

①

REPORT DOCUMENTATION PAGE

Form Approved
GSA No. 0704-0108

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Service, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0108), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE August 1981	3. REPORT TYPE AND DATES COVERED Final (30 June 81-29 June 1982)
4. TITLE AND SUBTITLE SUPPORT OF US DELEGATION TO FINITE ELEMENTS IN NONLINEAR MECHANICS (FENOMECH)		5. FUNDING NUMBERS 61102F 2307/B1	
. AUTHOR(S) J. Tinsely Oden			
. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) University of Texas at Austin Bureau of Engineering research Austin, Tx 78712-1085		6. PERFORMING ORGANIZATION REPORT NUMBER AFOSR-TR- 89-1640	
7. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) AFOSR BLDG 5L) BAFB DC 20332-6448		8. SPONSORING / MONITORING AGENCY REPORT NUMBER AFOSR-81-0237	
9. SUPPLEMENTARY NOTES DTIC ELECTE DEC 06 1989 S B D			
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution unlimited.		12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) The AFOSR grant provided travel funds for a group of American engineers and scientists who gave invited lectures at the FENOMECH '81 symposium, which represented the second international conference on finite elements in nonlinear mechanics held by West Germany during August 25-28, 1981. Nearly 5000 distinguished scientists representing 2 countries and four continents gathered to attend 24 main lectures and 20 submitted shorter contributions on nonlinear mechanics. The papers covered recent developments in the theory and practice of finite element methods for solids, structures, fluids, and thermodynamics. A lively and fruitful exchange of information took place between participants and lecturers. The meeting resulted in three special issues of the journal, Computer Methods in Applied Mechanics and Engineering, and was also published separately by the North-Holland Publishing Company, Amsterdam in a book entitled FENOMECH '81, and edited by J.S. Doltsinis, K Straub, and K J Willam.			
14. SUBJECT TERMS		15. NUMBER OF PAGES 23	
		16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT

NSN 7540-01-280-5500

Standard Form 298 (890104 Draft)
Prescribed by ANSI Std. Z39-18
278-01

89 12 05 114

AD-A216 044

*Symposium of U.S. Delegation to Finite
Elements in Nonlinear Mechanics (FENOMECH)*

Final Conference ...

to U.S. AIR FORCE OFFICE OF SCIENTIFIC RESEARCH

Contract AFOSR-81-0237

AFOSR-IX. 9-1640

The AFOSR provided travel expenses for a group of American engineers and scientists who gave invited lectures at the FENOMECH '81 symposium, which represented the second international conference on finite elements in nonlinear mechanics to be held by West Germany during August 25-28, 1981. Nearly 500 distinguished scientists representing 20 countries and four continents gathered to attend 24 main lectures and 20 submitted shorter contributions on nonlinear mechanics. The papers covered recent developments in the theory and practice of finite element methods for solids, structures, fluids, and thermodynamics. A lively and fruitful exchange of information took place between participants and lecturers. The meeting resulted in three special issues of the journal, Computer Methods in Applied Mechanics and Engineering, and was also published separately by the North-Holland Publishing Company, Amsterdam in a book entitled FENOMECH '81, and edited by J.S. Doltsinis, K. Straub, and K.J. Willam. This voluminous collection of papers, totalling over 1100 pages, is divided into three major parts. In Part I, there are four papers on computational mechanics of solids and fluids, three papers on stability analysis and four papers on buckling and post-buckling. Part II includes four papers on finite deformation elastoplasticity, three papers on plastic structures, three on inelastic problems, and four on fluid structure interaction. Part III includes two papers on general numerical methods, four on contact problems, three on computational techniques, two on plates and shells, and an additional five on nonlinear applications.

~~Approved for public release
distribution unlimited~~

There is probably no work published in the last five years that has a more impressive and useful collection of papers or which represents better the current state of the art in finite element analysis. Special mention is made of the support from the U.S. Air Force Office of Scientific Research, and without this support, this important meeting would not have been the success it definitely was.

Organizers of the meeting were John H. Argyris, University of Stuttgart, T.J.R. Hughes, Stanford University, J.T. Oden, University of Texas, K.S. Fister, University of California, and the late K. Washizu, University of Tokyo.

A list of participants at the meeting is attached. Also attached is a copy of the cover page of the Proceedings and a copy of the Table of Contents.



Accession For	
NTIS GRA&I	☒
DTIC TAB	☐
Unannounced	☐
Justification	
By _____	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	

FENOMECH '81

INTERNATIONAL CONFERENCE ON
FINITE ELEMENTS IN NONLINEAR MECHANICS

August 25 - 28, 1981

LIST OF PARTICIPANTS

Institut für Statik und Dynamik der Luft- und Raumfahrtkonstruktionen
Universität Stuttgart

