KTH Mechanics

SE-100 44 Stockholm, Sweden

Activity Report 2004

Contents

Preface

This report reflects the activities at KTH Mechanics during 2004. The report is less ambitious this year as compared to previous years and only includes fundamentals of the activities. For detailed reports on the research etc. the interested reader is referred to the KTH Mechanics web-information. However we have added information about responsible course leaders for the different courses, as well as more detailed information about the graduate students that are active within or connected to the department. Some more details about the economy is also added.

This year the publication and conference proceedings and presentation lists only include articles where the author address list contain KTH Mechanics, i.e. research carried out before coming to KTH Mechanics or adjoint scientists who report work carried out at their home institution are not included. Despite this the number of published articles has increased and this year 29 articles from work carried out at KTH Mechanics have been published, many in highly prestigious journals. Of the 29 published articles 15 are in cooperation with scientists outside the department. It is also noteworthy that 17 out 29 papers are fully or partially experimental. In addition to the published journal papers also about 25 papers in conference proceeding and a similar number of other conference presentations were made.

Stockholm, June 2005

Henrik Alfredsson, department chairman
Nicholas Apazidis, department vice chairman

1 Introduction

The Mechanics department (web address: http://www.mech.kth.se) has about 90 employees and during 2004 a turnaround of about 63 MSEK. It is host department for the Faxén Laboratory, a VINNOVA competence centre for the fluid dynamics of industrial processes.

During 2004 professor Arne Johansson was head of department ('prefekt') and prof. Gustav Amberg vice head up to July 31, whereafter they changed roles. The study rector ('studierektor') is Hanno Essén. From December 1, 2004 Gustav Amberg is Dean of the newly established School of Engineering Sciences and as a result of that Prof. Henrik Alfredsson was appointed prefekt from January 1, 2005. From the same date Nicholas Apazidis was appointed proprefekt.

During 2004 the department board consisted of: Nicholas Apazidis, Fritz Bark, Dan Henningson, Arne Johansson/Gustav Amberg (chairman), Lars Thor, Ingunn Wester, Peter Gudmundsson (prof. Dept of Solid mechanics, external board member), Johan Gullman-Strand (grad. stud. repr.) and an undergraduate student representative.

The teaching activities are comprised of courses in basic mechanics for almost all 4.5 year engineering programs at KTH, and a large number of higher level and graduate courses in many different aspects of mechanics of solids as well as of fluids.

A new International Masters Program in Engineering Mechanics was started during 2003. The second group started in August 2004. This is a joint effort with the Department of Solid Mechanics and is coordinated by Jean-Marc Battini.

The research activities can essentially be classified into major areas of "Fluid mechanics", "Theoretical and Computational mechanics", and "Biomechanics", although no strict boundaries exist between them. During 2004 there were more than 50 active graduate students enrolled in the graduate program. Six doctoral thesis defences and eight licentiate seminars were held during 2003.

The Faxén Laboratory (started July 1995) is directed by Professor Fritz Bark. The centre comprises activities at five different KTH departments, viz. 'Kemiteknik', 'Materialens Processteknologi', 'Mekanik', 'Pappers- och Massateknik' (now included in the Polymer and Fibre Technology department) and 'Hållfasthetslära', and 19 industrial partners. The activities are divided into the program areas of Electrochemistry, Material process technology and Paper technology.

KTH Mechanics has the coordinator role for the Nordic ERCOFTAC Pilot Centre. The coordinator was Professor Gustav Amberg. A number of partners from the different Nordic countries are members of the centre.

KTH Mechanics has gradually broadened its research profile. The aim is to have a strong basis in fundamental research in the general area of engineering mechanics and to have a good flexibility and width of application areas. The area of Biomechanics was defined as a strategically important area for the department, where we seek to expand the activities. One new researcher in biomechanics (Dr. Elena Gutierrez Farewik) has been employed during 2004.

Furthermore KTH Mechanics has employed two more research associates in fluid mechanics (Dr.

Luca Brandt and Dr. Jens Fransson). A new research position financed within the EU-project ECOTARGET was also filled (Dr. Fredrik Lundell).

During 2004 KTH Mechanics showed a deficit of 1.6 Msek. This was partly due to a delayed start of some EU-projects, but also due to the fact that the income from teaching was substantially less than the prognosis.

Personel related matters 2004 and miscellaneous

Arne Johansson was appointed secretary general for Natural and Engineering Sciences at the Swedish Research Council from July 1, 2004. He is still 25% at KTH Mechanics.

Gustav Amberg was appointed Dean of the School of Engineering Sciences from December 1, 2004.

Erik Lindborg's research was evaluated by VR in the report "International Evaluation of Meteorology in Sweden", and his research was graded as excellent.

Tony Burden was awarded the KTH president Gender Equality Award.

Nicholas Apazidis was awarded the F-students award "En fjäder i hatten" for his teaching on the F-program.

Henrik Alfredsson was awarded the Borelius medal for service to Engineering physics.

