Finite Element Cirus

Cornell University April 20-21, 1990.

The Spring, 1990 Cirus was held at Cornell University and hosted by Jim Bramble, Al Schatz and Lars Wahlbin.

Cirus members attended and twenty-three talks were given. After nine talks on Friday afternoon, Lars and Anita Wahlbin hosted a cocktail party at their house. We then had an excellent dinner at l'auberge.

The Way It Was – I think
by R. Falk

One of the first circuses I remember
Took place here at Cornell.
Since many of you weren't around back then,
There are some things that I should tell.

Al spoke in his own time slot,
And prepared his talk ahead.
And Ivo didn't stop the speakers
Until everything was said.

After Jim talked about the analysis
Of the methods of least squares,
We all went to dinner at MacDonalds.
Hey – back then we didn't have l'auberge.

Well, maybe my memory is a little fuzzy,
And it didn't happen quite that way.
Still, we must have done something right,
Because the Circus is going strong today.

attendees

per
Al Schatz

RODOLFO RODRIGUEZ

Jinn-Liang Liu

Likang Li

Jan Nugge

Tobias van Pelendorff

C. L. Chang
Math. Cleveland State U. Cleveland, OH 44115

Todd Arbogast

Wei-Chang Shann

Stephen Varasis

Charlie Van Loan

Soren Jensen

Zhiqiang Zheng

Weimin Han

O. Karakashian

Houde Han

Mg Mng

Susanne Brenner

Dan B. Waterfall

Bruce Wade

Ping Lee

Jinchao Xu

Craig C. Douglas

Markt Hanisch

Crista Draghicescu

Bill Semper

A.K. Aziz

B. Kellogg

J. Pasciak

Bo-nan Jiang

Takuya Tsuchiya
土屋卓也

John Lovell

Richard Falk

Gerard Richter

Jim Bramble

Donald A. French

M.W. Beyeseker

Larry Ball

Jens Markus Melenk

Zbigniew Leyk

Todd E Peterson

Dick Ewing

Lawrence Cowsar

Talks

Computation of the corner singularity and the boundary layer of the solution of various plate models (Likang Li)

A Posteriori estimation of optimal meshes for elliptic problems (Jens Hugger)

Behavior of solutions at "rounded corners" (T. von Petersdorff)

Optimal Error estimates ~~for~~ of Mixed Method for Biharmonic Equation in 1-D case (C.L. Chang)

Convergence Analysis of Richard's Equation (Todd Arbogast)

A Multigrid Algorithm for the Lowest Order Raviart-Thomas Mixed Triangular Finite Element Method (Susanne Brenner)

Abstract multigrid convergence theory requires almost no assumptions (Craig Douglas)

Roitberg - Seftel analyses on a polygonal domain (B. Kellogg)

Domain Decomposition methods for Problems with Partial Refinement (J. Pasciak)

Pressure recovery for Stokes problem via p-version of the F.E.M. Soren Jensen

Solving free boundary problems with the ~~hp~~ p-version F.E.M. (Z. Zhang)

A Relaxation Schwarz Method for Solving Elliptic Problems. Weimin Han

One numerical method for two improperly posed problems Houde Han

ASYMPTOTICALLY EXACT ERROR ESTIMATORS FOR LINEAR TRIANGULAR FINITE ELEMENTS
R. RODRIGUEZ

Remarks on Finite Element methods for Linear Elasticity, Rick Falk

The discontinuous Galerkin method with diffusion, Gerard Richter

Least-Squares Finite Element Method in Fluid Dynamics, Bo-nan Jiang

Particle Methods and BEM - Cristina Bagliesan

Convergence Analysis for Simulating flow in Root-Soil Systems — MANDRI OBEYESEKERE

A posteriori error estimates for parametrized Nonlinear equations. Jinn-Liang Liu

Multigrid for Mixed Finite Elements - Mark Franeck

Finite Element Circus

Rutgers

~~Feb~~ Oct 12-13, 1990

The fall 1990 circus was held at Rutgers and hosted by Rick Falk with party provided by Mike Vogelius. This was alleged to be the 20th anniversary of the circus, and Craig Douglas recalled a circus years before when he, a teenager, performed the traditional ceremony of drawing names. Twenty talks were given and a dinner was held on campus. Unfortunately, Ivo Babuska could not attend.

A very brief history of the circus

(R. Falk)

Standard Galerkin, mixed, and least squares

Raviart-Thomas, BDM, and PEERS

Miscible displacement, Stokes, and plates

$L^\infty$, negative norms, and optimal rates

Direct, CG, multigrid, and ADI

Inf-sup, bubbles, harmonic, and bi-

h and p versions and combined h-p

That's my twenty years circus summary

# attendees

Bruce Kellogg
Sayan V. Patel
Dirk Ewing
Jim Douglas Jr
Richard Haer
Jim Brauer
Chingling Chang 张慶玲
Bo-nan Jiang 江伯南
Lin Guobo (林国波)
TAD JANIK
Jinchao Xu
Craig C. Douglas
Jian-Ming Jin
Zhiqiang Cai
Jinshui Qin
Zhimin Zhang
Shangyou Zhang
William B. Symczak
Soren Jensen
A. K. Aziz
Kalin N. Goder