ARGYRIS	J.H. UNIV.STUTTGART PFAFFENWALDRING 27 GERMANY	ISD 7000 STUTTGART 80
ARNESEN	A. A.S. COMPUTAS POSTBOX 300 NORWAY	1322 HOVIK
ARNOLD	J. UNIV.STUTTGART PFAFFENWALDRING 31 GERMANY	IKE 7000 STUTTGART 80
BARUSKA	I. UNIV.OF MARYLAND U.S.A.	INST.F.PHYS.SCI.& TECH. COLLEGE PARK, MD 20742
BAITINGER	K.E. UNIVERSITAET STUTTGART PFAFFENWALDRING 7 GERMANY	INST.F.MECHANIK(BAUWESEN) 7000 STUTTGART 80
BAKER	A.J. UNIV. OF TENNESSEE 317 PERKINS HALL U.S.A.	DEPT ENGR.SCIENCE & MECH. KNOXVILLE, TN 37916
BALASUBRAMANIAN	S. DAIMLER-BENZ AG POSTFACH 202 GERMANY	EKG 7030 STUTTGART 60
BALMER	H.A. UNIV.STUTTGART PFAFFENWALDRING 27 GERMANY	ISD 7000 STUTTGART 80
BATES	S.N. IMPERIAL COLLEGE 7 MONTANA ROAD ENGLAND	LONDON SW 7
BAUSINGER	R. T-PROGRAMM GMBH POSTFACH 3 49 GERMANY	7410 RUTLIN'EN
BECKER	E.B. TH DARMSTADT HOCHSCHULSTR. 1 GERMANY	INST F.MECHANIK 61 0 DARMSTADT
BELYTSCHKO	T.B. NORTHWESTERN UNIV. U.S.A.	DEPT.OF CIVIL ENG. EVANSTON, IL. 60201
BERGMANN	H.W. DFVLR POSTFACH 3267 GERMANY	33 0 BRAUNSCHEIG
BESNIER	F. CICI 35, RD BRUNE FRANCE	7568 PARIS CEDEX 14
BESTEK	H.D. UNIV. STUTTGART PFAFFENWALDRING 9 GERMANY	INSTITUT A F MECHANIK 7000 STUTTGART 80

13412

UNIV. STUTTG RT
FAFFENWALDRING 31
GERMANY

IMP
7100 STUTTGART 8

100

KRAFTWERK UNION AG
BERLINER STR. 295
GERMANY

ABT. R 143
6150 OFFENBACH/MAIN

101

UNIV. STUTTGART
FAFFENWALDRING 17
GERMANY

ISD
7000 STUTTGART 80

102

UNIV. STUTTGART
KEPLERSTR. 11
GERMANY

INST. F. TRAGKONSTRUKTIONEN
7000 STUTTGART 1

103

UNIV. STUTTGART
FAFFENWALDRING 7
GERMANY

INST. F. D. USTATIK
7000 STUTTGART 8

104

UNIV. STUTTGART
FAFFENWALDRING 7
GERMANY

ISD
7000 STUTTGART 8

105

AEROSPATIALE
B.P. 96
FRANCE

SURD V. SYSTEMES-SYG/TF
78 130 LES MURFAUX

106

VOLKSWAGENWERK AG
POSTFACH
GERMANY

FORSCHUNG U. ENTW. CKLUNG
3.00 WOLFSBURG 1

107

BROWN BOVERT & CIE.
POSTFACH 35
GERMANY

ABT. ZKM/C1
68 0 MANNHEIM

108

UNIV. STUTTGART
FAFFENWALDRING 7
GERMANY

ISD
7000 STUTTGART 8

109

UNIV. STUTTGART
FAFFENWALDRING 7
GERMANY

INST. F. HAUSTATIK
7000 STUTTGART 8

110

UNIV. DE LIEGE
RUE E. SOLVAY 2
BELGIUM

4 20 LIEGE

111

U.S. IMPERIAL COLLEGE
PRINCE CONSORT ROAD
ENGLAND

DEPT. OF AERONAUTICS
13 DON SW 7

112

UNIV. OF AKRON
U.S.A.

DEPT. OF CIVIL ENGINEERING
AKRON, OHIO 44325

113

G.M. GENERAL ATOMIC COMPANY
P.O. BOX 81608
U.S.A.

SAN DIEGO, CA 92138

CHRISTIANSEN	M.O. BRIGHAM YOUNG UNIV.	DEPT. OF CIVIL ENGINEERING PRIV. UTA- 34402
	U.S.A.	
CHRISTIANSEN	UNIV. STUTTGART FAFFENWALDRING 7 GERMANY	ISI 7000 STUTTGART A.
COMLSCURE	S.O. C.O.A. S.E.O. SACLAY FRANCE	01192 CIF FOR YVETTE
COOM	U.S. LOS ALAMOS NATIONAL LAB U.S. 707 1601 U.S.A.	7- 777 LOS ALAMOS NM 875 5
CORRAULT	AVIONS MARCEL BASSOULT A R. QUAT. CANNOT FRANCE	91 214 ST. LO
CRISFIELD	U.S. TRRL BENTHORN ENGLAND	PIECE DIVISION BARKSHIRE 1911 640
DESTOYNOER	S.O. E.O.F.O. D.E.A. RAY DU GL. LE GAULLE FRANCE	IV. TECH. INST. INTERPRET 51 40 CLIMONT
DIETRICH	UNIV. STUTTGART FAFFENWALDRING 7 GERMANY	ISI 7000 STUTTGART A.
DINKLER	U.S. TU BRAUNSCHEWIG BEETHOVENSTR. 11 GERMANY	INSTITUT FUR STATIK 3300 BRAUNSCHEWIG
DOLTSINIS	U.S. UNIV. STUTTGART FAFFENWALDRING 7 GERMANY	ISI 7000 STUTTGART A.
DONE	U.S. COMM. OF THE EUROP. COMM. APPLIED MECH. DIVISION ITALY	JOINT RESEARCH CENT. 21 20 ISSP (124)
EBERLE	UNIV. STUTTGART FAFFENWALDRING 7 GERMANY	ISI 7000 STUTTGART A.
EGGERS	U.S. FLVLP FLUGHAFEN GERMANY	NET F. STRUKTURMECHANIK 33 00 BRAUNSCHEWIG
EISEL	UNIV. DORTMUND LEHRSTUHL F. ST. U. B. STAHL- U. BAU POSTFACH 5 1500 GERMANY	45 00 DORTMUND
EISENGIEGLER	INST. F. TRAGWERK TRUMPTON KLEPSTR. 11 GERMANY	U.S. ST. U. B. STAHL- U. BAU 7000 STUTTGART A.

