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Final Report
Fifth SIAM Conference on Applied Linear Algebra
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1 Introduction

The SIAM Conferences on Applied Linear Algebra are the centerpiece of activities for the SIAG on Linear Algebra. They are held every three years and bring together a diverse group of applied linear algebraists, representing industry, government and academics in both matrix theory and matrix computations. This sequence of conferences has two related goals: (i) to be useful and interesting to linear algebraists of every area of specialization, and, (ii) to develop and expose connections among problems in different areas.

Many aspects of the 1994 conference were carefully chosen to enhance interchange between the various groups and yet still provide a solid focus on specialties. The organizing committee adopted a new meeting structure to resolve the conflict between these two goals at earlier meetings in the series. We have prepared this report for others who may wish to consider our structure as an alternative to more traditional arrangements.

2 Meeting structure

The structure for the Snowbird meeting resulted from careful consideration given to several important and conflicting goals and needs. These included:

- The long-standing SIAM tradition of allowing any attendee to "present a paper" who so desires, and to give a formal place in the program to every such presentation. This has the important benefit for many attendees of providing justification for travel support.
- The need to reduce the level of concurrency among contributed presentation sessions. Concurrency has increased as minisymposia have become more popular.

Final

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- The desire to find a more effective means of communication than the traditional SIAM “12+3” minute contributed talks. (We regard the popularity of minisymposia as a recognition of the limitations of the “12+3” format.)
- The two special goals of this meeting series — providing opportunities for synergy among linear algebraists of all stripes and presenting material of interest across the entire breadth of linear algebra research and application.

We hope that our program will be viewed as a step in the evolution of the SIAM Conferences on Applied Linear Algebra.

2.1 Tradition

In several respects the meeting structure maintained the traditions of past meetings. There were seven invited plenary talks by distinguished researchers, who were carefully chosen for their lecturing skills as well as their research credentials. All of the invited speakers addressed their talks to the entire group; their efforts were well-received, according to the conference survey. The speakers and their topics are listed in Table 2 (page 13). There were twelve minisymposia, listed in Table 3 (page 13). We conformed to SIAM traditions, allowing 45 minutes for plenary talks and typically two hours for a minisymposium with four speakers.

2.2 Innovation

Where the traditional format has many parallel tracks of 25-minute minisymposium talks and 12-minute contributed talks, we limited minisymposia to two-way parallelism and did away with contributed talks entirely. Contributed “papers” were presented in any or all of three ways: as a poster, a proceedings paper, or as part of a discussion session. We did not reject or filter any of the contributions. More details follow.

2.2.1 Minisymposia

We allowed only twelve minisymposia. Eight of these were the result of invitations by the organizing committee, which chose topics to create a program of wide interest and to balance the plenary topics; the other four were selected from contributed proposals. We allocated six time slots for minisymposia two at a time, so that these sessions were “almost plenary”. It was our intention that these minisymposia enjoy nearly the same status as plenary sessions, allowing a strong focus on quality of presentation in addition to technical excellence.

We requested that a minisymposium organizer be one of the speakers.

2.2.2 Contributed presentations

The major innovation of the 1994 meeting, *the abolition of traditional contributed talks and the substitution of common interest sessions, poster sessions and a proceedings*, stemmed from the need to reduce the level of parallelism and conflict. Five- and six-way parallelism was

common at the Fourth SIAM Conference on Applied Linear Algebra in 1991. Although the final technical report for that meeting reported that this level of parallelism had not caused serious problems, a later survey of the SIAG/LA membership revealed less satisfaction. After much deliberation, our response to this challenge was the following structure.

The major themes of the conference were divided into nineteen topical areas, listed in Table 4 (page 14). Attendees were invited to participate in any or all of three ways, each focused on the nineteen topical areas.

- A $1\frac{1}{2}$ hour discussion or "common interest" session was scheduled for each topical area. The nineteen common interest sessions were scheduled into five time slots. Attendees had the opportunity to participate freely in these discussions.
- Each discussion session was preceded by a poster display session. Posters were on display, generally, for the entire day, but the last $\frac{1}{2}$ hour before the discussion sessions was designated as the official poster session, during which presenters were expected to be available for discussion. Nothing else was scheduled at this time. The poster sessions were open to all contributors.
- Finally, in the most permanent record of the conference, we published a proceedings of the meeting. Each proceedings paper was limited to five pages. Each topical area became a chapter in the printed proceedings. Each paper was assigned to one of the topical areas by its author(s), thereby avoiding misclassification by the editor.

Potential attendees were given two opportunities, poster presentation and proceedings papers, to contribute their work individually in a formal manner that would be acceptable for travel support. The common interest discussion sessions provided the opportunity for the informal give and take that most often characterizes the rapid exchange of technical ideas. The limited number of sessions allowed us to create a low conflict schedule, minimizing the cost of parallelism.

The most major of these innovations was the common interest discussion sessions. To provide some structure and order, each discussion session was chaired by an invited moderator. Each moderator was a respected senior researcher in the topical area. All were given access to the papers that would appear in their area of the proceedings; each was asked to lead a discussion of those papers and over the topical area in general. The role of the moderators is clearly key to the success or failure of the discussion sessions; the moderators at this meeting took their jobs seriously. The moderators are listed in Table 4 (page 14) with the topical areas they chaired. Their contributions to the meeting were noted at the conference banquet. They were also our guests for dinner earlier in the meeting.