Arup Mukherjee
Wei-Chang Shann
Chongqi Chen
Jens Markus Melenk
Lothar Pfeil
Pavatto Narasimha
Manil Suri
Sun Jen Chen
Gerard Richter
Peter Monk
May May
Susanne Brenner
Ridgway Scott
RODOLFO RODRIGUEZ
Douglas N. Arnold
Hee Joo Oh
Ping Lee
M. Cristina Squeff
V. Vanaja
W. Freeman
Stephen M. Alessandrini
T. von Petersdorff
K. Duran

# Talk titles

Chebyshev iterations for convection diffusion equations – Bruce Kellogg

Preconditioning – distribution of Singular Values
Seymour V. Parter

On the p-version of the finite element method for Stokes equations –
Tad Janik

preconditioned GMRES method
Jinchao Xu

A posteriori estimates of convergence for multigrid methods using decomposed spaces – Craig Douglas

Arch beam element: Locking and Superconvergence – Zhimin Zhang

Treatments of discontinuities and bubble functions in Multigrid method – Shangyou Zhang.

Behaviour in the Large of Continuous Time Galerkin Methods for a One-Dimensional Nonlinearly Viscoelastic Rod –
Soren Jensen (w. Don French)

$L^2$ error estimates for the p-version
Manil Suri

Least Squares Finite Element Approximations to Convected Dominated Problems
– Tsu-Fen Chen

Methods for Maxwell's equations Peter Monk

Software for Finite Element Algorithms
Ridgway Scott, Univ. of Houston

ASYMPTOTICAL EXACTNESS OF ERROR ESTIMATORS IN FEM — R. RODRIGUEZ

Galerkin Method on Spaces incorporating local properties of the sought solution.
Jens M. Melenk

A multigrid method with nested spaces for the Dirichlet problem on domains with curved boundaries.
James H. Bramble

Numerical analysis and efficient computation of heteroclinic orbits
Mark J. Friedman
Univ. of Al. in Huntsville

Stationary Incompressible 3-D Navier-Stokes Equations. Least-squares ~~method~~ finite element method. C.L. Chang
Cleveland State Univ.

A modified contour integral method for the extraction of stress intensity factors
TOBIAS VON PETERSDORFF
UNIV. OF TEXAS AT ARLINGTON

The L1 Finite Element Method for Pure Convection Problems Bo-nan Jiang

Mixed Methods for Reissner-Mindlin plates - Ricardo Durán

Arch Beam Elements: Locking and Superconvergence
Zhimin Zhang

# Finite Element Circus
## University of Houston
## 30-31 March 1991

The spring '91 Circus was held at the Hilton Hotel on the University of Houston (UH) campus. Over forty people attended fourteen talks*. The unusual Saturday-Sunday format was chosen to mesh with several other meetings held earlier in the week in Houston. The Saturday lunch was a down-home meal at the Blackeyed Pea a short walk from the hotel. Gary Etgen, Chairman of the UH Math. Dept., hosted a cocktail party after the talks on Saturday. This was followed by a Mexican buffet at the Hilton. The Circus concluded with talks Sunday morning.

*Talks were typically 30 minutes in length.

# A finite element lament

Y'aul came to see us
from north, east and west
To jaw about what
we all love the best
To Houston, Texas for a
finite element round-up
To talk 'til our tongues
drooped like a hound pup's.

Lars arrived late after a
long stop in Charlotte,
His perseverance to join us
was appreciated a whole lot.
We ate spicey shrimp
and steak chicken-fried,
Blackeyed peas, okra, red beans 'n
rice on the side.

The full potential of finite
elements for flow
Was proved by Feistauer
in an impressive show.
Randy gave a moving talk
about elements space-time
And Suri's robust codes were
working just fine.

D Scott

# Attendees

Ridgway Scott
Vanugopal Subramanyam
Harry C K Lalak
David Hu
Ed Dean
JOE SCHMIDT
Scott Runnels
Reza Abbasian
Lawrence Cowsar
[illegible]
Manilduri
Oliver Hardy
Ed Akin
Graham Carey
Clint Dawson
Pung Lee
Shangyou Zhang
David Young
Tad Janik

Todd Arbogast
Nai-Ying Zhang
[illegible]
Tsong-Whay Pan
[illegible]
Jinsheng Feng
Ling Ma
Po Geng
Nikolas Fontana
Naoe Saito
KHALID A. HASUE TEXAS A&M
Bi [illegible] Dona
[illegible]
Peter Monk
Uday Banerjee
Sonia M. Garcia
[illegible]
Randolph Bank

Theofanis Stroubouli

# Talk titles

A 3D IMPLEMENTATION OF DOMAIN DECOMP. FOR MIXED FINITE ELEMENTS. - L. COWSAR

Locking and robustness properties of rectangular elements - Manilsuri

On the convergence of the boundary element method for the exterior Stokes problem - T. Janik

Variable coefficient mixed finite element methods as nonconforming methods - T. Arbogast

Frequency-domain treatment of waves - Jim Douglas, Jr

Superconvergence up to boundaries: a simple counterexamble Lars B. Wahlbin

Numerical computation and analysis of microstructures in micromagnetics, Ling Ma

Conforming Finite Element approximations of a 4th order Singular Perturbation Problem, W. Semper.