THOMAS	F.A. HO SCHULE D.BUNDESJEHR JERNER-HEISENBERG-WEG 39 8014 MUELLERG GERMANY	LUFT U. RAUMFAHRTTECHNIK
LONGSTON	A.S. SITEF JORN-Y	DIV. OF STRUCT. ENGINEERING 734 TRONHEIM
FRIST	L.J. HERATOON P.O. BOX 93244 NETHERLANDS	25 9 DE DE. HAAG
FAUST	UNIV. STUTTGART HAFFENWALDRING 27 GERMANY	ISD 7000 STUTTGART 80
FAZEL	A.M. ST. LUCIADAAL 1 NETHERLANDS	2914 AM CAPELLE A/D YSSEL
FOERSTER	UNIV. STUTTGART HAFFENWALDRING 21 GERMANY	INST. AERODYNAM. GASDYNAMIK 7000 STUTTGART 80
FOVIA	V.M. USSR ACADEMY OF SCIENCES INSTITUTSKAYA UL. 471 USSR	INST. THEORET. & APPL. MECH. 63090 NOVOSIBIRSK 90
FORTE	I. Y FE OF ISRAEL	HAIFA 372
FRIEDEL	G. HOECHST AG GER. 6821 GERMANY	ABT. F. PRÄT. MATHEMATIK 6211 FRANKFURT 80
FRIK	UNIV. STUTTGART HAFFENWALDRING 27 GERMANY	I.E. 7000 STUTTGART 80
FROMM	A. INST. F. THERMODYNAMIK DER HAFFENWALDRING 31 GERMANY	LUFT- UND RAUMFAHRT 7000 STUTTGART 80
GERREKENS	P. UNIV. OF LIEGE P.F. SOLVAY 21 BELGIUM	SPACE LABORATORY 4000 LIEGE
GOERNER	A. INST. F. VERFAHRENTHECHNIK HAFFENWALDRING 3 GERMANY	U. DAMPFKES ELVESEN 7000 STUTTGART 80
GOUDREAU	P.L. UNIV. OF CALIFORNIA P.O. BOX 808 U.S.A.	LAWRENCE LIVERMORE LAB. LIVERMORE, CA 94550
GRIEGER	I. UNIV. STUTTGART HAFFENWALDRING 27 GERMANY	ISD 7000 STUTTGART 80

GROTH	P. T-PROGRAMM GMBH POSTFACH 3 49 GERMANY	7410 REUTLINGEN
GRUBER	P. GESELLSCHAFT F. REAKTOR- GLOCKENGASSE 2 GERMANY	SICHERHEIT (GRS) MMH 5050 KOELN 1
HAASE	M. UNIV. STUTTGART PFAFFENWALDRING 27 GERMANY	ISC 7000 STUTTGART 80
HAEPFNER	L. UNIVERSITAET STUTTGART PFAFFENWALDRING 7 GERMANY	INST. F. B. USTATIK 7000 STUTTGART 80
HALLUX	J.P. COMM. OF THE EUROP. COMM. JOINT RESEARCH CENTER ITALY	APPLIED MECH. DIV. (E 424) 21 20 ISPRA
HANCK	C. TH DARMSTADT PETERSENSTR. 30 GERMANY	FACHBEREICH LEICH BAU 6100 DARMSTADT
HE	J. UNIV. STUTTGART PFAFFENWALDRING 27 GERMANY	ISC 7000 STUTTGART 80
HELFRICH	R. UNIV. STUTTGART PFAFFENWALDRING 7 GERMANY	ISC 7000 STUTTGART 80
HIBBITT	H.C. HIBBITT & KARLSSON, INC. 132 GEORGE H. COHAN BLVD. U.S.A.	PROVIDENCE, RI 02903
HINDENLANG	J. UNIV. STUTTGART PFAFFENWALDRING 7 GERMANY	ISC 7000 STUTTGART 80
HOFFMANN	A.A. C.E.A. C.E.N. SACLAY FRANCE	91190 CLIF SUR YVETTE
HOGGE	M. UNIV. OF LIEGE S.E. SOLVAY 21 BELGIUM	AEROSPACE LABORATORY 4000 LIEGE
HUGHES	T.O. STANFORD UNIVERSITY DURAND BLDG. RM 252 U.S.A.	DIV. PPL. MECH. STANFORD, CA 94305
HUGILL	M.C. A.M.T. (DUNFERMLINE) ST. LEONHARD'S HILL SCOTLAND	DUNFERMLINE FIFE
ISH	M. CENTURY RES. CENTRE CORP 103-THOME, HONCHO JAPAN	TOYO 13