The 17th Nordic Seminar on Computational Mechanics was arranged by Prof. Anders Eriksson at KTH Mechanics, 15–16 Oct. 2004 with about 80 participants.

Dr. Luca Brandt and Dr. Jens Fransson were appointed as research associates ('forskarassistenter') in fluid mechanics

Dr. Elena Gutierrez Farewik was appointed as researcher in biomechanics.

Dr. Fredrik Lundell was appointed as researcher in fluid mechanics of paper making.

Assoc. Prof. Alessandro Talamelli (University Bologna) was appointed as 'guest lecturer'.

Dr. Ardeshir Hanifi (FOI) was awarded the Docent degree.

Nine new graduate students started.

Prof. Rolf Karlsson passed away on December 22, 2004 after a long illness. Rolf Karlsson has served as the chairman of the FaxenLaboratory since its start in 1995. He also was adjoint professor at the Department of Mechanics during the period 1995-2001.

Department meetings followed by dinner were held towards the end of the spring and fall semesters.

2 Personnel

Professors

- Henrik Alfredsson, PhD in mechanics, KTH 1983 and Docent there 1985. At KTH since 1977. Extra professor 1986 and professor in Fluid Physics 1989. Dean of KTH 1999 – Feb. 2003.
- Gustav Amberg, PhD in fluid mechanics, KTH 1986, Docent at KTH 1990. Professor in fluid mechanics 1999. At KTH since 1982. Department vice chairman until August 31, thereafter chairman. Dean of the school of engineering sciences, since December 1, 2004.
- Fritz Bark, PhD in Applied Mechanics at KTH 1974. Extra professor in Applied Mechanics 1979, professor in Hydromechanics, 1985, all at KTH. Director of the Faxén Laboratory.
- Anders Eriksson, PhD in steel structures, KTH 1981 and Docent there 1988. At KTH since 1976. Professor in structural mechanics 1992. Vice president of KTH since 1999.
- Dan Henningson. Ph.D. KTH 1988, Docent KTH 1992, Ass. Prof. Appl. Math. MIT 1988-1992, Adj. Prof. Mechanics (20%) KTH 1992-1999. Professor in fluid mechanics since 1999 (80% at KTH, 20% at FOI).
- Arne Johansson, PhD in mechanics, KTH 1983 and Docent there 1984. At KTH since 1977. Extra professor 1986 and professor in mechanics 1991. Department chairman until August 31, thereafter vice chairman. Appointed secretary general for Natural and Engineering Sciences at the Swedish Research Council (VR) since July 1, 2004 (75% at VR, 25% at KTH).
- Martin Lesser, Ph.D in Aerosp. Eng. 1966 at Cornell; Bell Labs 1966–71; Inst. Cerac in Lausanne 1971–75; 1975–84 docent and prof. at LuTH; 1984–87 Chairman and full prof. at Dept of Mech. Eng. & Appl. Mech. at Univ. of Penn.; 1987 professor in Mechanics at KTH.

Adjunct professors and guest professor

- Said Zahrai, PhD in Mechanics 1992, Docent KTH 1998, Employed 20% as Adj. Prof. in Fluid Mechanics at KTH (since April 2002) and 80% at ABB Corp. Res.
- Per-Olof Thomasson, PhD in 'Stålbyggnad' 1978, Docent KTH 1978. Employed 20% as Adj. Prof. in Applied Structural Mechanics at KTH (since October 2002) and 80% at Tyréns AB
- Laszlo Fuchs, Ph.D. in Gasdynamics 1977, Docent KTH 1980. Adj. prof. Applied CFD (50%), KTH 1989–1994 IBM Sweden (50%) 1989-1992. Prof. Fluid Mechanics LTH 1994–. Guest Prof. (20%) at the Mechanics Dept, KTH 1994–present.

Professor emeritii

- Bengt Enflo, PhD and Docent 1965 in theoretical physics, Univ. of Stockholm. Two years at Nordita and one year at CERN. 'Biträdande professor' at KTH since 1996. Formally retired in 2000, but still active in both teaching and research at KTH Mechanics.
- Stig Hjalmars

Senior Lecturers (in Swedish: lektorer)

- Nicholas Apazidis, PhD in mechanics, KTH 1985, Docent at KTH 1994. At KTH since 1977.
- Anthony Burden, PhD in applied mathematical physics, Univ. of Göteborg 1984.
- Ian Cohen, PhD and Docent 1982 in theoretical physics, Univ. of Stockholm.
- Anders Dahlkild, PhD in mechanics 1988 and Docent 1992 at KTH. At MIT Feb. –Dec. 1989. Vice director and scientific secretary of the Faxén Laboratory.
- Hanno Essén, PhD in theoretical physics Univ. of Stockholm 1979. Three years in England and Canada. Docent 1986. At KTH since 1988.
- Richard Hsieh, PhD in mechanics 1978, Docent at KTH 1980, at KTH since 1973.
- Arne Karlsson, TeknL.
- Göran Karlsson, PhD in quantum chemistry 1970 Univ. of Uppsala. Canada and US 1971. At KTH since 1973.
- Erik Lindborg, PhD in Mechanics KTH 1996, Docent at KTH 2001. Senior Lecturer in 'fluid mechanics with geophysical applications' since July 2002. At KTH since 1991.
- Arne Nordmark. PhD in mechanics 1992. At KTH since 1984. Docent 1999. Senior lecturer 2001.
- Christer Nyberg, PhD in mechanics 1979 KTH.
- Lars Söderholm, PhD and Docent 1970 in theoretical physics, Univ. of Stockholm. Two years at Nordita. At KTH since 1980.
- Lars Thor, PhD in mechanics at KTH 1973. At KTH since 1965.
- Karl-Erik Thylwe, PhD 1981 in theoretical physics, Univ. of Uppsala. Four years at Univ. of Kaiserslautern and Manchester. Docent 1987. At KTH since 1988.