A finite element method for approximating the time harmonic Maxwell equations Peter Monk

Effect of numerical integration on the p-version Finite Element Approximation — Uday Banerjee

Analysis of a Moving Space-Time Finite Element Method - R. Bank

Finite element variational crimes in potential transonic flow - M. Fleistauer

Recent Experiences with A-Posteriori Error Estimation and Adaptivity
T. Strouboulis and K. A. Haque.

Computation of stress intensity factors in 3 dimensions Babuska

~~Interior Estimates of F.E.M. for Stokes~~
and Reissner - Mindlin

There must be a Reason

by R. Fenk

Dedicated to R. Bruce Kellogg
On the occasion of his sixtieth birthday

Why the name "finite element circus,"
I was asked some time ago.
Bruce Kellogg had just finished speaking,
And my questioner was anxious to know.

Well, of course it's not really a circus, I said.
There are no lions, trapeze, or tents
And I can't recall a talk in which Bruce
Actually mentioned finite elements.

Hey, R. Bruce, can you help me out on this one
Or have we all been really dense.
To have used for over twenty years,
A name that makes no sense.

# Finite Element Circus

The Pennsylvania State University,
November 8-9, 1991

The Fall, 1991 Circus was hosted by Doug Arnold at Penn State Univ. Approximately 60 circus members attended with 26 talks being given. On Friday evening, Doug + Carmé hosted a cocktail party at their home, followed by dinner at the Nittany Lion Inn. The circus was dedicated to one of its foremost lion tamers, Bruce Kellogg, on the occasion of his Sixtieth birthday. In his honor, a special banquet was held on Saturday night at Tattrees Resort.

On the following page is the circus poem, contributed by Bruce Kellogg. A poem, written in Bruce's honor, was contributed by Rick Faul

← (left hand page)

In the hills of central Pa
Where the Nittany lions roar
My many friends have gathered
TO ponder my head of hoar.

Thoughts of long forgotten theorems
Inequalities of yore
The days when codes were serial
There were model problems galore.

What does the future bode?
methods unlocked, layers resolved
meshes adapted, non-symmetric
Problems solved.

As we move into the decade
And the young come to the fore
May the exploits of the circus
Be a part of future lore

# Attendees

Richard Faber
Alan Berger
Raymond S Chang
T. Y. Li
Min Chen
Doug Arnold
Joe Poznanski
Gerard Richter
Randolph Bank
Raymond Johnson
Mark Hanisch
Donald A. French
Soren Jensen
Benqi Guo
C. L. CHANG 张慶堃
John Osborn
Tivon Petersdorff
Adam Lutoborski
Jinshui Qin
Shangyou Zhang
Jinchao Xu

Changqi Chen
Arup Mukherjee
[illegible]
T. Stroubouliis
Susanne Brenner
Simon Tavener
Ch. Makridakis
Yimei Li
Jens M. Melenk
[illegible]
Jinn Liu
Keith [illegible]
P.A. [illegible]
Peter Hu
Jian-Ming Xu
Roger Temam
Hautto Oh
Bill Symynyal
Camille D'Amunzio
Joe Pasciak
[illegible]
Jerry Bona

[illegible]
Joseph Maubach
Bill Layton
Larry Bales
Adefemi Sunmonu
Uday Banerjee
[illegible]
Shang-Di Shih
B. Kellogg
Louis Garcia
Jim Brandt
Jie Shen
Raytcho Lazarov
Jiang Xing
Todd E Peterson
J.T. King
[illegible]

Talk Titles

* Some Two-Dimensional Plate Models - Derivation, Asymptotic Properties, Numerical Analysis
Richard S. Falk

* On using a modified Nystrom method to solve the 2-D potential problem.
Raymond S. Cheng

* A stable biconjugate-gradient method R. Bank

* FEM for an Evolution Problem from Nonlinear Viscoelasticity - D.A. French

* On the sharpness of certain $L^2$-estimates of $H_0^1$ projections onto polynomial subspaces.

* Enriched Least-squares Finite Element Method for a Modle PDE Boundary Value Problem.
by C.L. CHANG, Cleveland State Univ. Math.

* Special Finite Element Methods for Problems with Rough Coefficients
John Osborn

* Theoretical and numerical problems of constitutive laws of plasticity and other applications. Y. Li

* An A Posteriori Error Estimator for Indefinite BVPs.
Jim Liu

* An Efficient Explicit Scheme for Ree Stefan Problem.
P.A. Greenwald

T. Y. Li "A continuation approach to the eigenvalue problem".

J.T. King 'An answer and a ? regarding robust schemes on polygonal domains'

L.B. Wahlbin: Long time numerical solution of a parabolic equation with memory.