2.2.3 Scheduling common interest sessions

Nineteen common interest sessions still required four-way parallelism. Reducing the level of concurrency from six to four reduces conflict, but the more dramatic effect resulted from cutting the number of sessions:

1991	63 sessions	11 time slots
1994	12 minisymposia	6 time slots
	19 poster and common interest sessions	5 time slots

The low level of concurrency for minisymposia allowed us to schedule these sessions and the plenary talks as a whole, to create a coherent schedule for the entire meeting. The small number of time slots and topics for the common interest sessions made it possible to compute a nearly optimal scheduling of competing discussion meetings.

Conflict minimization necessitated the development of a discrete optimization code and of a procedure for obtaining the participants' preferences. The discrete optimization code was developed specifically for this meeting at Boeing Computer Services by Sam Eldersveld and John Lewis. This was a rather naive random search algorithm, but it performed quite well, and required only a few minutes of workstation time to produce a small set of good schedules, from which a final schedule was selected manually. (The complexity of the scheduling increases very rapidly with the level of concurrency. The scheme used would not be appropriate for greater levels of concurrency, but it could be used for larger numbers of sessions and time slots.)

Learning which sessions participants wanted to attend was made part of the registration process. Each registrant was asked to specify on their registration form the five common interest sessions of greatest interest to them, and a relative value to them of each of those five sessions. Although the decisions were not always easy for the registrants, the number of sessions was small enough to be manageable. (We find it hard to imagine applying the same registration process to 60 sessions in 15 slots.) These data were encoded and used to establish a final program. We believe the result was quite effective, but there were several issues of timeliness that need to be addressed for future meetings.

3 Evaluation

In many respects this meeting was an experiment. Although it was our intention to evaluate the results, we did not have the resources (or the prior data) to make the evaluation as formal or complete as we would have liked. However, we attempted to gather as many responses as we could from the attendees. We also paid very close attention to the most controversial part, the common interest discussion sessions, and asked each of the moderators to share their experiences and recommendations with us.

SIAM traditionally takes a survey of their attendees. Unfortunately for our purposes, many of the questions address the procedural aspects of SIAM's meeting department, not the technical aspects of meeting structure and its effects. Nonetheless, these surveys represent the best data that we have from other meetings. In trying to evaluate our meeting, we put a greater emphasis on the survey than is typical at SIAM meetings. We made repeated requests to fill out the surveys, and distributed the survey at the conference banquet rather than during a technical session. This in itself represents a small contribution to SIAM's techniques. The banquet preliminaries proved to be a better time for people to fill out the survey than during a technical talk. In our meeting structure this was also after the

conclusion of the technical program, allowing people to evaluate the entire meeting. We had a significantly higher survey return rate than is usual — 36% of our attendees returned the survey. The three meetings for which we have comparative data had return rates of 14, 14 and 21%, respectively.

Although we did not organize a controlled experiment against which to compare this meeting, we have been given data on three other recent, and similar, SIAM meetings. Therefore, where we make explicit comparative statements, we are comparing the results of the survey at our meeting to survey results from the meetings listed in Table 1. These are all meetings of similar size and focus. Two of the three are, like our “**Snowbird**” meeting, the general meeting of a SIAG; the “**Seattle**” meeting is the other major meeting sponsored by our SIAG. All were held within a year of the Snowbird meeting, and all were held in western cities. Throughout the evaluation, we refer to these meetings by their locations.

Table 1: Reference meetings for comparison

Third SIAM Conf. on Geometric Design	Nov. 1–5, 1993	Tucson Az
Third SIAM Conf. on Linear Algebra, Signals, Systems and Control	August 16–19, 1993	Seattle WA
Seventh SIAM Conf. on Discrete Math.	June 22–25, 1994	Albuquerque NM

We think that our innovations were a success. That comes in part from the large number of positive comments made directly to us or in the survey. It also appears in the survey results, in the overall rating of the meeting and the rating of program content, in both of which measures this meeting was rated highest of the four meetings compared.

Appendix A contains graphic representations of the data from the surveys. In our text we will be satisfied with qualitative comparisons, which the reader can verify by referring to Appendix A. For example, the overall meeting rating is given in Figure 3 and the program content rating is shown in Figure 5. We encourage the reader to read the description of the charts found at the beginning of Appendix A before trying to interpret the charts themselves.

3.1 The alternatives to contributed talks

The major innovation was the elimination of contributed talks. The three activities that replaced them are somewhat independent of each other, and are discussed separately. We begin with the most experimental, the common interest discussion sessions.

3.1.1 Common interest discussion sessions

The original goal for the common interest discussion sessions was a focused discussion on the papers that had been submitted to the proceedings. Part of the rationale for this plan

was to give a focus that would get discussion going. We anticipated and feared a dull silence instead of a lively discussion. We also felt a need to put a greater emphasis on the proceedings papers, which was intended as a most direct replacement for the contributed talks.

Because the number of papers submitted to the proceedings was significantly lower than expected, this focus on proceedings papers proved to be difficult or impossible for some of the common interest discussion sessions. In retrospect this was a good thing—it gave us much more opportunity to experiment with alternative structures for the common interest discussion sessions. The actual sessions ranged dramatically in size, from 10 to more than 50. We did not make explicit comparison of the effectiveness of different sizes. We did not receive any comments that lead us to believe that size represented a difficulty in making the discussion sessions work.

What went well with the common interest discussion sessions?

There was generally no lack of interesting discussion topics. It was clear that these discussions need a leader or moderator to keep the discussions on track. We encouraged the moderators to do whatever they felt appropriate to encourage a feeling of discussion rather than lecturing. It proved to be surprisingly effective, even in the largest sessions, to arrange the seating in a rough circle. We allocated 90 minutes per session, but scheduled the sessions so that discussions could run over if needed. This length of time proved to be a good guess. It was definitely not too short, but it was also long enough. Most of the sessions ended at 90 minutes because the participants were tired, but not because the discussion had died.