Lecturers, research associates and researchers

- Jean-Marc Battini, PhD in Structural mechanics 2002, 'bitr. lektor' since 2002.
- Luca Brandt, PhD in Fluid mechanics 2003. Research associate ('forskarassistent') in fluid mechanics since March 2004.
- Geert Brethouwer, PhD in Fluid mechanics, TU Delft 2001. Research associate ('forskarassistent') since January 2003
- Jens Fransson, PhD in Fluid mechanics 2003. Research associate ('forskarassistent') in fluid mechanics since Sept. 2004.
- Elena Gutierrez Farewik, PhD in Orthopedics, Karolinska Institute 2003. Researcher in biomechanics since 2004.
- Fredrik Lundell, PhD in Fluid mechanics 2003. Post-doc June 2003-May 2004 at Commissariat à l'Energie Atomique (CEA) in Grenoble, France. Researcher in fluid mechanics of paper manufacturing since Sept. 2004.
- Barbro M. Klingmann, PhD in Fluid physics 1991. Postdoc at EPFL Lausanne and Novosibirsk 1992-94 and at Volvo Aero. 1994-1996. Docent at KTH 1996. Left KTH Mechanics July 2004.
- Gunnar Maxe, ('adjunkt')
- Gunnar Tibert, PhD in Structural mechanics 2002. Research associate ('forskarassistent') since January 2003.
- Nils Tillmark, PhD in Fluid mechanics 1995. Responsible for the department's lab. facilities.
- Michael Vynnycky ('förste forskare'), PhD Univ. of Oxford, Lecturer at Univ. of East Anglia, Norwich 1991-92, Extended research visits in Japan 1992-96, Docent at KTH 2002, at KTH since 1997.

Adjunct Lecturers

- Daniel Söderberg, PhD in Fluid Mechanics 1999. Adjunct lecturer in fluid mechanics with paper manufacturing application, since December 2002 (20% at KTH, 80% at STFI/Packforsk).
- Stefan Wallin, PhD in Fluid Mechanics 2000. Adjunct lecturer in fluid mechanics with turbulence modelling application, since January 2003 (20%, since Oct. 1 2004, 40% at KTH, 60% at FOI).

Guest researchers, post-docs

- *Guest lecturer*: Prof. Alessandro Talamelli, Univ. of Bologna, Italy (3 months)
- *Guest researcher*: Dr. Mihailo Jovanovic, University of California at Santa Barbara (3 months)
- *Guest professor:* Prof. Yoshiyuki Tsuji, Nagoya University (3 months)
- *Guest researcher*: Dr. Carlo Cossu, LadHyx, Ecole Polytechnique, Palaiseau (2 weeks)
- *Post-doc*: Dr. Philippe Brunet (Nov 2003–present.)
- *Post-doc*: Dr. Shuya Yoshioka (April 2002–April 2004.)

Technical and administrative staff

- Lars Bjernerstam
- Pär Ekstrand
- Marcus Gällstedt
- Ulf Landén
- Katti Lindfors
- Anne-Mari Olofsson
- Hans Silverhag (administrativ chef)
- Stefan Skult
- Viviana Wallin
- Ingunn Wester (chefsadm./personalansvarig)