H.-S. OH: Benchmark Comparisions of the Method of Auxiliary Mapping for Problems Containing Singularties with some Alternative Methods and its 3-Dimensional Extensions.

R.H. Nochetto: A fully discrete adaptive nonlinear Chernoff formula.

Joseph Maubach: On continuous global time-space finite element methods in two space-dimension, using adaptive grid refinement on grids of tetrahedrons in time-space. (intended to lecture).

Bill Layton: Parallel finite Element Methods for Highly Nonsymmetric, Linear and Nonlinear Problems.

Jinshui Qin: P1-P0 and P2-P1 elements for Stokes equation.

Changzhi Chen: A locking Free Method on Naghdi Arches

T. Strouboulis: Adaptive Finite-Element Methods in Space & Time

Uday Banerjee: The effect of numerical integration on lower norm error estimates ~~non~~ in a Ritz-Galerkin method using trigonometric polynomials.

Interior Estimates of F.E.M. for Stokes and Reissner-Mindlin

D.N. Arnold, Xiaobo Liu

On two types of internal layer, Shagi-Di Shih

Boundary layers and corner singularities for a self adjoint problem - B. Kellogg

New estimates for multigrid methods including the V-cycle.

Jim Bramble + Joe Pasciak

Projection Methods for the Navier-Stokes Equations

Jie Shen

* Optimal multigrid methods for exterior boundary value problems — SHANGYOU ZHANG

*

Fin. El. Circ.

Finite Element Circus
Naval Academy
Annapolis, Md., March 27-28

The spring, 1992, was hosted by Sonia Garcia at the U.S. Naval Academy. The pace of the talks was a little more relaxed than in some recent circuses. The location was pleasant, the weather chilly, and the facilities were impressive. There was a dinner at the Holiday Inn in Annapolis, and a Saturday lunch in a library at Chauvenet Hall. appropriately. Chauvenet Hall was where the talks were held, and a plaque on the wall informed us that Chauvenet, who organized the math department in the last century, was also involved in the design and analysis of a bridge across the Mississippi River, including the measurements of the elastic constants of the steel used.

# Springtime in Annapolis

In the Spring of '92,
To ~~Annap~~ the Academy we drew,
To ponder the latest findings of our peers,

While ghosts from former days,
The elder Bramble, Chauvenet,
Stalked the halls and whisp'red in our ears.

Computer-twisted steel bars,
Error bounds posterior,
Miscible equations fired we 10 long years,

Thanks to Sonia and her crew,
We departed facing life anew,
Toward deeper theorems we will now all steer.

B. Kellogg

attendees

Sonia M. F. Garcia
A. K. Azib
Soren Jensen
Marul Suri
Christopher T. Johnson
Michael John Muuss
Raymond H. Chang
Xun Jiang
Ann B. Wehrkin
Craig C. Douglas
Jim Douglas Jr
Donald A. French
Todd E. Peterson
Theofanis Strouboulis
Gerard Richter
Jens Huggas
Revathi Narasimhan
Mary Wheeler
Thomas J. Stone
Rongsong Liu
Jens M. Melenk
Yiwei Li
Changyi Chen
Jinshui Qin

Da-mu Cai
Jian-Ming Xu
Mark Yarnisch
Susanne Brenner
Ch. Makridakis
Arup Mukherjee
Larry Bales
Xiaobo Liu
John Osborn
B. Kellogg
Mark Ainsworth.
Ricardo H. Nochetto
T. von Petersdorff
SHANGYOU ZHANG
Shimin Zhang
Benqi Guo
Howard Elman
X.-Z. Guo
Alan E. Berger
Jim Bramble

Titles of Talks

M. Suri — On the $L_2$ error in the presence of numerical Integration

T. Seidman — An approach to approximating a parabolic free boundary problem

B. Liu — The discontinous solution of steady state, linearized, viscous compressible flows

Likang Li — On the boundary layer of the Solution of various plate bending models

Craig Douglas — The effect of interpolation on the rate of convergence in two level algorithms for elliptic partial differential equations

Jim Douglas — Revised Darcy's Law and Model for Miscible Displacement in Porous Media

T. Strouboulis — Explicit Versus Implicit Residual Estimators

Z. Zhang — Uniform mesh refinement and reduced integration for piecewise quadrilateral elements

Jian-Ming Xu Numerical Approximation of the Dynamical Equations of Elastic Rods.

Susanne Brenner A Nonconforming Mixed Multigrid Method for the Pure Traction Problem in Planar Linear Elasticity

Xuejun Zhang Multilevel Schwarz methods for the biharmonic problem.

Xian-Zhong Guo Multilevel Preconditioners on Massively Parallel Computers

Howard Elman A Parallel Implementation of the hp-Version of the Finite Element Method

Jim Bramble A preconditioned Algorithm for Eigenvalue/Eigenvector Computation

Mark Ainsworth. "A Procedure for A Posteriori Error Estimation for h-p FEMs."