We also encouraged the moderators to prepare a list of discussion questions in advance and to distribute the questions prior to the meeting to the attendees who had declared their intention to attend on their registration. We obtained email addresses for most of the attendees and distributed mail aliases for each session to the moderators, so we were able to reach most of the attendees. Several of the moderators solicited discussion topics by this mechanism. The results of the solicitations were slim, but we suspect that the attendees' minds were better primed for the discussion than they would have been otherwise.

While the burden of preparing a list of questions for the discussion most commonly fell to the moderator, the lists themselves were quite valuable in providing a focus to the discussion. Moderators who were well-prepared brought transparencies with their list of questions. A few minutes spent at the outset to determine which questions were of interest and what questions had been omitted proved time well-spent in ensuring that the discussion would be valuable. (In at least one case, the discussion did not complete the moderator's list, so he simply carried the undiscussed questions off to a specialized workshop the following month to complete the discussion.)

Overall the reaction to the common interest discussion sessions was quite positive. We received many positive and few negative comments. We have no direct comparison to make with the reference meetings, but for intellectual interest we compared the survey results on the value of the "common interest sessions" to the results for non-plenary speakers at the other three meetings (see Figure 8). These showed very similar reactions, with nearly equal averages (the Snowbird meeting ranked second in a comparison of averages). We expected and received a wide range of responses to our experimental format. Overall we consider this

comparison of our first experiment with unstructured discussion sessions to the standard contributed paper sessions to be quite positive—our structure was experimental and we believe we have already learned enough to know how to improve our sessions.

What went badly with the common interest discussion sessions and where can we improve?

The most glaring failure was the attempt made in some sessions to compromise with the traditional structure by allowing the authors of proceedings papers to make short oral presentations. In only one session, where there were obvious connections between papers and where the speakers were willing to make the connections, did this work. Otherwise, this was generally a very bad mistake. Most of the speakers also had posters. The attendees had just finished looking at the posters, which are a much more effective means of communicating quickly than are most short oral presentations. The oral presentations were redundant.

It is our belief that many traditional contributed talks sessions are ineffective because the speakers have difficulty extracting the essence of their results in a 12 minute presentation. Doing so in a shorter period might encourage more effort to distill the most important points, but we are sceptical. It generally didn't work in the cases where it was tried at Snowbird. The discussions were at their best when the attendees were freely discussing issues raised in the papers or posters, or broad issues in the area.

Clearly size is an issue. A discussion of twenty or thirty people probably is more effective than of much smaller or much larger groups. However, the most serious problems we encountered with large groups were due to the tendency of a number of people to sit at the edges of the room and the concomitant difficulties in hearing caused by people being spread over a large room.

Even more than with contributed talks sessions, it is easy to leave the meeting remembering that interesting things had been said, but forgetting details or connections. After the fact we felt a need for a more permanent record of the discussions. At a minimum, the lists of discussion questions should be preserved. Better yet, we would like to have a scribe, equipped with a good tape recorder, appointed for each session. The scribe would produce a summary of the discussion topics for electronic distribution after the meeting. Taping the discussions might accentuate the difficulties of hearing, but perhaps could serve as an excuse for imposing a little standardization in seating arrangements and speaking conventions. The scribe's job, like the moderators, would deserve recognition and reward from the organizing committee.

Two of the common interest discussion sessions had two co-moderators (a third informally had this structure). This had the benefit of ensuring that all questions could be addressed by someone with another point of view; it also seemed to make open discussion easier. A possible alternative would be to have the moderator select in advance a small group (two or three) of people as discussants. These people would be expected to have thought about all of the preliminary questions, and so would be a resource for the moderator to use if discussion seemed spiritless or directionless. (These people should not be treated as a formal panel. In particular they should not expect to make formal presentations.)

3.1.2 Proceedings

In our original plan, we emphasized the published proceedings as the most important direct replacement for traditional contributed talks. In practice it appears to have been the least important of the three options.

We expected the proceedings to be well-received because it provides a permanent record of part of the meeting. It also provides a citable reference to the meeting for one's resume. It appears to have been well-received by the attendees. (The questions in the survey dealt mostly with procedural issues, not content. The results in Figure 2 are the response to format/layout.)

However, the proceedings was not well-received in terms of number of contributions. The proceedings contains 80 papers associated with common interest discussion sessions and 20 from minisymposia. The 80 papers plus 53 minisymposium talks is lower than the 248 talks at the preceding meeting in this series. Although a formal count of posters presented at this meeting was not kept, several informal counts agreed that there were more than 115 posters. What accounted for this lower turnout of papers?

We believe the primary issue was the deadline imposed by the proceedings. Papers needed to be submitted 12 weeks in advance of the meeting. For many people this was an obstacle. Three months prior to the deadline, we solicited a list of people who "intended" to submit papers; the number actually produced was noticeably less. There were also several problems relating to papers, especially from overseas, that were sent as hard copy and did not arrive before the deadline. The omission of these papers from the proceedings resulted in a few disgruntled authors, who, we suspect, account for the outliers in the evaluation of the registration procedures.

A second important issue was copyright. Papers in this proceedings were short, of no more than five pages. It was, and is, not clear whether publishing such an extended abstract in a formal proceedings will jeopardize subsequent publication of a full length paper in a journal. For most people publication in an unrefereed proceedings carries less significance than publication in a referred journal.

