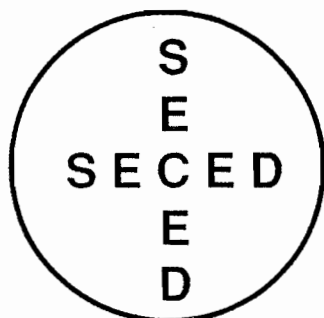


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THE SOCIETY FOR
EARTHQUAKE AND
CIVIL ENGINEERING
DYNAMICS



SECED NEWSLETTER

April 1989 Vo. 3 No. 2

IN THIS ISSUE

Special articles include a report on the Imperial College visit to Armenia and a note upon the roles of the British Geological Survey and the International Seismological Centre.

We would also wish to make special mention of Mr David Howells recent retirement from editorship and publisher of the SECED Newsletter. The Society owes David a considerable debt of gratitude for the services he has rendered not only as editor and publisher but as a past Chairman and as one of the members responsible for the formation of SECED.

A specific edition of the Earthquake Engineering and Structural Dynamics Journal containing the 1987 Mallet Milne lecture by Prof. N.N. Ambraseys is now available. If you wish to obtain a copy, details will be found at the back of this Newsletter.

Regular features

Letters to the Editor (Page 4)

SECED Meetings (Page 4)

Reports of past meetings and conferences with future dates to note.

Conference Calender (Page 7)

A selection of forthcoming international conferences upon Engineering Dynamics and related topics.

Publications and Book Reviews (Page 9)

A short list of publications relating to Earthquake Engineering and Structural Dynamics together with selected book reviews by our own members.

The SECED Newsletter is published four times a year by the SOCIETY FOR EARTHQUAKE AND CIVIL ENGINEERING DYNAMICS and is available to all members of the society. Articles for inclusion should be sent to The Editor, SECED Newsletter, C.R.Sharman, Allott & Lomax Fairbairn House, 23, Ashton Lane, Sale, Manchester, M33 1WP

Membership Notes (Page 12)

Details of present committee and working party membership together with a Society membership application form.

OUR NEXT ISSUE

Will contain a further report on the Armenian Earthquake based upon a visit to Armenia by a team of 19 U.S. earthquake experts in December of 1988.

CONTENTS

The Spitak (Armenia, USSR) earthquake of 7 December 1988

Summary report of the Earthquake Field Training Unit (EFTU), Imperial College.

Following the Spitak earthquake, and with the agreement of the Soviet authorities, Imperial College sent to the affected area a member of its Earthquake Field Training Unit (EFTU), J. Bommer, who spent two weeks surveying the damage. The ESEE section at Imperial College has produced a preliminary report on the seismicity of the area and on the effects of the Spitak earthquake, that may be summarized as follows:

The main shock occurred at 07:41:25 on 7 December 1988 with a preliminary epicentre 41.0°N, 44.2°E constrained to a focal depth of 10 km. The magnitudes of the event are $M_s = 6.7(\pm 0.3)$ and $M_s = 6.3(\pm 0.4)$ and the seismic moment is $1.1(\pm 0.6) \times 10^{26}$ dyn-cm. A second shock of $M_s = 5.9(\pm 0.4)$ followed four minutes later. The aftershock sequence is characterised by a large number of events of small magnitude. The earthquake was associated with a fresh fault-break, oblique (RL) thrust striking N70W, that can be followed on the ground for at least 12 km, showing the south-west block downthrown by about 70 cm on average (maximum 200 cm) and a maximum right-lateral slip of more than 100 cm. The fault plane dips to the NNE where all aftershocks have been located.

The earthquake triggered a number of accelerographs and seismoscopes. Peak horizontal acceleration was about 18%g and vertical 13%g.

The earthquake triggered many landslides and rockfalls, and caused slumping of the Leninakan-Kirovakan railway embankment as well as minor, sporadic liquefaction.

The main shock and its strong aftershock caused widespread damage associated mainly with the high vulnerability of certain types of construction. The intensity of shaking attenuates rapidly to the south and north of the fault-break but it extends more to the west with considerable damage in Turkey.

The EFTU report on the Spitak earthquake (ESEE Report No. 89/1) is available from Julian Bommer, Department of Civil Engineering, Imperial College, London SW7 2BU, for £10.00 (payable to 'Imperial College').

Other reports that are available from Imperial College include:

Ambraseys, N. (1986) UNESCO Earthquake Reconnaissance Mission Reports 1963-1981. ESEE Research Report No. 86/4a & 4b (2 vols. 800 pp.). £75.