J. Z. ZHU 'Derivative Recovery techniques and a posteriori error estimator in the Finite Element Method'

Benqi Guo : Boundary element Solution for Transmission problems with piecewise analytic data

T. von Petersdorff : COMPUTATION OF VERTEX SINGULARITIES FOR 3D POLYHEDRA

Babuška What is better - the $Q(b)$ or $Q'(b)$ element ?

F. E. C

University of Delaware, New-ark,
Nov 6-7, 1992

The fall, 1992, circus was hosted by Peter Monk and held at the University of Delaware. The Monks hosted a wine & cheese reception, and dinner was held at the University faculty club. The fall colors in the surrounding countryside were very nice. The 19 talks finished at 3:30, the final talk being a brief discussion by Babuška on a number of iterations to convergence.

One November day we went off ~~on a lark~~
on a lark
To meet with the circus
in old New-ark
Exhausted with words
from the political campaign
We sought solace in math
and things of the brain,
Quaffed wine in the cell
of Peter the Monk
a pleasant diversion from a
day on our rumps.
We spoke of arcand
as that Irishman's beam
O'Shenko his name was,
and how it did seem
That nonlinear Galerkin was
wonderful strange,
Those eigenmodes split into
high and low-range,
And how, picking meshes
hlower, H cap
10,000 steps in just 3
could be zapped
So here's to Delaware's
famous Hens Blue
(May they never wind up in a
Terrapin stew)

And the famed University
in old New-ark
We'll come back again
to continue the lark.

attendees

B. Kellogg
[illegible] Seidman
Greg [illegible]
[illegible] B. Wahlberg
Douglas N Arnold
Bill Semper
Jinchao Xu
Shangyou Zhang
Jianjun Lu
Steve Serbin
[illegible]
Eun-Jae Park
Fabio Milner
Randolph [illegible]
Todd E Peterson
Donald A. French
Changyi Chen
Clemente A. S. Tomajune
Tad Janik
Brian von Petersdorff

Jie Shen
T. Strouboulis
Biyue Liu
Zhimin Zhang
Alan Berger
John Osborn
Gerard Richter
Wilhelm Syganow
Xuejun Zhang
Michael P. Chernesky
Yuwei Li
Felix C. J. [illegible]
Jens M. Melenk
Thomas J. Sorg
Stuart Spinner
Craig Douglas
Susanne Brenner
Peter Kloeden
Peter [illegible]
Andrew Atlas
[illegible]
[illegible] Garcia
Sean Jesse [illegible]

Hautao Ch

Jim Douglas S

Arup Mukherjee

Xun Jiang

Ricardo H. Nochetto

Frank Ihlenburg

Kang-Man Liu

Jinshui Qin

Jian-Ming Xu

Shirley Pomeranz

# Talks

| | |
|---|---|
| Douglas N. Arnold | $P_2$-$P_1$ Finite Elements for the Stokes Equations |
| Jinchao Xu | Two-grid finite element discretization for nonlinear PDE. |
| Donald A. French | Long Time Behavior of Finite Element in Time Approximations to Nonlinear Evolution Problems |
| Zhimin Zhang | Interpolation Properties of Some Derivative Recovery Techniques in the Finite Element Method. |
| John Osborn | Remarks on Mixed Finite Element Methods for Problems with Rough Coefficients |
| William G. Szymczak | Computational experience with some free surface problems. |
| Michael P. Chernesky | Costs of Solving the Discrete Convection-Diffusion by Relaxation Methods |

| | |
|---|---|
| Craig Douglas | Some remarks on completely vectorizing SOR methods with the natural ordering. |
| PETR KLOUČEK | DYNAMICS OF MARTENSITIC MICRO-STRUCTURE |
| PETER MONK | Yee's method for Maxwell's Equations |
| Eun-Jae Park | A mixed finite element for a strongly nonlinear second order elliptic problem. |
| Soren Jensen | Two-stage finite element method for Stokes problem [with A.K. Aziz]. |
| Jie Shen | Nonlinear Galerkin Method using Chebyshev & Legendre polynomials |
| T. Strouboulis | A Comparison Between Various Residual Error Estimators |
| T. VON PETERSDORFF | NUMERICAL INTEGRATION FOR BOUNDARY ELEMENT METHODS |
| Hae-Soo Oh | The finite element solutions of Elasticity problems containing singularities |

Bill Sempa — Numerical Approximation of the Vibrating Timoshenko Beam Problem.

Ricardo H. Nochetto — Pointwise a posteriori error estimates for elliptic problems on highly graded meshes.

Frank Illenburg — Adaptive Approaches in the Finite Difference Method

Ivo Babuška — Remarks on convergence of conjugate product method.

University of Maryland
April 16-17, 1993

about 43 people attended the spring meeting, and there were about 16 talks

Bad rains on Friday morning hampered some arrivals, and high water on Lake Cayuga thwarted the travel of the Cornellians. Dinner was at the Chef Secret restaurant, preceded by a party at the Kellogg's. The meeting was very ably coordinated by Alice Ashton.

under pressure from our peerless leader, R. Falk contributed the following:

Title: Is That the Whole Thing?
or
You Should Have Paid me By the Word

OK, Ivo, so its a little terse.
Be grateful you are getting any verse.