A third significant issue is timing. There is a deep conflict between publishing material that is as hot off the press as possible and distributing the proceedings prior to the meeting. In our case we emphasized the former; as a result the proceeding was distributed at meeting registration. The limited time available to read the proceedings obviously reduced its value as a source of discussion topics at the meeting.

A fourth problem related to proceedings is cost. In Figure 13 we can see that our attendees were somewhat unhappy about the registration fee. We received several specific objections to the practice of bundling the proceedings with the registration fee, although 77% of the survey respondents agreed with this practice.

We considered alternative ways to distribute the proceedings. Several electronic alternatives (netlib-like email, cd/rom) were explored prior to the meeting, and none met with great enthusiasm. An email distribution was the most favorable, but at the meeting 58% of the respondents preferred the bound proceedings to such an email distribution.

We consider the primary value of the proceedings to be a record of a significant part of

the conference and a short-term reference to technical content. Given the apparent lack of enthusiasm for a more substantial, refereed, proceedings, we recommend instead a document that focuses exclusively on being a record of the conference. One possible form for this would be to augment the typical program with

- scribe's records of the common interest discussion sessions;
- updated abstracts, including *references* to additional materials, such as preprints available from the author;
- final list of attendees.

We believe that this could be put together reasonably easily after the meeting, especially if electronic transfer were emphasized heavily. It would be a small step to turn this into the basis of a voluntary electronic proceedings, in which papers are owned (and held) by the authors, if developments in internet interfaces continue to develop in this direction.

A proceedings is often valuable as an extended program, but a program does not need as elaborate preparation as a proceedings. We will have more to say about programs in the close of the next section.

3.1.3 Poster sessions

The third leg of our strategic triad was poster presentation. In SIAM folklore, posters are viewed as second class citizens *except* in cases where talks are tightly restricted in number. Our meeting supports that folklore. A comparison of the number of poster presentations in 1991 and in 1994 confirms part of the story. At the Fourth Applied Linear Algebra conference there were 7 posters; at the Fifth there were more than 115. A comparison of the reception of the posters is the other part of the story. Our poster sessions were rated noticeably better than those at the reference meetings (Figure 9). Figure 10 shows that our poster sessions were rated as comparable in value to the talks at the three reference meetings. This is important because it confirms our belief that *effective poster sessions can substitute for the traditional SIAM contributed talks sessions*.

What did we do right?

We encouraged people to bring posters. We set no deadline for posters. We rewarded people for bringing good posters.

For the organizers, the poster sessions worked better than contributed paper sessions because it was much easier to group related presentations. The algorithm is trivial: let the presenter designate in which session(s) the poster should appear. The simplicity of this scheme belies the dramatic impact it has on attendees' abilities to see related work together and to be able to attend sessions of real interest to them.

We did see that some presenters had some difficulty adapting to a different medium. Just as we sometimes hear speakers literally trying to read papers in contributed "paper" sessions and thereby failing to communicate their main points, at this meeting we saw several ways to fail with posters. Some of the posters were no more than articles tacked up on poster

boards. These were unreadable in any reasonable amount of time. Some of the posters were like transparencies for good oral presentations, but failed on their own because the presenter forgot that the motivating words were no longer going to be said or heard. Some of the posters were wonderful. These had something snappy going for them, had an interesting introduction, a conclusion and enough meat in between to spark further interest.

We rewarded the best posters by putting them on display, again, at the banquet. Sven Hammarling had led the organizing committee's efforts to improve the poster sessions. He gave a thorough and entertaining description of the way we had chosen the winning posters. We gave an award to the best poster (interestingly, a unanimous decision), to a very young researcher.

How can we improve future poster sessions?

One way is to provide better guidelines on what makes a good poster. Sven Hammarling and Nick Higham have already begun work on a guide for preparing posters (we can anticipate a new chapter in the second edition of "The Handbook of Writing for the Mathematical Sciences").

We also need to allow more time for each poster session. The $\frac{1}{2}$ hour allocated was insufficient. It would be better to have had the posters more conveniently available throughout the day and then to allow a longer viewing period, perhaps 1 to $1\frac{1}{2}$ hours, followed by a 15 minute break, followed by a 90 minute discussion session. It is important that the poster session be scheduled at a time with no other scheduled activities. With these changes we are convinced that poster sessions will become more valuable than the standard contributed talk sessions.

There are logistic problems. If two common interest discussion sessions slots occur on the same day (as happened for us), the breakout rooms would not be available for all-day viewing of posters. Further the breakout rooms were inconveniently located for informal viewing during coffee breaks. It would be better to have a central poster display from which posters would be moved to breakout rooms for the final formal poster session, but typical hotel display boards are not portable. Hotel display boards are also surprisingly expensive and do not have a standard size. The presenters should know in advance the dimensions of the display area they can use.

We also need to have a "just in time" poster program. At this meeting there was no special listing of poster presentations at all. People simply went to common interest discussion sessions by topic. It would be better to have a program, but preparing a program imposes deadlines. In this case, especially if titles and/or abstracts were available electronically, a "put together at the last minute" program could be made to work because the presenters schedule themselves. If our recommendations are followed, a program is necessary, because posters listed in a program will be the only means of gaining the "official stamp of approval" of attendance and presentation.

3.2 Plenary and mini-symposium sessions

The traditional parts of the program were also well-received. We tried to select plenary speakers who could engage the entire audience with interesting presentations. The survey results indicated that we succeeded. We did, of course, get comments both from people who wanted more technical detail and from those who wanted even more of a survey, but overall Figure 6 shows a high level of satisfaction.