Active graduate students at KTH Mechanics during 2004

Name	Affiliation	Adv.	Start	TeknL	TeknD
Daniel Ahlman	Mech	AJ/GB	07/2002		
Anders Ahlström	Mech	AE	02/2000	10/2002	
Erik Birgersson	Mech/FLA	MV	06/1998	02/2003	02/2004
Arnim Brüger	Mech	AJ/DH	10/2000	06/2002	06/2004
Mattias Chevalier	FOI	DH	08/1999	06/2002	12/2004
Carl-Ola Danielsson	Mech/FLA	AD	01/2001	11/2004	
Federica De Magistris	STFI	AE	02/2000	09/2003	
Veronica Eliasson	Mech	NA/NT	02/2003		
Johan Eriksson	Mech	AN	03/2002		
Luca Facciolo	Mech	HAL/NT	06/2001	11/2003	
Monika Fällman	Mech/FLA	FB/DS	04/2003		
Kazuya Goto	Mech	AE	09/2002		
Olof Grundestam	Mech	AJ/SW	09/2001	02/2004	
Johan Gullman-Strand	Mech	AJ/GA/SW	01/1999	06/2002	12/2004
Johannes Gårdstam	KIMAB	AE	07/2003		
David Hammarström	PFOY, Åbo	AD	03/2002	06/2004	
Sofia Heintz	Mech	AE/EG	07/2002		
Astrid Herbst	Mech	DH	03/2001	04/2004	
Jerome Hoepffner	Mech	DH	09/2001	09/2004	
Richard Holm	Mech	GA/DS	09/1999	06/2002	
Claes Holmqvist	Mech/FLA	AD	10/1999	10/2002	
Marko Hyensjö	Metso, Karlstad	AD	09/2001		
Thomas Hällqvist	Scania	LF	06/2000	05/2003	
Kenta Inagaka	Mech/FLA	SZ/MV	05/2004		
Nulifer Ipek	Mech/FLA	MV	11/1997	03/2002	
Stefan Ivanell	Mech/HGO	DH	10/2003		
Mattias Jansson	Mech	AE/GT	03/2004		
Robley Kisitu	Mech	AN	02/2003		
Jordan Ko	Mech/FLA	SZ	11/2004		
Jenny Kron	MPT/FLA	HF	12/2003	–	03/2004
Ori Levin	Mech	DH	06/2000	12/2003	
Yuan Lin	Mech	GA	01/2004		
Darja Ljubimova	Mech	AE	11/2002		
Ola Lögdberg	Scania	HAL/JF	09/2003		
Olivier Macchion	Mech/FLA	SZ	06/2002		
Linus Marstorp	Mech	AJ/GB	02/2004		
Davide Medici	Mech	HAL	01/2001	03/2004	
Do-Quang Minh	Mech	GA	02/2001	12/2003	12/2004

Name	Affiliation	Adv.	Start	TeknL	TeknD
Niklas Mellgren	Mech/FLA	MV	05/2003		
Gustaf Mårtensson	Mech/FLA	AJ/SW/GB	05/1999	02/2004	
Filli Nurhussen	Mech	AE	03/2002		
Linda Nylen	KET/FLA	GL	09/2002		
Lorant Olasz	Hållf/FLA	PG	01/2001	12/2004	
Erik Stålberg	Mech	DH/AJ	01/2003		
Olle Törnblom	Mech	AJ	01/2000	01/2003	
Carl-Gustav Unckel	Mech	DH	10/2004		
Roland Wiberg	Mech/FLA	FB/NL	09/1999	01/2004	–
Walter Villanueva	Mech	GA	02/2003		
Tom Wright	Mech	ML	10/1998	12/2001	
Espen Åkervik	Mech	DH	03/2004		
Krister Åkesson	PMT/FLA	BN	04/2002	10/2004	–
Ramis Örlü	Mech	HAL/NT	02/2004		
Jan Östlund	Mech/VAC	BMK	09/1999	06/2002	06/2004

3 Economy

A brief overview of the different categories of incoming resources to the department is given below for 2004. The sums do not include in-kind contributions and salaries for doctoral students employed outside KTH.

INCOME (in Mkr)

KTH Education (GRU)		**15.0**
KTH Research (FOFU)		**20.1**
External research		
VR	6.4	
STEM	4.2	
EU	1.2	
Vinnova (PSCI)	1.1	
SSF	1.0	
BiMaC	0.8	
Göran Gustafsson Foundation	0.7	
Scania	0.5	
Various	2.8	
Σ		**18.7**
FaxenLaboratory		
Vinnova	6.0	
Industry	3.2	
Mistra	0.9	
Σ		**10.1**
Grand Total		**63.9**

4 Teaching activities

4.1 Undergraduate courses

Program	Year	Course no.	Credit	Name	Responsible
Basic courses mechanics					
K	1	5C1102	4	Mechanics, Smaller Course	Lindborg
E	1	5C1102	4	Mechanics, Smaller Course	Hsieh
OPEN	1	5C1102	4	Mechanics, Smaller Course	Maxe
VBI	1	5C1103	6	Mechanics, Basic Course	Cohen
F	1	5C1103	6	Mechanics, Basic Course	Thylwe
I	1	5C1103	6	Mechanics, Basic Course	Apazidis
D	2	5C1105	4	Insights in Mechanics; Modelling and simulation	Lesser
ME	1	5C1106	4	Tillämpad fysik, mekanik	Maxe & Mårtensson
T	2	5C1111	4	Mechanics, Continuation Course	Nyberg
M	2	5C1112	6	Mechanics, Continuation Course	Thor
F	2	5C1113	4	Mechanics, Continuation Course	Apazidis
V	2	5C1114	4	Mechanics, Continuation Course	Essén
T	1	5C1130	6	Mechanics I	Nyberg
M	1	5C1130	6	Mechanics I	Hsieh
BD	1	5C1130	6	Mechanics I	Hsieh
P	1	5C1130	6	Mechanics I	Maxe
Advanced courses mechanics					
	3	5C1121	4	Analytical Mechanics	Essén
	4	5C1122	4	Continuum Mechanic	Söderholm
	4	5C1123	4	Math. Methods of Mechanics	Söderholm
	4	5C1400	5	Nonlinear Dynamics in Mechanics	Söderholm
	4	5C1902	4	Advanced Dynamics of Complex Systems	Thylwe
	4	5C1904	4	Advanced Modern Mechanics	Thylwe
	4	5C1980	4	Applied Mechanics	Enflo
Basic courses structural mechanics					
V	3	1C1103	5	Structural Mechanics III	Tibert
V	2	1C1109	5	Structural Mechanics I	Battini
V	2	1C1115	5	Structural Mechanics II	Eriksson
Advanced courses structural mechanics					
	4	5C1840	5	Structural dynamics	Battini
	4	5C1850	5	Finite element methods	Eriksson
	4	5C1860	5	Finite element method modelling	Eriksson