Attendees

Paul Ohlenburg
Thomas J. Stone
Xian-zhong GUO
[illegible]
Shangyou Zhang
Xuejun Zhang
Michael Plexousakis
Ch. Makridakis
Tobias von Petersdorff
Jens M. Melenk
Anja Lee
Alexandre FEDOSEYEV
Mark [illegible]
Biyue Liu
Xun Jiang
Fehr [illegible]
Yiwei Li
Michael P. Clemmesby
[illegible] J. Wu
[illegible]
Taïeb HADHRI
Todd E. Peterson
Hang-Nan Liu

B. Kellogg
Thomas J. Seidman
Susanne Brenner
Eun-Jae Park
Qi Chen
J. Z. ZHU
T. Stroubouls
Jens Hugger
Shirley Pomeranz
Alan Berger
J. Thomas King
Soren Jusen
Ricardo H. Nochetto
Richard S. Falk
Jae Ryong Kwon
Bruce Wade
Ulrich Rude
Peter Monk
Zhimin Zhang
Mohamed AMARA
Bei Wang
[illegible]
Steve Serbin
Sonia Garcia

Talks

- Numerical Study of the Solution to the Helmholtz Equation with High Wave Number by FEM
  Frank Ihlenburg, UMCP, IPST (with I. Babuška)
- A Frontal Solver for p-Version Finite element method (X. Z. Guo)
- Finite element methods for compressible Stokes equations (B. Liu)
- Effect of numerical integration for elliptic obstacle problems (X. Jiang)
- A p-Version FEM for one dimensional Plasticity Problem. (Y. Li)
- Mixed Finite Element Methods for Nonlinear Second Order Elliptic Problems. (E.-J. Park)
- Validation of Error Estimators by Numerical Method (T. Strouboulis)
- A dynamic mesh algorithm for the geometric motion of interfaces (R.H. Nochetto)
- A robust finite element method for Dirichlet problems on smooth domains (J.T. King)
- Derivation of Two Dimensional Plate models (R.S. Falk)

- Partially reduced integration technique in the FEM for the R-M Plate Model. (Zhimin Zhang)
- Extrapolation Techniques for Constructing Higher Order Finite Element Methods (Ulrich Rüde)
- Constitutive laws for cyclic shear for aluminum alloy 5454-H34
- Dimentional Reduction Method for Laplace equation (Kang-Man Liu)
- Preconditioned Iterative Solution Technique for FEM in CFD (Alexander FEDOSEYEV)
- Polynomial Interpolation of functions on a triangle (Qi Chen)

Cornell University

November 12–13, 1993

About 45 people attended the fall circus with 21 giving talks. Jim Bramble hosted a party at his home in honor of Al Schatz's 60th birthday. The food was so abundant and good that the usual circus dinner was unnecessary. The following poem was contributed by R. Faehr

A tribute to Al Schatz on the occasion of his 60th birthday

Don't worry - you don't look a day over 58.

He is a legend of the circus
For the amazing things he has done.
But I want to talk about Al the man,
And a friendlier man — there's none.

He will stop whatever he is doing
To discuss any mathematics with you.
And he has an endless supply of jokes,
In case you're feeling blue.

He has been my teacher,
My mentor, and my pal.
It is always great to come to Ithaca,
And a lot of the reason is Al.

attendees

Wei Yuan
John Osborn
Hans B. Wahlbin
Jie Shen
Zhimin Zhang
Xiaobing Feng
Kang-Man Liu
Uday Banerjee
B. Kellogg
Raytcho Lazarov
Joe Pasciak
Dick Ewing
Doug Arnold
Steve Serbin
Richard S. Falk
Manil Suri
Gerard Richter
J. Thomas King
Alfred Schatz
Felix Gilgen
Thomas J. Stone
Yiwei Li
Susanne C. Brenner
Stephen Vavasis

Jim Bramble
Craig Douglas
Jinchao Xu
Theofanis Strouboulis
Peter Monk
Tobias von Petersdorff
Stefan Sauter
Frank Brezzi
Uwe Schramm
Changzhi Chen
Zhiqiang Chen
Martin Hanke
Min Chen
Alexandre F. Madureira
Qijing Yue
Arup Mukherjee
Shangyou Zhang
Jinshui Qin
Richard Arlyp
Larry Bales
Lin Zhou
Feng Wang
Yimin Kang
Jianqun Lu
XUEJUN ZHANG

Talks

B. Kellogg - Driven cavity problem

D. Arnold - Locking free Finite elements for plates & shells

M. Suri - Mixed h-p finite element methods for elasticity problems.

G. Richter An Explicit finite element method for the wave equation

S. Brenner - Two-level additive Schwarz preconditioners for nonconforming finite element methods

C.C. Douglas - Numerical Solution of Flame Problems

L.B. Wahlbin Superconvergence via Symmetry.