We also made vigorous efforts to have good speakers in our minisymposia. The surveys at the three reference meetings did not break out minisymposia separately. Figure 7 compares our minisymposia against all (non-plenary?) talks at the other meetings. As we hoped, the level of satisfaction at the Snowbird meeting was higher.

There are two issues to consider with respect to minisymposia. While we had complaints that younger people were not featured in minisymposia, we also had much less response to the call for contributions to the minisymposia than we wanted or expected. Although that made the selection process easier, it was disappointing. A much more aggressive job of soliciting proposals is probably called for in the future. (At past Applied Linear Algebra meetings most minisymposia were recruited by the conference chair, despite the oft-voiced misconception that minisymposia are just a popular way to get yourself and two or three of your friends onto the program.)

It is not clear in retrospect what the right level of concurrency is for minisymposia. Our program, with two-way parallelism, emphasized the status of these presentations. Three-way parallelism would allow more presentations. The scheduling conflicts this would engender could be managed by scheduling with the same procedures as were used for the common interest discussion sessions. However, while this might address the small number of complaints that there were periods in the meeting of no interest to certain attendees, it could well exacerbate the issue of being too busy a meeting, of which we had a larger number of complaints. More minisymposia might also detract from the poster/common interest discussion sessions. On balance we consider two-at-a-time to be better than three-at-a-time.

3.3 Registration procedures

Our registration process was unnecessarily complicated. Even so, Figure 12 shows only a slightly lower level of satisfaction with the registration process than at other meetings, mostly due we believe to the responses of a small number of people who had serious and legitimate complaints about our procedure. We had several deadlines, which created additional complexity and also confused some people. There were a very small number of people who refused to read the program description, and showed up with transparencies, wondering when their talks had been scheduled. The data collection for the scheduling process did not go entirely smoothly. It was surprisingly difficult for this linear algebra community to create four positive integers that summed to 100. Email rescued us. Better yet, in the future we can foresee scheduling interactively with the WWW or similar technologies.

For the future there will be fewer deadlines. The most contentious deadline (paying the registration fee by a certain date in order to see your paper published) will be removed,

as it was imposed, by SIAM fiat. Our attendees' experience with this meeting will help the next time, but it is important for SIAM to move as quickly and thoroughly as possible to electronic communication. This will be especially important in trying to prepare a last minute program if that is adopted. The comments in the survey pointed out several problems with the last minute program at this meeting.

4 Particulars of the meeting

The Fifth SIAM Conference on Applied Linear Algebra was organized by Beresford Parlett (University of California, Berkeley), chair, with John Gilbert (Xerox Palo Alto Research Center) and John Lewis (Boeing Computer Services) serving as co-chairs. Harm Bart (Erasmus University, The Netherlands), Richard Brualdi (University of Wisconsin, Madison), Sven Hammarling (Numerical Algorithms Group, United Kingdom) and Paul Van Dooren (University of Illinois, Urbana) comprised the rest of the actively involved committee. The diversity of backgrounds of the members should be noted, as should the effort to maintain continuity over this series of meetings: Brualdi, Lewis and Van Dooren were organizers of the previous meeting. Richard Brualdi deserves special recognition for his contributions to the entire series of meetings.

The conference took place at the Snowbird resort, approximately one hour from the airport in Salt Lake City, Utah. Like its immediate predecessor in this series, the meeting was held on a Wednesday through Saturday, June 15 through 18, 1994. The meeting had a strong and vital representation from each of these groups. There were 243 official registrants, of whom 31 were from industry, 10 from government and 202 from academe. Attendees from foreign countries numbered 68.

4.1 Plenary lectures, minisymposia and common interest discussion sessions

Table 2 lists the seven invited speakers and their topics. Table 3 lists the minisymposia and their topics. Fifty three talks comprised these twelve minisymposia. The moderators and topics for the nineteen common interest discussion sessions are given in Table 4.

4.2 SIAG/LA Prize lecture

The SIAM Conferences on Applied Linear Algebra have been the traditional setting for the awarding of the SIAG/LA Prize. We followed past practice and reserved an additional plenary session for the award and a presentation by the awardee(s). At this meeting the third SIAG/LA Prize was awarded jointly to two papers:

- Roland Freund and Noel Nachtigal for "QMR: A Quasi-residual Method for Non-Hermitian Linear Systems",
- Anne Greenbaum and Zdenek Strakos for "Predicting the Behavior of Finite Precision Lanczos and Conjugate Gradient Computations".

Table 2: Invited speakers and topics

James Demmel (Berkeley)	Fast Parallel Algorithms for Eigenproblems
Persi Diaconis (Harvard)	Geometry and Eigenvalues
Israel Gohberg (Tel Aviv)	Control Theory and Linear Algebra
Anne Greenbaum (Courant)	Recent Advances in Iterative Methods for Solving Linear Systems
Charles Johnson (William & Mary)	Nonnegative Matrices: Can the Next Century Top this One?
Robert Schreiber (RIACS)	Parallel Matrix Computations
Leslie Trotter (Cornell)	Linear Algebraic Duality for Discrete Optimization

Table 3: Minisymposium organizers and topics.