Ambraseys, N. and Finkel, C. (1986) Regional Seismicity of the Eastern Mediterranean Region. ESEE Research Report No. 86/8a & 8b. £35.

Elnashai, A.S. and Pilakoutas, K. (1986) The Kalamata (Greece) Earthquake of 13 September 1986. ESEE Research Report No. 86/9. £9.

Ambraseys, N. (1988) The Seismicity of Saudi Arabia and Adjacent Areas. ESEE Research Report No. 88/11 (400 pp). £45.

Seismological Organisations

There is often confusion about the respective roles of different seismological organizations, and here in Britain particularly about the activities of the British Geological Survey and the International Seismological Centre.

The Global Seismological Unit of BGS, with headquarters in Edinburgh, is the governmental agency responsible for seismological monitoring and archiving in the United Kingdom. It operates a recording network at up to 80 individual sites, and is responsible for analysing the information from these and issuing statements to the public and scientific community about British earthquakes. It keeps a data base of British earthquakes, and also a file of global events. Although it does not directly locate earthquakes outside the British region, it contributes readings made in Britain of earthquakes elsewhere to international data centres to help in global location.

The International Seismological Centre at Thatcham, near Newbury in Berkshire, has quite a different function. It is not a British organization, but as its name implies an internationally controlled and funded body with the task of carrying out the final compilation of earthquake readings from throughout the world, and working out definitive locations. Similar work is done rapidly by the National Earthquake Information Centre of the US Geological Survey, who run a Preliminary Determination of Epicenters Service, which locates about 800 to 1000 earthquakes each month with a few months delay. ISC, on the other hand, waits 22 months before starting analysis, to ensure that all readings including those from remote areas are available, and its monthly lists generally comprise between 2000 and 3000 events.

ISC publishes a monthly bulletin with all station readings on which its analysis is based and also a six-monthly Regional Catalogue of Earthquakes which includes only origin information such as time, location and magnitude, and any available information on felt effects or damage. This is the ISC publication most in demand from engineering and insurance organizations. ISC maintains its own data base of world wide information, including an Historical File of instrumentally located earthquakes from 1904. This file is made available to agencies like BGS, and can be searched for earthquakes in a particular region or selected by other criteria such as time, size or felt effects. This service is used extensively by engineering organizations.

ISC does not undertake any seismological recording but collates information supplied to it by national agencies such as BGS. At present ISC is not involved in storing information on strong-motion recordings, but it supplies seismological information to agencies that do, such as the Department of Civil Engineering, Imperial College.

Within Britain, BGS and ISC have complementary roles. It is best to direct seismological enquiries regarding British earthquakes to BGS, while questions of a more global nature are best answered by ISC.

LETTERS TO THE EDITOR

As a footnote to the informed report upon the Armenian earthquake provided by Imperial College, we have received a note from Mr. John Colloff of BNFL Engineering which provides a lay view of the buildings in the earthquake. John had been in contact with Mr Tweedle, Chief Surgeon of Christies Hospital in South Manchester who was a member of the medical team sent to help survivors. Mr Tweedle reports to have noted that:-

- i) There were multi storey structures but no steel framing was evident.
- ii) Concrete could be 'crumbled in the hands'.
- iii) Concrete columns were noted which did not appear to contain a method of tying to vertical bars.
- iv) In noted instances, support to precast floor slabs appeared to rely on 100mm projecting reinforcement from concrete beams and columns.

Whilst authoritative interpretation of Mr Tweedles observations is naturally open to doubt, it is evident that the form of construction in the area has made some impact upon him.

SECED MEETINGS

Report on SECED Meeting of 25th January 1989.

PROGRESS in SOIL DYNAMICS

(Introduced by B. Skipp and C. Browitt)
(Reported by J.R. Maguire)

This half-day meeting was held in the Civil Engineering Department of Imperial College, London and attracted a large audience of approaching 70 people. Six presentations were made, based around current testing and analytical techniques.

The first presentation was entitled "Resonant Column Testing of Sand - A New Model" by Dr. Malcolm Bolton of the University of Cambridge. This SERC sponsored research covered questions such as what is a resonant column? What is the resulting data like? What are the soil parameters? How do they vary? Does strain rate matter? Subsequently hysteretic models, prediction of dynamic response, extension to analysis of foundations and conclusions were then examined.