JIA	UNIV. STUTTGART OLZGARTENSTR. 17 GERMANY	INST. F. UNIFORMTECHNIK 7000 STUTTGART 1
KAMEL	U.A. UNIV. OF ARIZONA COLLEGE OF ENGINEERING U.S.A.	AEROSPAC. & MECH. ENG. DEPT TUCSON, ARIZONA 85721
KARLSSON	L.A. UNIV. OF LULEA SWELEN	DEPT. OF MECH. ENGINEERING 95187 LULEA
KEY	S.W. SANDIA NAT. LABORATORIES J.S.A.	DIVISION 9531 ALBUQUERQUE, NM, 87109
KIENDER	UNIV. STUTTGART PFAFFENWALDRING 27 GERMANY	ISC 7000 STUTTGART 2
KIMURA	UNIVERSITY OF MITSUBISHI RESEARCH INST. -1 OHTA-MACHI 1-CHOME JAPAN	OHTE-MACHI BUILDING TOKYO
KIRCHGAESSNER	UNIV. STUTTGART PFAFFENWALDRING 27 GERMANY	ISC 7000 STUTTGART 2
KLEI-ER	POLISH ACADEMY OF SCIENCES UL. SWIETOKRZYSKA 21 POLAND	INST. OF FUND. TECHN. PS. 00-049 WARSAW
KNAFF	UNIV. STUTTGART PFAFFENWALDRING 27 GERMANY	ISC 7000 STUTTGART 2
KNEESE	UNIV. STUTTGART PFAFFENWALDRING 27 GERMANY	ISC 7000 STUTTGART 2
KNOBEL	MTU EUCHENWEG 4A GERMANY	847 KARLSFELD
KOENIG	UNIV. STUTTGART PFAFFENWALDRING 27 GERMANY	ISC 7000 STUTTGART 2
KOLLMANN	INST. F. MASCHINENELEMENTE UND FORDERTECHNIK LANGER KAMP 19 B GERMANY	330 BRAUNSCHWIG
KOMPNER	UNIV. STUTTGART PFAFFENWALDRING 27 GERMANY	INST. F. STATIK 7000 STUTTGART 2
KRAPOTH	A.R. RUTH AACHEN TEMPLERGRABEN 64 GERMANY	INST. F. TECHN. MECH. 5100 AACHEN

KROEPLIN	G.H. 10 BRAUNSCHWEIG BEETHOVENSTR. 31 GERMANY	INSTITUT FÜR STATIK 3300 BRAUNSCHWEIG
LARSEN	N.O. UNIV. OF TRONDHEIM RICH. BIRKELANDS VEI 1 A NORWAY	NORWEGIAN INST. OF TECH. 7014 TRONDHEIM - NTH
LEENHNS	M.J. TNO - IJECO LEECHWATERSTRAAT 5 NETHERLANDS	2600 AA DELFT
LEIPHOLZ	G.H. UNIV. OF WATERLOO CANADA	DEPT. OF CIVIL ENGINEERING WATERLOO, ONTARIO N2L 3G1
LI	V. UNIV. STUTTGART PFAFFENWALDRING 7 GERMANY	ISO 7000 STUTTGART 6
LING	UNIV. STUTTGART GERMANY	INST. F. MECHANIK 7000 STUTTGART
LISSENBURG	P.C. H.V. PHILIPS PROF. HOLSTLAAN NETHERLANDS	RESEARCH LABORATORY EINDHOVEN
MAHPENHOLTZ	G.H. UNIV. HANNOVER APPELSTR. 11 GERMANY	INST. F. MECHANIK 3000 HANNOVER
MAI	G.H. UNIV. STUTTGART PFAFFENWALDRING 7 GERMANY	ISO 7000 STUTTGART 6
MATIGUY	J.P. HEWLETT PACKARD GMBH HERRENBERGERSTR. 103 GERMANY	POB 10 7011 EBLINGEN
MAKRIS	S. LYSSIKRATOUS 74 GREECE	ATHEN-KALAMAKI
MALEJANNAKIS	G. UNIV. STUTTGART PFAFFENWALDRING 7 GERMANY	ISO 7000 STUTTGART 6
MAREZKA	G.R. UNIVERSITAET HANNOVER WELFENGARTEN 1A GERMANY	INST. F. UNIFORMTECHNIK 3000 HANNOVER
MARS-FY	S. 6 HAYDON WAY ENGLAND	LONDON N. 62
MASSON	J.C. CI I 35, RD BRUNE FRANCE	7508 PARIS CE 6

MATTHIES	M.G. GERMANISCHER LLOYD VORSITZEN 3. GERMANY	HAUPTVERWALTUNG HAMBURG 2 00 HAMBURG 1
MCGUIRE	M. CORNELL UNIVERSITY U.S.A.	SCHOOL OF CIVIL ENGG. ITHACA, NEW YORK, N.Y. 14850
MEIER	I.T. UNIVERSITAET STUTTGART PFAFFENWALDRING 7 GERMANY	INST. F. MECHANIK (BAUWESEN) 7000 STUTTGART 80
MENZ	UNIV. STUTTGART PFAFFENWALDRING 7 GERMANY	INST. F. MASSIVBAU 7000 STUTTGART 80
MESINA	M. FESTO MASCHINENFABRIK KG POSTFACH 6040 GERMANY	73 0 ESSLINGEN 1/BERKHEIM
MESKOURIS	M. RUHR-UNIV. BOCHUM UNIVERSITAETSSTR. 150 GERMANY	INST. F. KONSTR. IVG. 84. III 4630 BOCHUM 1
MEJNER	M.P. UNIV. STUTTGART PFAFFENWALDRING 27 GERMANY	ISO 7000 STUTTGART 80
MOLLESTAD	M. UNIVERSITY OF TRONDHEIM LICH. BIRKELANDS VEI 1A NORWAY	INSTITUTT FOR STATIK 7034 TRONDHEIM - NTH
MUEHLHAUS	M.G. TU KARLSRUHE POSTFACH 63 GERMANY	LEHRSTUHL F. FELSMECH. 7500 KARLSRUHE
MUELLER	M. CONTROL DATA GMPH BERG-AN-LAIM-STR. 47 GERMANY	DISTRIKT SUED 8000 MUENCHEN 10
MUTEGAAL	J.C. MARC ANALYSIS RES. CORP. 260 SHERIDAN AVENUE U.S.A.	PALO ALTO, CA 94304
NEIGHLUS	M. NRIMS - CSIR P.O. BOX 395 SOUTH AFRICA	PRETORIA 201
NEITZERT	T. UNIV. STUTTGART HOLZGARTENSTR. 17 GERMANY	INST. F. MECH. TECHNIK 7000 STUTTGART 1
NETZER	I. UNIV. STUTTGART PFAFFENWALDRING 9 GERMANY	INST. F. MECHANIK 7000 STUTTGART 80
NEUNER	C. INGENIEURBUERO PASSER ADAMGASSE 7A AUSTRIA	6020 INNSBRUCK