Invited minisymposia	
Richard Brualdi	Topics in Matrix Theory
Angelika Bunse-Gerstner	Numerical Methods for Structured Matrices
Thomas Coleman	Linear Algebra in Optimization
Iain Duff	Direct Methods for Large Sparse Systems
Roland Freund	Iterative Methods for Large Sparse Systems
Peter Lancaster	Algebraic Riccati Equations and their Applications
Alex Pothén	Eigenvalues, Geometry and Graph Computation
Gilbert Strang	Teaching Linear Algebra
Contributed minisymposia	
Ralph Byers	Matrix Sign Function Developments
Dianne O'Leary, Rosemary Renaut and Barry F. Smith	Parallel Multisplitting Methods and Applications of Domain Decomposition
Lothar Reichel	Iterative Methods for Image Restoration
Kresimir Veselic and Jesse Barlow	Accuracy Issues for Eigenvalue and Singular Value Problems

Table 4: Common interest sessions: topics and moderators

Greg Ammar	Structured Matrices
Steve Ashby	Sparse Iterative Methods: Preconditioning, Domain Decomposition, Multigrid
Daniela Calvetti & Lothar Reichel	Applications in Signal and Image Processing
Tony Chan	Sparse Iterative Methods: Iteration Algorithms and Acceleration Methods
Alan Edelman	Parallel Algorithms for Dense Problems
Alan George	Sparse Direct Methods
John Gilbert & John Lewis	Parallel algorithms for Sparse Problems
John Gilbert	Combinatorial Matrix Problems and Graph Theory
Per Christian Hansen	Eigenvalue and Singular Value Algorithms for Dense Matrices
Nick Higham	Condition Estimation and Rank-Revealing Factorizations
Velvel Kahan	Generalized and Quadratic Eigenvalue Problems
Volker Mehrmann	Other Applications
Michael Overton	Applications in Optimization and Operations Research
Leiba Rodman	Matrix Functions and Operator Theory
Yousef Saad	Eigenvalue and Singular Value Algorithms for Sparse Matrices
Gil Strang	Education and Teaching
George Styan	Least Squares Problems and Applications in Statistics and Probability
Robert C. Thompson	Matrix Theory: Canonical Forms, Multilinear Algebra, Nonnegative Matrices, Spectral Inequalities
Paul Van Dooren	Applications in Systems and Control

This year's prize presented two challenges to the winners. Most obvious was that the time slot had to be shared between the two papers. A greater difficulty was due to the organizing committee and the (separate) prize committee independently recognizing the importance of this work—Greenbaum was an invited speaker and Freund the invited chair of a minisymposium. Both speakers endeavored to augment their previous presentations appropriately.

The SIAG/LA Prize was selected through the careful and diligent review of recent papers, by the Prize committee comprising Biswa Datta, Richard Brualdi, James Demmel, Volker Mehrmann and Robert Plemmons.

4.3 Schedule, banquet, poster prize, site

We scheduled the meeting for four days, beginning on a Wednesday and ending on Saturday evening. This was the overall preference expressed by the members in earlier surveys, presumably partly because of discounted airfares for Saturday night stays.

The organizing committee unanimously recommended spreading the activities for any given specialty across the four day period—interaction between specialties is one of the main goals of the conference, so we did not want to end up with a sequence of specialized miniconferences. We made a conscious effort to schedule very attractive activities on both the first and the last day.

Realizing that plane schedules and location meant that we were asking most of our attendees to remain over Saturday night, we decided to hold the conference banquet as the final activity of the conference. We found a particularly interesting, and always somewhat controversial, banquet speaker in Velvel Kahan. He did not disappoint us, giving what the authors of this report thought was a superb banquet talk. The combination of the schedule and the speaker led to an unusually high turnout for the banquet. The banquet festivities also featured the award of our first "Best Poster" award to Paulina Chin of the University of Waterloo, for her poster "PCG Techniques for VLSI Layout Optimization".

The conference site reflected our intention to promote interaction. We required a site with suitable meeting rooms and sufficient space to lodge the entire meeting in one hotel. We desired a site where the focus was on the meeting, not on distractions. Yet we also wanted a site where it would be easy to escape the conference briefly for private discussions or just as an escape valve. We also wanted geographic diversity over this series of meetings. The Snowbird Resort proved generally to have been a good choice.

The overall attendance was lower than at the Fourth SIAM Conference on Applied Linear Algebra held in 1991, which had 324 attendees (against 243 in 1994). The drop in attendance is consistent with general economic effects on meetings and also the lack of a large graduate student population nearby. It may also be due in part to the experimental nature of the meeting. We have no data to evaluate these effects.

4.3.1 Site and schedule recommendations for future Applied Linear Algebra meetings

Should the Applied Linear Algebra meetings be 3 days, 4 days or 5? Should it occur during the work week, or begin or end on the weekend? How concentrated and intense should the meeting be? We believe that our broad-based schedule, with the banquet on Saturday night, worked well. For non-academics it is inconvenient (and even costly) to stay into the weekend, but this has been justified by the relative sizes of these communities. However, it would be worth investigating whether a slow decline in the number of industrial attendees is due to this schedule. Few people argue for a shorter meeting. More argue for a longer meeting, allowing more play or break time. Five days increases cost, which is also an issue. There isn't an obvious optimum, but the tradition of four days is probably a good compromise.

Past Applied Linear Algebra meetings have been held in the late spring, in the summer, and in the early fall. We have had difficulty agreeing on a standard date, which makes cooperation with other societies more difficult. In a survey of SIAG/LA, late spring and early summer were the top two choices. Although the committee has been concerned by conflicts with academic calendars, May appears to be the favorite time for the SIAG members. Summer meetings compete for resources with the SIAM National Meeting. We therefore recommend that the Sixth SIAM Conference on Applied Linear Algebra occur in April or May of 1997, and that the April-May time period be adopted as standard.