The second presentation was entitled "Laboratory and In-Situ Tests" by Dr. Jim Bennell of the University of North Wales, Maritime Sciences Laboratory. A review of testing at the Menai Bridge over the last 25 years was made. The main area of interest was the engineering properties of soil gleaned from in-situ data, backed up by the laboratory work. Measurements of shear waves using various devices were described, as well as the use of pressuremeters, resonant column and crosshole devices.

The third presentation was entitled "Soil Testing Facilities for Earthquake Engineering" by Matthew Raybould of the University of Nottingham. Over the years a triaxial test facility has been developed, incorporating a digital servo-hydraulic control system. Parameters that can be measured include displacements (by LDVT), internal and base porewater pressure, back pressure, volume change, cell pressure and load. A current SERC project was outlined, looking at the Effect of Silt Content on the Dynamic Properties of Clay.

The fourth presentation was entitled "Site Response" by Dr. Jack Pappin of Ove Arup & Partners. The 1985 Mexico earthquake was studied, looking at how the earthquake motion was modified by the overlying soil deposits, leading to a spectral concentration of energy at 0.5Hz. A research exercise

at McMaster University, Ontario, was discussed, looking at soil stress/strain characteristics and their effects on different sites.

The fifth presentation was entitled "Ground Deformation" by Prof. Nick Ambraseys of Imperial College. The maximum amount of amplification that can be tolerated by a soil before "cracking" was discussed (post-yield behaviour of soils). Projects funded by the SERC and Brussels were outlined - including the flow of energy (flux) through recording stations. Ring shear test results were presented, as was a sliding block model of a slip circle. Research outside the quasi-elastic region was thought to be of importance. As an addendum, Dr. Tikka of Imperial College talked further about the ring shear apparatus results.

The sixth and final presentation was entitled "Seismic Bearing Capacity Factors of Shallow Strip Footings" by Dr. S.K. Sarma of Imperial College. After continued discussions concerning sliding blocks (as earlier outlined by Prof. Ambraseys and Dr. Tikka), Dr. Sarma outlined his concerns about the "Standard" bearing capacity formula, and the incorrect relationship between some of the parts. His own studies have led him to suggest a relation between N_c and N_q , and between N_g and K_c .

Post Meeting Note

The Society Committee would wish to confirm that the unfortunate cancellation of both the talk due to be given by Dr. R. Stubbs and the proposed demonstration of the Imperial College Strong Motion Data Bank were due to circumstances beyond their control.

Dr. Stubbs was required to be in attendance at the Hinkley 'C' Public Enquiry and Mr Bommer who was to provide the Data Bank demonstration, was still in Armenia.

Dr. Stubbs has however kindly offered to provide the substance of his talk in a future edition of this Newsletter.

We would also hope that demonstration of the Imperial College Data Bank may be arranged for a later meeting.

Report on SECED Meeting of 22nd February 1989

SEISMIC VULNERABILITY STUDIES OF MASONRY BUILDINGS

(Introduced by P.F. Sheppard, Institute for Structures,
Building Physics and Restoration, Ljubljana)

(Reported by Dr. David Key)

The seismic vulnerability of masonry buildings is of importance both to engineers and town-planning authorities. In many seismic regions most older residential buildings are constructed of unreinforced stone or brick masonry, and are subject to heavy damage or collapse in the case of strong earthquakes.

Thirty-one percent of the republic of Slovenia, northwest Yugoslavia, including the capital city of Ljubljana, lies in seismic zones of degree 8.0 and 9.0 on the MCS scale. These areas are inhabited by 44% of Slovenia's population, about half of whom live in "older buildings", i.e. those built before the first federal seismic code was introduced in 1964. The behaviour of these buildings in past earthquakes, together with extensive experimental investigations, have formed the basis for recent seismic vulnerability studies in the city of Ljubljana. Work so far carried out includes: (1) urban renewal studies, defining possibilities for improved building exploitation through aseismic repair and strengthening, (2) compilation of lists of more important "older buildings", assessing their vulnerability, (3) vulnerability studies of special categories of buildings, e.g. school buildings and unreinforced-masonry tower

blocks, and (4) parametric studies of the vulnerability and seismic risk to older residential and mixed-purpose buildings in individual planning-zones, taking into account population density.

The above-described work has been based on the results of extensive experimental studies of the structural properties of older masonry buildings, including tests of original and strengthened wall elements, model shaking-table tests, and forced-vibration and ambient-vibration tests of buildings to determine their dynamic characteristics.