NGUYEN	T.N. CONTROL DATA GMBH STRESEMANNALLEE 30 GERMANY	PROFESSIONAL SERVICES 6900 FRANKFURT/M. 30
NGUYEN	T.C. EVT ENERGIE- UND JOHANNESSTR. 39-45 GERMANY	VERFAHRENSTECHNIK GMBH 7000 STUTTGART 1
NGUYEN-DUNG	L. UNIVERSITAET HANNOVER APPELSTR. 11 GERMANY	INSTITUT F. MECHANIK 3000 HANNOVER 1
NILSSON	L. TECHN.UNIV.OF LULEA SWEDEN	DIV.OF STRUCT.ENGN. 95 87 LULEA
NOLTE	L.P. RUHR-UNIVERSITAET BOCHUM UNIV.-STR.150 IA 3/125 GERMANY	LEHRSTUHL F.MECHANIK II 4630 BOCHUM 1
NOOR	L.K. GEORGE WASHINGTON UNIV. MAIL STOP 241 U.S.A.	NASA LANGLEY RES.CENTER HAMPTON, VIRGINIA 23665
ODEN	J.T. UNIV.OF TEXAS U.S.A.	TEXAS INST.F.COMP.MECH. AUSTIN, TEXAS 78712
ONATE	E. ETS INGENIEROS DE CAMINOS BURRIANA 29 SPAIN	VALENCIA -
OSMONT	O. ONERA AV.DE LA DIV. LECLERC FRANCE	CHATILLON/BAIGN UX 92320
OSTERRIEDER	P. UNIV.STUTTGART PFAFFENWALDRING 7 GERMANY	INT F.O. USTATIK 7000 STUTTGART 8
PAJARI	M. TECHNICAL RESEARCH CENTRE OF FINLAND VUORIMIEHENTIE 5 FINLAND	02150 ESPOO 15
PANOSYAN	G. NOVATONF 20,AV.EDOUARD HEPRIOT FRANCE	92350 LE PLESSIS-ROBINSON
PARISCH	M. UNIV.STUTTGART PFAFFENWALDRING 7 GERMANY	INT 7000 STUTTGART 8
PAUCHET	FR. CE	
PAUWELUSSEN	J.P. R.V.HERATOOM P.O.BOX 93244 NETHERLANDS	25 9 AE DE HAAG

PEF:UX	AVIONS MARCEL DASSAULT 8, QUAI CARNOT FRANCE	PREG ET AVIATION 9-214 ST. LOUD
PESTEL	E. ILTE HERREMAEUSER STR.10 3000 HANNOVER GERMANY	
PETERS	C. CONTROL DATA GMBH STRESEMANNALLEE 30 GERMANY	6000 FRANKFURT/H. 70
PIMENT:	P.H. UNIV.STUTTGART PFAFFENWALDRING 27 GERMANY	ISO 7000 STUTTGART 80
PIST:R	U.S. UNIV.OF CALIFORNIA U.S.A.	COLLEGE OF ENGINEERING BERKELEY, CA 9472.
PLATZ	C. OBERE HAUPTSTR. 11 GERMANY	7000 REMSH-LOEN -
POTERASU	J.F. POLYTECHNIC INST.OF JASSY DEPT.OF MECHANICS MODUL INDEPENDENTE 5 ROMANIA	6600 IASI
PRESEL	J. DATHLER-BENZ AG GERMANY	UNTERTUERKHEIM, 481.529F 7 00 STUTTGART 60
RADAU	D. DAIMLER BENZ AG POSTFACH 202 GERMANY	7 00 STUTTGART 60
RAFF	C. INST.F.TRACKONSTRUKTIONEN U.KONSTR.UIT ERKEN KOPPLERSTR. 11 GERMANY	7 00 STUTTGART 1
RAMM	F. UNIV. STUTTGART PFAFFENWALDRING 7 GERMANY	INST. F. B. STATIK 7000 STUTTGART 80
RANVACHER	F. UNIV.ERLANGEN MARTENSSTR. 2 GERMANY	INST.F.ANGEW.MATHEMATIK 8520 ERLANGEN
REIHE	UNIV.STUTTGART PFAFFENWALDRING 7 GERMANY	INST F. MASSIVBAU 7000 STUTTGART 80
RENFOLD	P. FIDES RECHENZENTRUM GMBH HOENCHSTR. 31 GERMANY	7000 STUTTGART 1
REUSCH	H. UNIV.STUTTGART PFAFFENWALDRING 31 GERMANY	IKK 7000 STUTTGART 80