We received many favorable comments on the location. We also received complaints on the limited and expensive opportunities for food. Figures 15 and 16 show reasonably high levels of satisfaction with this particular location, and presumably then with the idea of remote or resort locations. Suggestions received for future meetings were literally all over the map. There was a strong sentiment for a Canadian venue, despite the difficulties this would impose for a small number of members.

5 Summary of Recommendations

We believe the experimental format of the Fifth SIAM Conference on Applied Linear Algebra was a success, and should be used to guide future conferences in the series.

Below, we briefly summarize our specific recommendations for things to repeat and things to do better next time.

5.1 Common interest discussion sessions

- The common interest discussion sessions should be structured completely around informal discussions; no formal oral presentations should be allowed.
- Seating should be arranged to facilitate discussion rather than as in a lecture room.
- Each moderator should be given the email addresses of the preregistrants interested in his or her session, to use in soliciting input or proposing discussion topics before the conference.

- The moderator should prepare and announce a preliminary list of discussion questions or topics.
- The moderator should be prepared to keep the discussion on track; the list of topics may be very useful here.
- The moderator may wish to select co-moderators or additional discussants in advance.
- A scribe should be appointed for each session prior to the meeting; proper equipment should be provided by SIAM.

5.2 Posters

- Posters should be emphasized as first-class parts of the conference, both in the call for presentations and by a prize at the conference.
- Provide guidance to the attendees on preparing effective poster presentations.
- Allow as much time as possible for viewing of posters; if at all possible, have each poster up for 24 hours before its discussion session.
- Schedule a designated period of at least one hour when poster presenters should be present to answer questions. This period should not conflict with other activities.
- Produce a last-minute poster program to hand out at registration, giving titles, authors, and sessions.

5.3 Proceedings

- Having a hardcopy proceedings of extended abstracts available at the conference is more trouble than it is worth; this should be omitted next time.
- A post-conference record should be produced, including the scribes' notes from the common-interest sessions, updated abstracts and references, poster titles and a final list of attendees. Possibly this record should be produced only in electronic form.
- If possible, produce a pre-conference proceedings as a collection of electronic abstracts/papers available on the internet, with changes allowed up until the conference date (or as near thereto as possible).
- Include traditional SIAM 100-word abstracts in the final program available in hardcopy at the conference.

5.4 Minisymposia

- Be aggressive in soliciting more mini proposals, but also ...
- ...make very clear in the call for presentations that only a small number of proposals will be accepted.
- Two-way parallelism seems to be a good level.

5.5 Registration procedures

- Have fewer different deadlines!
- Collect common interest session preference data and use it in scheduling to minimize conflict.
- Get current email addresses for use by the organizers and moderators before the meeting.

5.6 Dates

- Four days ending on Saturday is good.
- Use the April/May time period consistently for this meeting.

A Summary of conference survey

The figures in this Appendix present the relevant parts of the survey data collected by the SIAM Meetings department at the Snowbird meeting and the three reference meetings. SIAM's survey uses a scale, running from one to six, which appears in the standard form shown in Figure 1.

Each data summary figure in this appendix contains data in two forms, as histograms of percentile data and as modified box plots. Each histogram shows the relative distribution of the survey responses for a single question. We use a standard legend for histogram display, which is also shown in Figure 1. All of the histograms share the convention that responses are shown in the same left to right order as the SIAM surveys, with left corresponding to "excellent" and right to "poor".

The modified box plots show summary data for the same data. Consider Figure 2 shown below. The hourglass figure shows three statistics. The horizontal line passing through the waist of the hourglass is the mean of the survey responses. The top and bottoms of the hourglass are the means of the highest half and lowest half of the responses, respectively. The lines at the top and bottom of the chart give two additional statistics, the overall maximum and minimum responses. These five data present a picture both of average data and of data spread. (Box charts often present rank-order or quartile data. Such charts would not be meaningful here because the number of possible responses, six, is so small.)

Figure 1: SIAM standard evaluation scale and histogram legend

excellent	good	poor
6 5	4 3	2 1

Figure 2: Rating of "proceedings: format/layout" at Snowbird meeting

Figure 2 is unique in displaying the responses only from the Snowbird survey (none of the reference meetings had proceedings). All of the other data figures are designed to allow visual comparison of ratings from the Snowbird meeting with the reference meetings; each of these figures displays responses from the Snowbird meeting side by side with data from some or all of the reference meetings.

Figure 3: Ratings at all meetings for "Overall, how would you rate the conference?"

Figure 4: Ratings at all meetings for "subject matter of conference"

Figure 5: Ratings at all meetings for "program content, overall"

Figure 6: Ratings at all meetings for "Plenary sessions"

Figure 7: Ratings of "minisymposia sessions" at Snowbird meeting compared to "speakers' presentations" at reference meetings

Figure 8: Ratings of "common interest sessions" at Snowbird meeting compared to "speakers' presentations" at reference meetings

Figure 9: Ratings for "poster sessions" at Snowbird and reference meetings with poster sessions

Figure 10: Ratings for "poster sessions" at Snowbird meeting compared to "speakers' presentations" at reference meetings

Figure 11: Ratings at all meetings for "layout of conference program"

Figure 12: Ratings at all meetings for "general processing of registration"

Figure 13: Ratings at all meetings for "level of registration fee"

Figure 14: Ratings at all meetings for "guidance/information received"

Figure 15: Ratings at all meetings for "convenience of location"

Figure 16: Ratings at all meetings for "city as a meeting site"

Figure 17: Ratings at all meetings for "meeting rooms"

B Program

On the following page we reproduce the program-at-a-glance from the final program for the meeting. Below we give the schedule for the common interest discussion sessions, which was produced in a just-in-time fashion and distributed at the meeting.