B.H. Wade Uniform Power Boundedness and the Resolvent Condition in Banach Space

T. Strouboulis η% - Superconvergence by a computer based approach

T. VON PETERSDORFF WAVELET BASED BOUNDARY ELEMENT METHODS ON POLYGONS

S. Sauter A MULTIGRID METHOD FOR THE COMPUTATION OF THE EIGENMODES OF CLOSED WATER BASINS

U. Schramm Finite Element Mapping using B-Spline Surfaces and its Application for Shape Optimization

T.F. Chen — Weighted Least Squares Approximations to Nonlinear Hyperbolic Equations

Shangyou Zhang — Multigrid methods for negative order (Simple Layer Potential) operator

Jinshui Qin — Some new results on $Q^1$-$P^0$ element for Stokes equations

Xiaobing Feng — A Parallel Iterative Algorithm for Convection-dominated Equations

Jie Shen — Efficient spectral-Galerkin Method for some elliptic equations

~~Jianguo Lu~~

S. Vavasis — Stable numerical algorithms for problems with wild coefficients

Al. Schatz. A new approach to Superconvergence and extrapolation

Z. Zhang Derivative Superconvergence of the Rectangular finite elements for the Reissner-Mindlin plate.

I. Babuska Iterative correction method

Rutgers University
April 29-30, 1994

We convened at the Hill Center, Rutgers's campus, with R. Falk, Richter, & Vogelius as hosts. There were 22 talks, from 11:30 Friday afternoon, and ending about 4 PM Saturday evening. A fine banquet at the faculty club was held on Friday evening. About 45 people were in attendance.

# Busch, Cook-Douglass, and Livingston
## by Walt Whitman

School of the multi-valued campus
Slashed by the raging Raritan
Exit 9 off the fabled Pike
Home of luminaries Falk, Richter, and Vogelius
Venue of the spring '94 circus
I sing of you, O Rutgers

Here it was that Arnold's how'd his colors
and flex'd his hole-ed plate
(a plate off which he never ate!)
There were lectures chaotic, singing of
Nodes hanging, rods writhing, and
Oh- a talk singular, not null.
Learned scholars discussed the difference between one and
two dimensions

Errors were estimated, no
Meshes most subtly refined,
Metaphors and methods were
Well and stably mixed.

Bolstered by fine viands
And choice (New Jersey?) wines
The finite elementists withdrew
From the Garden State
To prepare for future glories.

# Attendees

Rick Falk

Michael Vogel

Susanne Brunner

Todd E Peterson

Mohammad Arsadzadeh

Hae-Soo Oh

A.K. Azb

Gerard Auchter

Craig Douglas

Soren Jensen

Alan E. Berger

Steve Serbin

Eun-Jae Park

Douglas N Arnold

QI Keith Chen

Zhimin Zhang

Theofanis Stroubouli

Shangyou Zhang

Jie Shen

Jinshui Qin

Rozita Lassaker

Xun Jiang

Maher Moakher

Peter Monk

Kang-Man Liu

Stefan Sauter

Feng Wang

Jingshen

Rolf Sterling

Biyue (Betty) Liu

Max Gunzburger

Hwan-Ho Kim

Jianqun Lu

Thomas J. Stone

Yinnei Li

Jens M. Melenk

Felix J. Santos

Changyi Chen

Kumara Jayasuriya

Bruce Wade

Sergey Asvadurov

John Osborn

Tobias von Petersdorff

Jian-Ming Xu

Uwe Schwarzer

[illegible]

# Talks

A Continuous Space-Time FEM for the Wave Equation
Todd E Peterson

A finite element + quadrature approximation for non-linear parabolic problems.
Mohammad ASADZADEH

The Method of Auxiliary Mapping For the Finite Element Solutions for Elasticity problems containing Singularities
Hae-Soo Oh

Semi-Chaotic Multigrid Methods
Craig Douglas

Analysis of Mixed finite element methods for generalized Forchheimer flow in porous media
Eun-Jae Park

Nonconforming Stokes elements and applications to Reissner-Mindlin plates
Douglas N. Arnold

Validation of recipes for the recovery of derivatives and stresses by a computer-based approach.
Theofanis Strouboulis

A class of pseudo-compressibility methods for the incompressible Navier-Stokes equations

Jie Shen

The Engineering Patch Test and the Inf-Sup Condition

Ravatt Narasimhan

Stabilization Techniques for the FEM appl. to the Helmholtz eq.
What is different in one and two dimensions?

Stefan Sauter

Numerical analysis of a phase relaxation model.

Xun Jiang

A finite element method for compressible Stokes equations

Bruce Kellogg, Biyue (Betty) Liu

A finite element formulation for Reissner-Mindlin plates

Rolf Stenberg

Algorithms for flow control problems

Max Gunzburger

Equilibria of closed elastic Rods.

Yinlei Li

Numerical Solutions of Parametrized Partial Differential Equations

Felix C. J. Santos

On the Smoothing Property of the Modified Crank-Nicolson Scheme for Parabolic Evolution Problems

Finite Element Method for Surface Diffusion Problems.