RHEINHOLDT	U.C. UNIV. OF PITTSBURGH FAC. OF ARTS AND SCIENCES U.S.A.	DEPT. OF MATH. & STATISTICS PITTSBURGH, PA 15260
RICHARD	L. FRAMATOME TOUR FIAT FRANCE	92 84 PARIS LA DEFENSE
RIKS	L. NATIONAL AEROSPACE LAB. VOORSTERWEG 1 NETHERLANDS	NLR 407
RITSCHER	M. SIEMENS AG POSTFACH 32 40 GERMANY	ABT. E TDV 2 8530 ERLANGEN
RIVLIN	R.S. UNIV. HANNOVER PPPELSTR. 11 GERMANY	INST. F. MECHANIK 3000 HANNOVER 1
ROTHMERT	L. UNIV. HANNOVER CALLINSTR. 32 GERMANY	INST. F. STATIK 3000 HANNOVER 1
SAKAI	F. KAWASAKI HEAVY IND. 2-4-25 MINAMISUNA JAPAN	LTD. TOKYO ENGNG. OFFICE TOKYO 136
SAKUNAI	T. JAPAN ADVANCED NUM. IN. 1-71 NAKAMEGURO 1-CHOME JAPAN	TOKYO 153
SANDER	G. UNIV. DE LIEGE 21 RUE E. SOLVAY BELGIUM	INST. DE MECANIQUE 400 LIEGE
SAWOSZUK	L. POLISH ACADEMY OF SCIENCES UL. SWIETOKRZYSKA 21 POLAND	00-040 2A 1A1
SCHAPPHORST	T. VOLKSWAGENWERK GERMANY	FORSCHUNG IT - AS 3180 WOLFSBURG
SCHELKLE	L. SCHUBARTSTR. 57 GERMANY	7250 LEINBERG 1
SCHIEHLER	S.O. UNIV. STUTTGART HAFFENWALDRING 9 GERMANY	INST. F. MECHANIK 700 STUTTGART 8
SCHMIDT	A. HOCHTEMP. REAKTORBAU GMBH OTTLIED-DAIMLER-STR. 8 GERMANY	680 MANNHEIM 1
SCHMIDT	F. UNIV. STUTTGART HAFFENWALDRING 31 GERMANY	IME 7000 STUTTGART 80

THEILEMAN	L. UNIV. STUTTGART PFAFFENWALDRING 21 GERMANY	INST. AERODYN. U. GASDYNAMIK 7070 STUTTGART 8
THOMAS	G. UNIV. STUTTGART PFAFFENWALDRING 27 GERMANY	INST. F. MECHANIK (BAUWESE) 7000 STUTTGART 8
UEDA	Y. OSAKA UNIVERSITY YAMADA - KAMI, SUITA JAPAN	WELDING RESEARCH INST. OSAKA 565
VAN DER HEIDE	D.T. MARC ANALYSIS RESEARCH REDEWATER 26 NETHERLANDS	CORPORATION EUROPE 2715 CA ZOLTERMEER
VAN LAETHEN	P.A. K.U. LEUVEN VAAMSESTEENWEG 1 BELGIUM	3045 OUT-HEVERLEE/BELANDEN
VAN WYNGAARDEN	H. N.V. PHILIPS PROF. HOLSTLAAN NETHERLANDS	RESEARCH LABORATORY EINDHOVEN
VON MORISCO	G. BROWN BOVERI & CIE. POSTFACH 351 GERMANY	ABT. ZKN/C 68 0 MANNHEIM
WAG	UNIVERSITY OF TRONDHEIM RICH. BIRKELANDS VEI 1A NORWAY	INSTITUTT FOR STATIK 7034 TRONDHEIM - NTH
WASSERMAN	Y. BEN GURION UNIV./NEGEV P.O. 2053 ISRAEL	MECH. ENG. DEPARTMENT BEN SHEVA
WENDLER	S.A. GEORGIA INST. OF TECHNOLOGY 125 NORTH AV. N.W. U.S.A.	SCHOOL OF ENG. SCI. & MECH. ATLANTA, GEORGIA 3 332
WHITMAN	J.R. BRUNEL UNIVERSITY ENGLAND	INST. OF COMP. MATHEMATICS UX RIDGE, MIDDLESEX URB. 10H
WILLAM	G. UNIV. STUTTGART PFAFFENWALDRING 27 GERMANY	ISO 7070 STUTTGART 8
WILL	V.O. VOLKSWAGENWERK AG POSTFACH GERMANY	ABT. 7/FT-TH 3120 WOLFSBURG
WISSMANN	G. TH DARMSTADT PETERSENSTR. 30 GERMANY	FACHGEBIET LEICHTBAU 61 0 DARMSTADT
WU	G. UNIV. STUTTGART PFAFFENWALDRING 27 GERMANY	ISO 7070 STUTTGART 8

STAVRINIDIS	C.P. ESA / ESTEC NETHERLANDS	NOORDWIJK
STEIN	E.O. TU BRAUNSCHWEIG AUSS-STR. 1 GERMANY	LEHRSTUHL F. MECHANIK 33 0 BRAUNSCHWEIG
STESMUELLER	UNIV. STUTTGART RAFFENWALDRING GERMANY	INST F. BAUSTATIK 7000 STUTTGART 80
STEIN	UNIV. TU HANNOVER CALLINSTR. 32 GERMANY	LEHRSTUHL F. BAUMECHANIK 3000 HANNOVER
STOECKER	HOCHTIEF AG, AUT. KERNT. TECHN. INGENIEURBAU OCKENHEIMER LANDSTR. 24 GERMANY	6000 FRANKFURT A.M. 1
STOECKLIN	UNIV. STUTTGART RAFFENWALDRING 7 GERMANY	INST F. MECH. (BAUWESE) 7000 STUTTGART 80
STRAUS	UNIV. STUTTGART RAFFENWALDRING 7 GERMANY	ISO 7000 STUTTGART 80
STREINER	P.H. UNIV. STUTTGART RAFFENWALDRING 7 GERMANY	ISO 7000 STUTTGART 80
SJODODA	INST. F. BAUSTATIK U. VERST. KUNSTSTOFFE INNSBRUCK TECHNIKERSTR. 13 AUSTRIA	6 20 INNSBRUCK
SYMONIDIS	UNIV. STUTTGART RAFFENWALDRING 7 GERMANY	ISO 7000 STUTTGART 80
SZILARD	UNIVERSITAET DOPTMUND GERMANY	LEHRST. F. BAUTECH.-STATIK 46 0 DOPTMUND 50
SZIMMAT	UNIV. STUTTGART RAFFENWALDRING 7 GERMANY	ISO 7000 STUTTGART 80
TAKETA	CENTURY RES CENTRE CORP 103- HONE, HONCHO, JAPAN	TOYO 1 3
TALASLIDIS	INST. F. KONSTR. INGENIEURBAU POSTFACH 102146 GERMANY	LEHRSTUHL IV 4630 DOPTMUND 1
TAYLOR	U.C. UNIV. OF CALIFORNIA 721 DAVIS HALL U.S.A.	DEPT OF CIVIL ENGINEERING BERKELEY, CA 9472

