me say from the start the meeting was great! I have come away with a better feeling for computational statistics. There are a few things I would suggest to improve the conference: (1) Hand out notes ahead of time. (2) Hand out background references ahead of time (sort of what level the lectures will start). (3) Titles for all the lectures ahead of time. (4) Have all the notes for the lectures available, even if it means xeroxing a book, or include the book in the conference price. (5) Hand out a problem set for the participants to work on (homework) and give the solutions later. (6) More on software and packages. Quite a few people have the role of consultants where they work. This meeting is perfect to expose them to mathematics software of all types. (7) More NA. Over 75% of the talks were on statistics, not counting the participants' talks. (8) Have CRT and TV monitor for participants' presentations.

Include case studies illustrating the application of the material.

Have all notes available for each talk, with references as most did.

(1) If possible, distribution of lecture notes 2 weeks before the conference convenes would be helpful; (2) Encourage participants to submit their "unsolved" problems early in the conferences--later entertain brief comments and suggestions from the other participants.

Encourage sharing by participants.

More detailed description of the schedule (topic per talk).

All the material presented in the lectures should be in the notes.

I felt that the NA sessions were very cohesive, but I did not feel that way about the STAT sessions, although that may be because of my lack of knowledge about a lot of the STAT material.

The meeting was well organized. I was benefited very much from attending the meeting.

I would prefer more time for informal discussion.

Much of the material presented was either exclusively numerical analysis or exclusively statistics. Such "side-by-side" presentation is educational, but I would like to see more material dealing with the interface. (Perhaps the difficulty is that there isn't much material there at present?) Pete Stewart's lecture were commendable for doing just that.

Some lectures might indicate more frequently where they are in their notes. Also I'm fond of exercises. It would be nice to have some people from England, especially from those working on NAG and GENSTAT at the conference. The same for BMDP, not in the least for improving the quality of packages like BMDP in the future.

Add a suggestion box in the lecture hall, to be read daily during the conference.

presented; depending on audience, emphasis on development or on application of techniques; uniformity of notation; a list of "prerequisite" concepts or ideas to review prior to conference.

I think it would be helpful if lecture notes could be sent to the participants sometime before the conference.

I feel the notes we were given could be improved by (1) first, a quick summary of each lecturer's intentions in each lecture, so we know where we're going, (2) an annotated reference list with some handy tips for the uninitiated, e.g. "this is the most important paper in this field, but don't read it until you've read this other review—it might be easier that way," etc.

The organization was excellent. I thought the numerical analysis material was just right. I think the statistical material could be a little more in the mold of data analysis and model building.

An accessible xerox machine—many of the volunteer speakers could have distributed their transparencies via xerox copies. Some were quite nice. I would also like to see more area of science that have mathematical needs presented, e.g. neurophysiology, tumor growth, genetic determination of form, say, one survey talk each. Numerical techniques have a great hope for the problems of these areas. Huge interaction problems with messy nonlinearities and highly irregular geometrics.

Some thought might be given to providing some further details on meal costs at dining commons, location with descriptions of local shopping centers (drugs, sundries, notions, etc.). Also, location and how to get to nearby dining places. Some information on shuttle bus service on campus would have helped.

(1) Get the lecture notes a couple of weeks ahead of the conference. (2) A simple problem or two, to illustrate the points—as in Wilkinson's talk, can be very helpful.

I think the organization and content of the materials presented were good.

Get notes out early (possibly sent to people).

8 (b). What topics would you like to have added?

I would like to see the consulting aspect of both fields.

Respect to the content is very important; include statistical analysis in non-linear parameter estimation.

Some specific treatment of outliers.

(1) More on structural models. (2) More on nonlinear least squares in the optimization talks.

Techniques and methods of exploratory data analysis plus some under philosophies of such in the spirit if not in the exact manner of Dr. John W. Tukey and Dr. Mosteller.

Stochastic processes and DE's with probabilistic inputs.

Computational techniques for robust regression, analysis of variance.

I would have liked more on the topics in Virginia's last lecture. While perhaps not central to the conference's theme, I am interested in the material discussed by J. Friedman and would have enjoyed more on this.

More on pattern recognition.

Make the intro to statistics optional or parallel to something well known to the numerical analysts.

Multivariate Analysis (more of it)—recently developed techniques owe their existence to high-speed computers; the field interacts substantially.

More on partitioning and nonparametric regression algorithms of Friedman.

Model selection in statistics, cross validation and jackknifing.

More time series analysis would be nice.

Welsch's.

Large scale NLP.

More opportunity for numerical analysts and statisticians to learn about each other via "problem solving" and problem formulation.

Function approx such as for C.D.F.s and their inverses (includes multidimensional).

An introduction to numerical analysis for statisticians, like Tapia's introduction to statistics for numerical analysts.

More basic statistics. Perhaps suggest some homework to be done pre-meeting.

Sessions devoted to application of the theory presented in previous lectures.

More applied material.

Available statistical software, and what numerical methods are used therein.

(1) Intro to cross-validation/boot strap/jackknife (2) Regression ANOVA for nonrandom sampling ....various rational surveys. There exist 3 methods I know of: (1) Taylor linearization, (2) BRR, (3) jackknife. I don't know how any works. I am particularly interested (1) possible reference: Fuller, Iowa State Supercrpp Program, (3) EM algorithm in more detail, (4) Full Information Maximum Likelihood.

Sequential (linear) estimation would be a good topic in that recent research has combined stat and N.A. analysis ideas. Thomas Kailath of Stanford or G. J. Beirman, formerly of JPL and now consulting, could be possible speakers. If you're short on travel money, Brad Dickinson at Princeton, one of Kailath's students, is in the neighborhood.

8 (c). What topics would you like to have deleted?

Those not relating to the "keynote," e.g. Burt Singer's lectures, while interesting, were in a relative vacuum with other lecture series.

The ad hoc presentation of nonstatistical problems.

Change the discussion on robust statistics to completely discuss cross-validation.

Make the intro to statistics optional or parallel to something well-known to the numerical analysts.

I would have been satisfied with less on the details of ROSEPACK and other PACKS.

Error analysis could be compressed somewhat.

Absolutely none. A good mix.

The problem is--none. Just add much more without increasing the total.

9. Miscellaneous Comments

The conference was extremely well organized and of tremendous help to me.

Another useful question (on the questionnaire) might have been: "How do you rate the organization and exposition of the material by the lecturer?" Also, visual aids, etc.

I found out about the conference via both SIAM and ACM mailings.

Two weeks is a long time. I know of another person who wanted to come, but couldn't afford 2 weeks away from her job.

The conference was recommended to me by Dan O'Reilly.

Contacted by direct mail.

Learned about the meeting through SIAM material.

SIAM mailing.

If you give a complementary breakfast, announce what it will be. I and others thought it was a meal.

Information about conference found in ASA newsletter.

Learned of the conference from Gene Golub.

I consider it positively obscene that smoking was permitted in the conference room.

I (from the Netherlands) found out about the conference from SIAM News and ASA. Gives two addresses (foreign) of newsletters that would announce the conference free of charge.

I found out about the conference from a flyer received by the head of research at my company.

Advertising-orange SIAM flyer.

I learned of this conference from Jim Baker, Vice President of Verbex (Bedford, MA).

I learned of this conference from AMSTAT News and a later flyer in the mail.

Why not have a statistician help design your review form?

Heard about the conference through brochures mailed to me by SIAM.



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