Basic courses fluid mechanics					
Program	Year	Course no.	Credit	Name	Responsible
T	2	5C1201	8	Fluid Mechanics with Thermodynamics	Karlsson
F	3	5C1202	4	Fluid Mechanics, Introductory Course	Bark
M	3	5C1921	4,5	Fluid Mechanics for Engineers	Amberg
Advanced courses fluid mechanics					
	4	5C1211	4	Vehicle Aerodynamics	Talamelli
	4	5C1212	5	Computational Fluid Dynamics	Henningson
	4	5C1213	2	Applied Computational Fluid Dynamics	Wallin
	3	5C1214	5	Fluid Mechanics, General Course	Henningson
	4	5C1215	5	Compressible Flow	Alfredsson
	4	5C1218	5	Turbulence	Burden

KTH Mechanics also gave the course 4C1120 Experimental methods in mechanics in cooperation with KTH Solid mechanics (2p each, with Alfredsson as responsible at KTH Mechanics).

4.2 Master thesis projects ('examensarbeten')

- Andersson, Andreas & Malm, Richard "Measurement evaluation and FEM simulation of bridge dynamics"(Examiner: A. Eriksson)
- Carlsson, Allan "Numeriska beräkningar av strömning i separatorinlopp" (Examiner: A. Johansson)
- Norlindh, Peter "Differenced GPS using nonsimultaneous measurements by applying extrapolations of the carrier phase observables"(Examiner: H. Essén)
- Spehr, Saskia "Proper orthogonal decomposition applied to turbulent separation" (Examiner: D. Henningson)
- Palmblad, Carl "Finite element modelling of wood cell deformation" (Examiner: A. Eriksson)
- Crnkovic-Dodig, Tvrtko & Erlandsson, Måns "Using adaptive systems in classical mechanics"(Examiner: H. Essén)
- Wester, Marcus "Finite element modelling of mast foundation and T-joint" (Examiner: A. Eriksson)
- Mattsson, Frida & Rissler, Lotta "Methods in practical design. Vertical loads; horizontal stability; flat slabs including punching"(Examiner: A. Eriksson)
- Frank, Cathrine "FEM modelling of train induced ground vibration from railway to house" (Examiner: A. Eriksson)

- Skött, Mats "Theory and dynamic model of guy loss for a guyed mast with modal analysis"(Examiner: H. Essén)
- Hinkelbein, Jan "Matrix analysis of some coupled damped vibration problems" (Examiner: H. Essén)
- Fallenius, Bengt "Modeling of heat transfer in the cathode of a polymer electrolyte fuel cell"(Examiner: M. Vynnycky)
- Vikblad, Johan "A study of nonlinear earthquake response analysis and a proposed model for slipping behaviour in two dimensions"(Examiner: A. Eriksson)
- Evegren, Philip "Numerical simulation of turbulent blood flow in an artificial heart" (Examiner: S. Zahrai)
- Xiao, Heng "A unified approach to a co-rotational framework for continuum elements" (Examiner: A. Eriksson)

4.3 Graduate courses

During 2003 the following graduate courses ('forskarutbildningskurser') were given (some of which were given in combination with the corresponding undergaduate course). In addition several reading courses were given.

- 1C5049 FEM modelling (Eriksson)
- 5C5001 General and analytical mechanics (Thylwe)
- 5C5045 Non-linear oscillations and dynamical systems (Söderholm)
- 5C5102 Problems in fluid mechanics (Alfredsson, Amberg)
- 5C5105 Fluid Mechanics, Advanced Course (Amberg, Henningson, Söderholm, Dahlkild)
- 5C5112 Turbulence (Johansson)
- 5C5113 Compressible Aerodynamics (Alfredsson)
- 5C5114 Numerical Methods in Fluid Mechanics (Henningson)
- 5C5135 Free boundary problems (Amberg)

5 Research activities

5.1 Doctoral theses defended 2004

Erik Birgersson

Thesis title: Mathematical modelling of transport phenomena in polymer electrolyte and direct methanol fuel cells
Date: February 4, 2004
Faculty opponent: Prof. Trung van Nguyen, The University of Kansas, Lawrence
Evaluation Commitee: Dr. Knut Beck, SINTEF Materials Technology, Trondheim, Dr. Mårten Behm, KTH, Dr. Ed Fontes, COMSOL
Main Advisor: Docent Michael Vynnycky