SCHOLZ	P. UNIV.STUTTGART PFAFFENWALDRING 7 GERMANY	ISO 7000 STUTTGART 8
SCHREN	P. UNIV.STUTTGART PFAFFENWALDRING 7 GERMANY	ISO 7000 STUTTGART 8
SCHULZ	U.M. UNIV.STUTTGART PFAFFENWALDRING 27 GERMANY	ISO 7000 STUTTGART 80
SCHWEIZERHOF	K.M. UNIV.STUTTGART PFAFFENWALDRING 7 GERMANY	INST.F. BAUSTATIK 7000 STUTTGART 80
SCOTT	F.C. ATKINS RESEARCH AND WOODCOTE GROVE ENGLAND	DEVELOPMENT EPSON KT18 SEV
SEEDER	K.M. UNIV.STUTTGART.INST.F. PFAFFENWALDRING 57/VI GERMANY	THEOR.ET.U.ANGEW.PHYSIK 7000 STUTTGART 8
SEVENSTER	L. NORTH HOLLAND P.O. BOX 103 NETHERLANDS	PUBLISHING COMPANY 1.00 AC AMSTERDAM
SHILKRUT	B. BEN GURION UNIV./NEGEV P.O. BOX 653 ISRAEL	MECH ENGG. DEPT. BEER SHEVA 84120
SIEDEMUND	F. INST.F. KUNSTSTOFFPRUEFUNG U. KUNSTST FERRUDE PFAFFENWALDRING 32 GERMANY	7000 STUTTGART 8
SMITH	P.D. LAWRENCE LIVERMORE P.O. BOX 808, L-95 U.S.A.	NATIONAL LABORATORY LIVERMORE, CA 94550
SOPEK	UNIV.STUTTGART PFAFFENWALDRING 7 GERMANY	INST F. 2 SSIVBAU 7000 STUTTGART 8
SPECHT	P. TH DARMSTADT PETERSENSTR. 30 GERMANY	FACHBEREICH LEICHTBAU 6100 DARMSTADT
SPEIDEL	P. KES TALSTR. 7 GERMANY	6458 RODENRACH 2
SPRING	P.P. VOLKSWAGENWERK AG GERMANY	FORSCHUNG U. ENTWICKLUNG 3140 WOLFSBURG
STALHAYN	L.P. UNIVERSITAET HANNOVER WELFENGARTEN 1 A GERMANY	INST. F. UNIFORMTECHNIK 3000 HANNOVER 1

WUESTENBERG	4. UNIV.STUTTGART PFAFFENWALDRING 27 GERMANY	ISD 7000 STUTTGART 80
YAMADA	Y.Y. UNIV. OF TOKYO 22-1 ROPPONGI 7-CHOME JAPAN	INS.-OF IND.SCIENCE TOKYO 106
YANG	U.M. UNIV.OF MICHIGAN U.S.A.	DEPT.OF MECH.ENGINEERING ANN ARBOR. MI 48105
YOSHIDA	Y. TOKYO INST.OF TECHNOLOGY 12-1 U-OKAYAMA 2 CHOME JAPAN	DEPT.OF CIVIL ENGINEERING TOKYO 152
YU	. UNIV.STUTTGART PFAFFENWALDRING 7 GERMANY	ISD 7000 STUTTGART 80
YU	. UNIV.STUTTGART PFAFFENWALDRING 7 GERMANY	ISD 7000 STUTTGART 80
YURTSEV	U.O. PURDUE UNIV 799 WEST MICHIGAN STREET U.S.A.	SCHOOL OF ENGRG. & TECH. INDIANAPOLIS. IN 46202
ZHANG	4. UNIV.STUTTGART PFAFFENWALDRING 21 GERMANY	INST.F. AERODYN.U.GASDY.. 7000 STUTTGART 80
ZHU	4. UNIV.STUTTGART PFAFFENWALDRING 17 GERMANY	ISD 7000 STUTTGART 80
ZHU	. UNIV.STUTTGART PFAFFENWALDRING 7 GERMANY	ISD 7000 STUTTGART 80
ZHU	4. INST.F.THERMODYNAMIK D. GERMANY	LUFT-U.FLUHFAHRT. TOT. 7000 STUTTGART 80
ZHU	2. UNIV.STUTTGART GERMANY	INST. & F. MECHANIK 7000 STUTTGART
ZHUR	4. INST.F. VERFAHRENSTECHNIK UND DAMPKESSELWESEN PFAFFENWALDRING 3 GERMANY	7000 STUTTGART 80
ZWISCHER	. UNIV. STUTTGART PFAFFENWALDRING 7 GERMANY	7000 STUTTGART 80

FENOMECH '81

Proceedings of the 2nd International Conference on Finite Elements in Nonlinear Mechanics

