Interdisciplinary Symposium on Computational and Applied Mathematics

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Mathematical modeling, computer simulation, and numerical and computational mathematics have had a revolutionary influence on how scientific research is done. Every day new applications appear which demonstrate the dramatic increase in the role of computer simulation to model a variety of natural phenomena in order to both better understand them and to uncover new scientific principles and data. To explore these diverse topics, the need for interdisciplinary interaction and collaboration has become evident. These topics were the basis of an interdisciplinary symposium held at the University of Texas in April 1995.

The symposium brought together leading researchers to assess the increasing opportunities in scientific research on computational mathematics and computer simulation, including mathematical modeling using numerical methods, high performance computing for large-scale applications, specialized applications in biology, environmental studies, numerical science, penetration mechanics, and wavelets and image processing together with the role of computer simulations in engineering analyses, manufacturing, and design.
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INTERDISCIPLINARY SYMPOSIUM ON
COMPUTATIONAL AND APPLIED MATHEMATICS

FINAL REPORT

J. Tinsley Oden

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The University of Texas at Austin

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INTERDISCIPLINARY SYMPOSIUM ON COMPUTATIONAL
AND APPLIED MATHEMATICS

Mathematical modeling, computer simulation and numerical
and computational mathematics have had a revolutionary influence
on how scientific research is done. However, every day new
applications appear which demonstrate the dramatic increase in the
role of computer simulation and mathematical modeling for
engineering analysis, manufacturing and design, and the
unprecedented use of computer simulation to model a variety of
natural phenomena in order to both better understand them and to
uncover new scientific principles and data. To explore these diverse
topics, the need for interdisciplinary interaction and collaboration
has become evident. This special issue contains invited papers
embracing the main areas pertinent to mathematical analysis,
modeling, computer simulation, methodology, and algorithms. These
topics were the basis of an interdisciplinary symposium held at the
University of Texas in April 1995 to celebrate the inauguration of
the new Computational and Applied Mathematics Ph.D. Program and
the establishment of a new research center devoted to this area,
TICAM: The Texas Institute for Computational and Applied
Mathematics.

The symposium brought together leading researchers to assess
the increasing opportunities in scientific research on computational
mathematics and computer simulation, including mathematical
modeling using numerical methods, high performance computing for
large scale applications, specialized applications in biology,
environmental studies, material science, penetration mechanics, and
wavelets and image processing together with the role of computer
simulations in engineering analyses, manufacturing, and design.
This symposium was designed to help lay down specific directions
for interdisciplinary graduate research that incorporate
computational mathematics, and to provide a forum for a diverse
group of scholars and researchers in computational and applied
mathematics.
Many of the topics presented at the symposium (e.g. high performance computing, finite elements, object-oriented programming) are represented at national meetings as topic areas and there have been specialty conferences on, for example, wavelets; but the purpose at this symposium was to focus on the interdisciplinary aspects of the subject and to explore the interactions between these areas.

Invited papers presented at the Symposium were published in a special issue of *Journal of Computational and Applied Mathematics* 74 (1996) 1. The following is a list of papers published in this volume. An extra 100 copies of this volume have been ordered, but not received to date.

_A.N. Agarwal and P.M. Pinsky_
Stabilized element residual method (SERM): A posteriori error estimation for the advection-diffusion equation.

Computational methods for multiphase flow and reactive transport problems arising in subsurface contaminant remediation.

_O. Axelsson_
The stabilized V-cycle method

_I. Babuska, B. Andersson, B. Guo, J.M. Melenk and H.S. Oh_
Finite element method for solving problems with singular solutions

_Z. Bai, M. Fahey and G. Golub_
Some large-scale matrix computation problems

_R. Barrett, M. Berry, J. Dongarra, V. Eijkhour and C. Romine_
Algorithmic bombardment for the iterative solution of linear systems: A poly-iterative approach

Smoothing and accelerated computations in the element free Galerkin method

The effect of dissipation on solutions of the generalized Korteweg-de Vries equation

J.H. Bramble and J.E. Pasciak
Least-squares methods for Stokes equations based on a discrete minus one inner product

B. Engquist and O. Runborg
Multi-phase computations in geometrical optics

R.E. Ewing
Multidisciplinary interactions in energy and environmental modeling

T.J.R. Hughes and J.R. Stewart
A space-time formulation for multiscale phenomena

T. Karkkainen, P. Neittaanmaki and A Niemisto
Numerical methods for nonlinear inverse problems

J.T. Oden and Y. Feng
Local and pollution error estimation for finite element approximations of elliptic boundary value problems

A.L. Pardhanani and G.F. Carey
Efficient simulation of complex patterns in reaction-diffusion systems

S. Shaw, M.K. Warby and J.R. Whiteman
Discrete schemes for treating hereditary problems of viscoelasticity and applications

D.M. Young and D.R. Kincaid
A new class of parallel alternating-type iterative methods

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Randy Bank, University of California, San Diego
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