Jan Östlund

Thesis title: Supersonic flow separation with application to rocket engine nozzles.
Date: June 10, 2004
Faculty opponent: Prof. David S. Dolling, The University of Texas at Austin
Evaluation Commitee: Prof. Lars Davidsson, Chalmers, Prof. Torsten Fransson, KTH, Dr. Ardeshir Hanifi, FOI
Main Advisor: Docent Barbro M. Klingmann

Arnim Brüger

Thesis title: A hybrid high order method for simulation of turbulent flow in complex geometries.
Date: June 11, 2004
Faculty opponent: Bill Henshaw, Lawrence Livermore National Laboratory
Evaluation Commitee: Prof. Lars Davidsson, Chalmers, Prof. Gunilla Kreiss, KTH, Dr. J. Nordström, FOI
Main Advisors: Prof. Arne Johansson and Prof. Dan Henningson

Mattias Chevalier

Thesis title: Feedback and adjoint based control of boundary layer flows
Date: December 7, 2004
Faculty opponent: Prof. Jean-Marc Chomaz, LadHyX - Ecole Polytechnique, France
Evaluation Commitee: Prof. Lennart Löfdahl, Chalmers, Prof. Per Lötstedt, Uppsala University, Prof. Torsten Söderström, Uppsala University
Main Advisor: Prof. Dan Henningson

Do-Quang Minh

Thesis title: Parallel computations on fusion welding and floating zones
Date: December 15, 2004
Faculty opponent: Prof. Andreas Ludwig, Univ Leoben, Austria
Evaluation Commitee: Dr. Gunilla Efraimsson, KTH, Prof. Lars-Erik Lindgren, LuTU, Dr. Bo Rogberg, Sandvik
Main Advisor: Prof. Gustav Amberg

Johan Gullman-Strand

Thesis title: Turbulence and scalar flux modelling applied to separated flows
Date: December 17, 2004
Faculty opponent: Dr.-ing. Suad Jakirlic, TU Darmstadt
Evaluation Commitee: Dr. Peter Eliasson, FOI, Prof. Antti Hellsten, HUT, Dr. Christoffer Norberg, LTH
Main Advisor: Prof. Arne Johansson
Assisting Advisors: Prof. Gustav Amberg and Dr Stefan Wallin

5.2 Licentiate theses presented 2004

Roland Wiberg

Thesis title: A study of heat transfer from cylinders in turbulent flows by using thermochromic liquid crystals
Date: January 23, 2004
External examiner: Prof. Dan Loyd, Linköpings universitet
Main Advisor: Prof. Fritz Bark
Assisting Advisor: Prof. Noam Lior

Gustaf Mårtensson

Thesis title: Experimental and numerical study of turbulent flow in rotating ducts
Date: February 18, 2004
External examiner: Dr Björn Anders Pettersson-Reif, FFI, Norway & Chalmers
Main Advisor: Prof. Arne Johansson
Assisting Advisors: Dr. Geert Brethouwer and Dr. Stefan Wallin

Olof Grundestam

Thesis title: Development and analysis of turbulence models for flows with strong curvature and rotation
Date: February 19, 2004
External examiner: Dr Björn Anders Pettersson-Reif, FFI, Norway & Chalmers
Main Advisor: Prof. Arne Johansson
Assisting Advisor: Dr. Stefan Wallin

Davide Medici

Thesis title: Wind turbine wakes - control and vortex shedding
Date: March 25, 2004
External examiner: Prof. Jens Sørenssen, DTU, Copenhagen
Main Advisor: Prof. Henrik Alfredsson

Astrid Herbst

Thesis title: Studies of periodic excitation of a turbulent separation bubble
Date: April 29, 2004
External examiner: Prof. Lennart Löfdahl, Chalmers
Main Advisor: Prof. Dan Henningson

David Hammarström

Thesis title: A model for simulation of fiber suspension flows
Date: June 11, 2004
External examiner: PhD Tomas Wikström, Metso Paper, Sundsvall
Main Advisor: Docent Anders Dahlkild

Jerome Hoepffner

Thesis title: Control and estimation of wall-bounded flow systems
Date: September 6, 2004
External examiner: Prof. Alessandro Bottaro, University of Genova, Italy
Main Advisor: Prof. Dan Henningson

Carl-Ola Danielsson

Thesis title: Continuous electropermutation using ion-exchange textile
Date: November 19, 2004
External examiner: PhD Christoffer Sylwan, Kemiteknik, KTH
Main Advisor: Docent Anders Dahlkild

5.3 Publications and conference presentations during 2004

5.3.1 Papers published in archival journals and books

1. Battini, J.M. & Pacoste, C 2004 On the choice of local element frame for corotational triangular shell elements. *Commun. Numer. Meth. Engng.* **20**, 819–825.