August 25-28, 1981

Edited by
J. St. Doltsinis
K. Straub
K. J. Willam



1982

NORTH-HOLLAND PUBLISHING COMPANY
AMSTERDAM, NEW YORK, OXFORD

TABLE OF CONTENTS

Preface	v
Part I	
CHAPTER I. COMPUTATIONAL MECHANICS OF SOLIDS AND FLUIDS	
Recent natural formulations in nonlinear mechanics <i>J.H. Argyris, J.St. Doltsinis, K. Straub, P. M. Pimenta, Sp. Symeonidis and H. Wüstenberg</i>	2
Modelling of continuum mechanics problems with large deformations <i>V.M. Fomin, V.P. Shapeev and N.N. Yanenko</i>	157
Streamline upwind/Petrov-Galerkin formulations for convection dominated flows with particular emphasis on the incompressible Navier-Stokes equations <i>A.N. Brooks and T.J.R. Hughes</i>	199
On current aspects of finite element computational fluid mechanics for turbulent flows <i>A.J. Baker</i>	261
CHAPTER II. STABILITY ANALYSIS	
A formulation and solution procedure for post-buckling of thin-walled structures <i>Y. Yoshida, T. Nomura and N. Masuda</i>	285
Large deflection and post-buckling analysis of shell structures <i>T.Y. Chang and K. Sawamiphakdi</i>	311
CHAPTER III. BUCKLING AND POST-BUCKLING	
Stability and postbuckling analysis of nonlinear structures <i>E. Carnoy and G. Sander</i>	329
A creep type strategy used for tracing the load path in elastoplastic post-buckling analysis <i>B.-H. Kröplin and D. Dinkler</i>	365
On nonlinear membrane theory <i>Ph. Destuynder</i>	377
On the energy criterion in the context of plate stability <i>H.H.E. Leipholz</i>	401

Part II

CHAPTER IV. FINITE DEFORMATION ELASTO-PLASTICITY

Nonlinear matrices, their implications and applications in inelastic large deformation analysis

Y. Yamada 417

On the numerical implementation of inelastic time dependent and time independent, finite strain constitutive equations in structural mechanics

S.W. Key and R.D. Krieg 439

Different finite element approaches to large plastic deformations

O. Mahrenholtz 453

On the implementation of inelastic constitutive equations with special reference to large deformation problems

J.C. Nagtegaal 469

CHAPTER V. PLASTIC STRUCTURES

Studies on plastic structures: stability, anisotropic hardening, cyclic loads

M. Kleiber, J. A. König and A. Sawczuk 487

Yield surface applications in nonlinear steel frame analysis

J.G. Orbison, W. McGuire and J.F. Abel 557

A variational principle and an algorithm for limit analysis of beams and plates

W.H. Yang 575

CHAPTER VI. INELASTIC PROBLEMS

Accelerated solution techniques and concrete cracking

M.A. Crisfield 585

One-dimensional finite element analysis of thermal ablation with pyrolysis

M. Hogge and P. Gerrekens 609

Computational aspects of welding stress analysis

J.H. Argyris, J. Szimmat and K. J. Willam 635

CHAPTER VII. FLUID-STRUCTURE INTERACTION

Finite element methods with user-controlled meshes for fluid-structure interaction

T. Belytschko, D.P. Flanagan and J.M. Kennedy 669

An arbitrary Lagrangian-Eulerian finite element method for transient dynamic fluid-structure interactions

J. Donea, S. Giuliani and J.P. Halleux 689

Recent developments in large-scale finite element Lagrangian hydrocode technology

G.L. Goudreau and J.O. Hallquist 725

Large deformation inelastic analysis of impact for shipping casks <i>C.M. Charman, R.M. Grenier and R.E. Nickell</i>	759
 Part III	
CHAPTER VIII. NUMERICAL METHODS	
A fast pseudo-time integration scheme for the solution of the steady transonic flow problem <i>H.O. Yurtseven, C. Kuraca and A. Ecer</i>	787
An energy balancing method for large displacement analysis of structures <i>R. Szilard</i>	801
 CHAPTER IX. CONTACT PROBLEMS	
A numerical analysis of a class of contact problems with friction in elastostatics <i>L.T. Campos, J.T. Oden and N. Kikuchi</i>	821
Computation of the dynamic response of structures with unilateral constraints (contact) - comparison with experimental results <i>D. Osmont</i>	847
Calculation of impact-contact problems of thin elastic shells taking into account geometrical nonlinearities within the contact region <i>E. Stein and P. Wriggers</i>	861
Nonlinear dynamic analysis of submerged pipelines <i>E. Mollestad and P.G. Bergan</i>	881
 CHAPTER X. COMPUTATIONAL TECHNIQUES	
Computational error estimates and adaptive processes for some nonlinear structural problems <i>I. Babuška and W.C. Rheinboldt</i>	895
Solution of nonlinear structural problems using array processors <i>N. Sarigul, J. Maitan and H.A. Kamel</i>	939
On making large nonlinear problems small <i>A.K. Noor</i>	955
 CHAPTER XI. SHELLS AND FLATES	
Nonlinear analysis of elasto-plastic shells by hybrid stress finite elements <i>O.M. Eidsheim and P.K. Larsen</i>	989
Finite element analysis of plates with nonlinear properties <i>D. Harrison, T.J.W. Ward and J.R. Whiteman</i>	1019

Table of Contents

CHAPTER XII. NONLINEAR APPLICATIONS

Computer graphics displays of nonlinear calculations <i>H.N. Christiansen and S.E. Benzlev</i>	1037
A simple finite element for elastic-plastic deformations of shells <i>D. Talaslidis and G. Wempner</i>	1051
Tube collapse analysis using finite elements <i>A. Ricard</i>	1065
Non-linear analysis of prestressed plates <i>G. Swoboda and O. Neuner</i>	1073
The plastic node method: A new method of plastic analysis <i>Y. Ueda and T. Yao</i>	1089
Author Index	1105