Table 5: Schedule for Common interest discussion sessions

Wednesday, June 15, 7:30-9:30 pm

eigenvalue and singular value alg. for sparse matrices
matrix theory
applications in optimization and operations research
condition estimate and rank revealing factorizations

Thursday, June 16, 2:00pm - 4:00pm

sparse iterative methods: preconditioning
eigenvalue and singular value alg. for dense matrices
matrix functions and operator theory
other applications

Thursday, June 16, 7:30-9:30 pm

parallel algorithms for dense problems
sparse direct methods
structured matrices
education and teaching

Friday, June 17, 7:30-9:30 pm

parallel algorithms for sparse problems
applications in systems and control
least squares and appl. in statistics and probability

Saturday, June 18 2:00pm - 4:00pm

sparse iterative methods: algorithms and acceleration
applications in signal and image processing
combinatorial matrix problems
generalized and quadratic eigenvalue problems

PROGRAM-AT-A-GLANCE

Tuesday, June 14	Wednesday Morning, June 15	Thursday Morning, June 16	Friday Morning, June 17	Saturday Morning, June 18
6:00 PM-8:00 PM Registration opens <i>Cliff Lodge Lobby</i>	7:30 Registration opens <i>Cliff Lodge Lobby</i>	8:00 Registration opens <i>Cliff Lodge Lobby</i>	8:00 Registration opens <i>Cliff Lodge Lobby</i>	8:00 Registration opens <i>Cliff Lodge Lobby</i>
6:00 PM-8:00 PM Welcoming Reception <i>Golden Cliff Room</i>	8:15 Opening Remarks Beresford N. Parlett	8:30-10:30 CONCURRENT SESSIONS	INVITED PRESENTATIONS	8:30-10:30 CONCURRENT SESSIONS
	8:30 IP1 Geometry and Eigenvalues Persi Diaconis	MS5 Eigenvalues, Geometry, and Graph Theory Organizer: Alex Pothen	8:30 IP5 Nonnegative Matrices: Can the Next Century Top This One? Charles R. Johnson	MS11 Direct Methods for Large Sparse Systems Organizer: Iain S. Duff
	9:15 IP2 Parallel Matrix Computations Robert S. Schreiber	MS6 Accuracy Issues for Eigenvalue and Singular Value Problems Organizers: Jesse L. Barlow and Kresimir Veselic	9:15 IP6 Recent Advances in Iterative Methods for Solving Linear Systems Anne Greenbaum	MS12 Topics in Matrix Theory Organizer: Richard A. Brualdi
	10:00 Coffee	10:30 Coffee	10:00 Coffee	10:30 Coffee
	10:30 AM-12:30 PM CONCURRENT SESSIONS	INVITED PRESENTATIONS	10:30 AM-12:30 PM Concurrent Sessions	INVITED PRESENTATIONS
	MS1 Algebraic Riccati Equations and Their Applications Organizer: Peter Lancaster	11:00 IP3 Linear Algebraic Duality for Discrete Optimization Leslie E. Trotter	MS7 Matrix Function Developments Ralph Byers	11:00 IP7 Fast Parallel Algorithms for Eigenproblems James Demmel
	MS2 Iterative Methods for Large Sparse Systems Organizer: Roland W. Freund	11:45 IP4 Control Theory and Linear Algebra Israel Gohberg	MS8 Iterative Methods for Image Restoration Lothar Reichel	Presentation and Award
				11:45 SIAM Activity Group on Linear Algebra Prize
	Wednesday Afternoon, June 15	Thursday Afternoon, June 16	Friday Afternoon, June 17	Saturday Afternoon, June 18
	12:30 - 2:00 Lunch	12:30 - 2:00 Lunch	12:30 - 2:00 Lunch	12:30 - 2:00 Lunch
	2:00-5:00 CONCURRENT SESSIONS	2:00-4:00 CONCURRENT SESSIONS COMMON-INTEREST	2:00-4:00 CONCURRENT SESSIONS	2:00-4:00 CONCURRENT SESSIONS COMMON-INTEREST
	MS3 Teaching Linear Algebra Organizer: Gilbert Strang	4:00-5:00 Meet-and-Greet Hour <i>Golden Cliff Room</i>	MS9 Numerical Methods for Structured Matrices Organizer: Angelika Bunse-Gerstner	4:00-6:00 COUNTERPOINT SESSION
	MS4 Parallel Multisplittings and Applications of Domain Decomposition Organizers: Dianne P. O'Leary, Rosemary Renaut, and Barry F. Smith	Thursday Evening, June 16	MS10 Nonlinear Algebra in Optimization Organizer: Thomas F. Coleman	Saturday Evening, June 18
	5:00-6:00 Meet-and-Greet Hour <i>Golden Cliff Room</i>	6:00-7:30 Dinner	4:00-5:00 Business Meeting SIAM Activity Group on Linear Algebra <i>Ballroom 1</i>	6:00-9:00 Banquet Dinner Guest speaker: William M. Kahan "Tales of the Role of Technology in War" <i>Snowbird Resort Ballroom</i>
	Wednesday Evening, June 15	7:30-9:30 CONCURRENT SESSIONS COMMON-INTEREST	5:00-6:00 Meet-and-Greet Hour <i>Golden Cliff Room</i>	
	6:00-7:30 Dinner		Friday Evening, June 17	
	7:30-9:30 CONCURRENT SESSIONS COMMON-INTEREST		6:00-7:30 Dinner	
			7:30-9:30 CONCURRENT SESSIONS COMMON-INTEREST	

IP = Invited Plenary
MS = Minisymposium