B. D. Coleman

R. S. Falk

M. A. Monkher.

Adaptive Mesh Refinement using quadrilateral elements with piecewise linear shape functions

Uwe Schramm, P. Möller, A. Tischer, Ch. Reinmann

I. Babuska The h-p Version in 3 dim.

Finite element methods for the time harmonic Maxwell equations

Peter Monk

Principles for the design of reduced shear elements for plate models

Manil Suri

Penn State University
November 4-5, 1994.

The Fall, 1994 Circus was held at the Penn State Scanticon hotel, part of the new research complex at Penn State. Fifty two Circus members attended with twenty-two talks. The traditional Friday night dinner was held at the Scanticon.

## Highlights of the Circus

Doug Arnold, having won best transparencies 12 times in a row, did not enter this years contest, being too busy with his duties as Circus host. It is not clear who won, but it was certainly not Bruce Kellogg, who despite the high quality of his mathematical results, apparently hasn't figured out how to even make transparencies. There was some good news to report at the Circus. Al Schatz, who came to the Circus having lost a logarithm, found it again at Penn State. And finally, despite his reputed God-like abilities in all fields, Joe Paterno, coach of the #1 ranked Penn State football team, did not show up at the Circus, apparently due to

the fact that he was not able to obtain any new results about finite elements. Well, it takes more than x's and o's to get by in finite elements, Joe. To be fair, I should say that Doug Arnold's claim that Joe didn't attend because the football team was playing an away game might possibly be true, since everyone did manage to get a hotel room.

Hey, so what is the answer now, already?
by R. Fair

"So the question is now."
That distinctive phrase
Reverberates through my brain.

"So the question is now,"
Our leader says,
And I listen intently again.

"So the question is now,"
He keeps on saying.
But my hopes are all in vain.

Because no one ever says,
"So the answer is now,"
And then goes on to explain.

Attendees

Pal R

Lawrence Cowsar

Dan B. Wahlbin

Theofanis Strouboulis

A.K. Aziz

Changzhi Chen

S.K. Zhang

Al. Schatz

Larry Bales

Rovat Narasimha

Don Estep

Ching L. Chang

Cleveland State University

Least-square FEM for incompressible flow with mass conservative. 11/4/94

Ragnar Winther

Peter Monk

Richard Falk

Jinchao Xu

Tobias von Petersdorff

Hae-Soo Oh

Douglas N Arnold

B. Kellogg

Bruce Wade

Todd E Peterson

Susanne Brenner

Uwe Schramm

F. Zhang

Dexin Xie

Jie Shen

Jinshui Qin

Yin Zhang

Joseph Jerome

John Osborn

Ling Shen

Hwan-Ho Kim

Arup Mukherjee

P.A. Grenaud

Luc Pauly

Uday Banerjee

Manikini

Christos Xenophontos

Yiwei Li

Jens M. Melenk

Thomas J. Stone

Johar Josibash

Kirill Pronistel

Chris Jacobs

Qijing Yue

Min Chen

Ricardo H. Nochetto

Shangyou Zhang

Zhimin Zhang

J. Z. Zhu

Maher Moakher

Feng Wang

# Talks

Lars B. Wahlbin. Superconvergence in 1-d problems.

Hae-Soo Oh: The Method of Auxiliary Mapping for FE solutions of Elliptic PDEs on Nonsmooth Domains in $\mathbb{R}^3$.

B. Kellogg & B. Liu, Penalized finite elements for compressible Stokes

Susanne Brenner: Preconditioning Complicated FEMs by Simple FEMs

Frank Ihlenburg: Error estimates for Galerkin FEM in the numerical computation of waves

Dexuan Xie: New Parallel Iteration Methods by Domain Decomposition

LAWRENCE COWSAR: Some Preconditioners for Hybrid Mixed Finite Elements

Jinshui Qin: Locking free quadrilateral elements for the Naghdi Shell.

Joseph Jerome: A quantum fluid model

P.A. Grenaud: A priori-a posteriori error estimates for conservation laws

Christos Xenophontos : An hp FEM for elliptic problems with boundary layers.

Theofanis Strouboulis : A-posteriori estimation of the pollution-error in finite element solutions of Laplace's and Helmholtz's equations
(w. Ivo Babuška, C.S. Upadhyay & S.K. Gangaraj)

Changzi Chen Asymptotic Convergence Rates of Kirchhoff Plates

Zohar Yosibash: Numerical Analysis of singularities for elliptic BVPs in 2-D.

Al. Schatz 1) pointwise error estimates.
2) asymptotic error expansion inequalities
3) Extrapolation in the F.E.M.

R.H. Nochetto : F.E.M.s for Curvature Driven Interfaces: Convergence Past Singularities

J. Z. Zhu Automatic Mesh Generation: Progress & problems

Zhimin Zhang Stability analysis of Wilson's element for Linear elasticity and Incompressible flow on General quadrilateral meshes

Shangyou Zhang: A family of Macro-mesh mixed Elements for the 3D Stokes equation.

Jinchao Xu Optimal preconditioning Technique for unstructured grids

Don Estep The computability of the Lorenz system

C.L. Chang Least-squares FEM for incompressible Flow with mass conservative