2. Birgersson, E., Nordlund, J., Vynnycky, M., Picard, C.P. & Lindbergh, G. 2004 Reduced two-phase model for analysis of the anode of a DMFC. *J. Electrochem. Soc.* **151**, A2157–A2172.

3. Borg, K.I., Söderholm, L.H. & Essén, H. 2004 Response to "Comment on 'Force on a spinning sphere moving in a rarefied gas' and 'On the inverse Magnus effect in free molecular flow'" [Phys. Fluids 16, 3832 (2004)]. *Phys. Fluids* **16**, 3833–3833.

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5.3.2 Papers published in conference proceedings

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41. Evegren, P., Zahrai, S. & Alnajjar, A. Flow of blood in Aros-Heart, a Swedish total artificial heart. *Proc. 17th Nordic Seminar Comp. Mech.*, 15–16 Oct 2004, Stockholm, pp. 98–101.

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54. Törnblom, O., Herbst, A. H. & Johansson, A.V. 2004, Separation control in a plane asymmetric diffuser by means of streamwise vortices - experiment, modelling and simulation, *Proc. 5th Symp. Smart Control of Turbulence*, Feb. 29- March 2, 2004, Tokyo, pp. 1-6.

55. Tibert, G. 2004, Optimisation of pretensioned triangulated cable nets. *Proc. 17th Nordic Seminar Comp. Mech.*, 15-16 Oct. 2004, Stockholm, pp. 160–163.

5.3.3 Presentations at conferences

56. Alfredsson, P.H. & Tillmark, N. Instability, transition and turbulence in plane Couette flow with system rotation. (Invited talk) *IUTAM Symp., Non-uniqueness of solutions to the Navier-Stokes equations and their connection with laminar-turbulent transition*, 9-11 August 2004, Bristol.

57. Alfredsson, P.H. & Tillmark, N. Instability, transition and turbulence in plane Couette flow with system rotation. (Invited talk) *35th JAXA Workshop on Investigation and Control of Boundary-Layer Transition*, 30 Sept.-1 Oct. 2004, Tokyo.

58. Brandt, L. Numerical studies of streak instability in boundary layers. *IUTAM Symposium Laminar-Turbulent Transition*, 13-17 Dec. 2004, Bangalore.

59. Burden, T., Cohen, I., Dodd, D. & Karlsson, G. Tutoring in Mechanics at a Distance, *Third EDEN Research Workshop "Supporting the Learner in Distance Education and e-Learning*, March 2004, Oldenburg, Germany.

60. Burden, T. & Engström, M. Teamwork and Gender in Project-Based Learning. *CDIO International Workshop*, 13-14 Sept. 2004, Belfast.

61. Burden, T., Lundin, I. & Öhrman, A.-C. Tjejer, killar och lärare på T vid KTH (invited talk) Nationell Jämställdhetskonferens, Oct. 2004, Norrköping.

62. Chevalier, M. Linear control and estimation in boundary layer flows. *IUTAM Symposium Laminar-Turbulent Transition*, 13-17 Dec. 2004, Bangalore.

63. Enflo, B.O. 2004 Nonlinear standing and travelling waves in dissipative media. (Invited lecture) *27th Scan. Symp. Physical Acoustics*, Ustaoset, Norway.

64. Facciolo, L., Alfredsson, P.H. & Orlandi, P. The counter-rotating core of a swirling jet emanating from a turbulent rotating pipe flow. *APS-meeting, Div. of Fluid Dynamics*, 21-23 Nov. 2004, Seattle, USA.

65. Fransson, J.H.M. Experimental study of the stabilization of Tollmien-Schlichting waves by finite amplitude streaks. *IUTAM Symposium Laminar-Turbulent Transition*, 13-17 Dec. 2004, Bangalore.

66. Henningson, D.S. Thresholds and linear mechanisms in shear flow transition. (Invited talk) *IUTAM Symposium on Non-Uniqueness of Solutions to the Navier-Stokes Equations and their Connection with Laminar-Turbulent Transition*, 9-11 August 2004, Bristol.

67. Henningson, D.S. The application of optimal control to boundary layer flow. (Invited talk) *IUTAM Symp. One hundred years of boundary layer research*, 12-14 August 2004, Göttingen.

68. Henningson, D.S. Transient growth with application to bypass transition. (Invited talk) *IUTAM Symposium Laminar-Turbulent Transition*, 13-17 Dec. 2004, Bangalore.

69. Hoepffner, J.P.J, Chevalier, M., Bewley, T. R. & Henningson, D.S 2004, Linear feedback control of transition in shear flows. *IUTAM Symposium Laminar-Turbulent Transition*, 13-17 Dec. 2004, Bangalore.

70. Ko, J., Macchion, O., Zahrai, S, & Vomhoff, H. Numerical analysis of swirling turbulent pipe flow created by tangential inlets. *17th Nordic Seminar Comp. Mech.*, 15-16 Oct. 2004, Stockholm.

71. Ko, J. Numerical Simulation of Flow in a Through-Flow Cylindrical Hydrocyclone *Swedish Industrial Association of Multiphase Flow*, 21 Oct. 2004.