The presentation described a methodology of vulnerability assessment for masonry buildings as part of an urban renewal programme. Some interesting approaches to testing masonry were described including large sample panels cut from existing stone masonry walls.

Methods of repair and strengthening buildings included the installation of horizontal steel tie bars, grouting and the use of foam concrete.

Report on SECED Meeting 15th March 1989

EUROCODE 8: STRUCTURES IN SEISMIC REGIONS

This meeting was held jointly by SECED and the Institution of Structural Engineers Vibration Group

SPEAKERS :

Dr. Bryan Skipp, Soil Mechanics Ltd
European seismology and ground motion

Dr. John Maguire, W.S. Atkins Engineering Services
Earthquake loading and analysis

Dr. John Mills, Allott & Lomax
Design and detailing of steelwork

Dr. David Key, CEP Research/Bristol University
Design and detailing of reinforced concrete

Dr. Skipp covered the present position with the code - a draft for comment is expected in June 1989, and this is likely to be very similar to a draft produced in May 1988 and given a restricted circulation. The assessment of hazard is the responsibility of individual nations, although the methodology to be used is not yet defined. In the UK the development of a hazard map is being handled by the DoE and is awaiting the award of a tender. It is considered unlikely that seismic design calculations will be required for normal buildings in the UK although building robustness regulations may need to be re-examined.

Dr. Maguire explained the philosophy of design adopted by the code, in particular the use of target reliability, the 'no collapse' requirement and serviceability limits. The code allows ground motion to be modelled as a response spectrum, time history or power spectrum. The use of the q factor covering ductility and energy absorbing capacity was explained and its effect on the derivation of equivalent static design forces. Analytical procedures and safety verifications were explained and typical loading calculations were presented.

Dr. Mills gave an overview of the steel design requirements. In particular the design of (energy) dissipative and non-dissipative structures was examined, and the differences in design forces (higher for non dissipative structures) and detailing requirements (more rigorous for dissipative structures). Some interesting and novel requirements for steel are the use of a 50% preload on high strength

friction grip bolts, the need to detail all connections on the drawings and the need for a quality assurance scheme covering construction standards.

Dr. Key explained the use of low, medium and high (L, M and H) behaviour (q factor) requirements for reinforced concrete building structures, and the parameters fed into the classification - including the use of capacity design, local ductility, redundancy, non structural components, regularity and method of analysis. Comparative tables of the L M and H design procedures for beams and columns were presented and the capacity design procedure explained. Novel aspects of the code are the inclusion of a ductile design procedure for shear walls and, as for steel, a quality assurance requirement. Dr. Key gave the view that the R.C. section of EC8 was complicated and almost unusable without a design manual.

(Reported by Dr. David Key).

CONFERENCE CALENDAR

Dynamics of Civil Structures 1989

Date unknown as yet

Stavebni ustav CVUT, Solinova 7,
16608 Praha 6 Czechoslovakia

Symposium on the Seismicity,
Seismotectonic and Seismic Risk
of the Ibero-Maghrebian Region

April 13-14 1989 Madrid

Prof. A. Udias, Catedra de Geofisica,
Ciudad Universitaria, 28040 Madrid, Spain

Engineering Seismology

16th May 1989

D.M. McCann, Regional Geophysical Research
Group, British Geological Survey, Keyworth,
Nottingham, NG12 5GG

(Tel: 06077 - 6111 ext. 3356)

(Further details of this meeting are given below)

2nd Mallett - Milne Lecture : Prof. G.W.

Housner "Coping with Natural Hazards"

24th May 1989

The Secretary, S.E.C.E.D., The Institution of
Civil Engineers, Great George Street,
Westminster, SW1P 3AA

International Symposium on Foundations for
Machines with Dynamic Loads

May 1989 Leningrad

Leningradski Promstroiproekt, 160 Leninsky
pr., 196247, Leningrad, USSR

International Conference on Earthquake
Resistant Construction and Design

June 13-16 1989 Berlin

Prof. S.A. Savidis, Grundbau Institu TU

Berlin, Sekr. B7 Str. des 17 Juni 135,
D 1000 Berlin 12, Tel: 030-31423321

10th International conference on
structural mechanics in reactor
technology

14-18 August 1989 Anaheim, Ca, USA
Asadour H. Hadjian, General Chairman,
SMIRT 10, Bechtel Western Power Company,
PO Box 60860 - Terminal Annex, Los Angeles,
California 90060, USA