72. Nordmark, A. Grazing bifurcations of non-hyperbolic limit cycles in impacting systems. (Invited talk). *Piecewise smooth dynamical systems: Analysis, numerics and applications*, 13-16 Sept. 2004, Bristol, England.

73. Nordmark, A. Analysis of grazing bifurcations in impacting systems. *Bifurcations in Nonsmooth and Hybrid Dynamical Systems*, 21-22 Oct. 2004, Milan, Italy.

74. Shiomi, J. & Amberg, G. Stabilization of nonlinear thermocapillary oscillation by local heating. *APS-meeting, Div. of Fluid Dynamics*, 21-23 Nov. 2004, Seattle, USA.

75. Stålberg, E. High order accurate solution for flow past circular cylinder. *Int. Conf. Spectral and High Order Methods (ICOSAHOM)*, 21-25 June, 2004 Brown University, USA

76. Söderholm, L. Nonlinear acoustics to second order in Knudsen number without unphysical instabilities. *24th Int. Symp. Rarefied Gas Dynamics*, 10-16 July, 2004, Bari, Italy.

77. Tibert, G., 2004, Force density methods for form-finding of pneumatic structures. *2nd European Workshop on Inflatable Space Structures*, 21-23 June 2004, Tivoli, Italy.

78. Yoshioka, S. & Alfredsson, P.H. Control of turbulent boundary layers by uniform wall suction and blowing. *IUTAM Symposium Laminar-Turbulent Transition*, 13-17 Dec. 2004, Bangalore.

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5.4 Seminars at KTH Mechanics (not including licentiate seminars)

January 22 Erik Lindborg, KTH Mechanics
Simulations of the energy cascade in a strongly stratified fluid

January 29 Lars Arneborg, Göteborgs Universitet
The seiches in Gullmar Fjord

February 5 Trung van Nguyen, University of Kansas
Research on proton-exchange-membrane fuel cells at the University of Kansas

February 17 Olaf Marxen, IAG, Univ. Stuttgart
DNS of laminar separation bubbles: comparison with theory and experiment

February 26 Richard Holm, KTH Mechanics
On the settling of dilute rigid fibre suspensions

June 8 Alessandro Bottaro, University of Genova, Italy
Optimal and robust control of streaks in wall-bounded shear flows

June 9 Jerome Hoepffner, KTH Mechanics
Control and estimation of wall-bounded flow systems

June 9 David S. Dolling, The University of Texas at Austin
Unsteadiness of shock-induced turbulent boundary layer separation - An overview

June 10 Bill Henshaw, Lawrence Livermore National Laboratory
The fast solution of elliptic boundary value problems in complex geometry

August 20 Saskia Speer, TU Karlsruhe
Proper orthogonal decomposition applied to turbulent separation

August 30 G.M. Homsy, University of California at Santa Barbara
Some novel Marangoni flows

September 16 Mihailo Jovanovic, University of California at Santa Barbara
Input-output analysis of the linearized Navier-Stokes equations

October 5 Nobuhide Kasagi, University of Tokyo
Progress in the active feedback control of wall turbulence

October 5 Anders Eriksson, KTH Mechanics
Musculoskeletal biomechanics seen as applied structural mechanics

October 14 Veronica Eliasson, KTH Mechanics
Experimental investigation of converging shock waves

October 21 Mattias Chevalier, KTH Mechanics
Estimation and control of transition in wall-bounded flows

October 28 Davide Medici, KTH Mechanics
Comparisons between wind-turbine near wakes and discs

November 4 Philippe Brunet, KTH Mechanics
Instabilities and disorder in falling liquids

November 9 Karl-Erik Thylwe, KTH Mechanics
Ermakov-Lewis invariants - tools in the Regge-pole analysis of scattering

November 11 Luca Facciolo, KTH Mechanics
Swirling flows: DNS and experiments

November 16 Erik Birgersson, Institute of High Performance Computing, Singapore
Model development of stimuli-responsive hydrogels in micro-scale regimes

November 18 Daniel Ahlman, KTH Mechanics
Simulation of mixing in a plane compressible and turbulent wall jet

November 26 Shiho Tanaka, Tokyo University of Science
The flow structure and dynamic particle accumulation of thermocapillary convection in a liquid bridge

November 30 Minh Do-Quang, KTH Mechanics
Surface tension problems in liquid metal

December 2 Richard Holm, KTH Mechanics
Some aspects on mechanisms regarding fluid mechanics in papermaking

December 8 Jean-Marc Chomaz, LadHyX - Ecole Polytechnique, France
Instability of corotating vertical vortices in a stratified fluid: why strongly stratified turbulence is not similar to 2D turbulence

December 9 Jens H. M. Fransson, KTH Mechanics
Experimental study of the stabilization of Tollmien-Schlichting waves by finite amplitude streaks

December 13 Bengt Fallenius, KTH Mechanics
Modelling of heat transfer in the cathode of a polymer electrolyte fuel cell