IASPEI-CSMS Workshop/Symposium on
Estimation of Site Specific Ground
Motions for Large Earthquakes
August 22-30 1989 Istanbul
Prof. M. Erdik, Dept. of Civil Engineering,
Bogazici Uiv., 80815 Bebek, Istanbul, Turkey

Symposium on "Durabilite des Constructions"
to be held by IABSE (AIPC=Association
Internationale des Ponts et Charpentes)
6-8 September 1989 Lisbonne, Portugal
Secretariat de L'AIPC, ETH-Honggerberg,
CH-8093 Zurich, Suisse

15th Regional Seminar on Earthquake Engineering
September 1989 near Milan
Prof. A. Giuffre, Dipartimento di Ingegneria
Strutturale e Geotecnica, Universita di Roma
"Las Sapienza", Via A. Gramsci 53, 00197 Roma,
Italia

International Conference on Reinforced and
Prestressed Prefabricated Concrete Structures
in Seismic Areas
September 1989 Romania
Prof. A. Negoita, Polytechnical Institute,
Bd. Karl Marx 38, 6600 Lasi, Romania

IUTAM Symposium on Nonlinear Dynamics in
Engineering Systems
1989
University of Stuttgart, Pfaffenwaldring 9,
D-7000 Stuttgart 80, Germany FR

Ninth European Conference on Earthquake
Engineering
September 1990 Moscow
Dr. B.E. Denisov, Secretary-General
Organising Committee of the 9th ECEE, USSR
Societ Committee on Earthquake Engineering,

Gosstroy of the USSR 26, Pushkinskaya St.,
103828 Moscow, USSR

International Conference on Vibration
Problems in Engineering
6-9 June 1990 Nanjing, China
Prof. Zhu Demao, Chinese Society for
Vibration Engineering, Nanjing Aeronautical
Institute, 29 Yudao Street, Nanjing, China
(Telex 34155)

Further details of the meeting on Engineering Seismology are as follows:-

This is a joint meeting between the Geological Society and SECED at BURLINGTON HOUSE ON
16TH MAY 1989 STARTING AT 14.00

List of Papers

1. The prediction of near surface earthquake ground motion amplification using in-situ geophysical testing and non-linear stress-strain modelling.
P.D. Jackson and M.G. Raines
2. Stress-aligned fluid-filled microcracks throughout the Rock Mass allow stress to be monitored with seismic shear waves.
S. Crampin
3. Evaluation of liquefaction potential and other geotechnical seismic phenomena in New Zealand.
J.R.A. Gammon
4. Advances in soil dynamics
P.J. Eldred, R.M. Nisbet, D. Ricketts and B.O. Skipp
5. Instrumental seismology and seismic hazard in the UK today
B.O. Skipp, R. Aspinall and M. Richey?
6. Liquefied Quaternary deposits as strong motion records
P.S. Ringrose and C.A. Davenport
7. Dynamic Soil-Structure interaction analysis: an example benchmark test
J.R. Maguire

PUBLICATIONS

(* SECED and related)

1. ***"Directory of Practitioners in Earthquake Engineering and Civil Engineering Dynamics" (Issue No. 2, April 1988).
Price : £15.00 (Summer 1988) from Chris Sharman, Allott & Lomax
2. ***"Earthquakes & Earthquake Engineering in Britain"
(1st SECED Conference, 18-19 April 1985, University of East Anglia)

Price : £30.00 (Spring 1988) from Thomas Telford Limited

3. **"Civil Engineering Dynamics"**
(2nd SECED Conference, 24-25 March 1988, University of Bristol)
Price : £30.00 - pub. due Spring 1989 from Thomas Telford Limited
4. **"The Mexican Earthquake of 19 September 1985"**
(A field report by EEFIT)
Price : £25.00 (Autumn 1988) from Thomas Telford Limited
5. **"The San Salvador Earthquake of 10th October 1986"**
(A field report by EEFIT)
Price : £10.00 (1987) fro RPT or Julian Bommer, Imperial College
6. **"The Chilean Earthquake of 3rd March 1985"**
(A field report by EEFIT)
Price : £25.00 (Autumn 1988) from Thomas Telford
7. **"EEFIT Constitution and Aims and Methods" booklet**
Price : Free Order from Secretary, SECED
8. **"Earthquake Design Practice for Buildings"**
(ICE Design Series - author David E. Key)
Price : £35.00 (Spring 1988) from Thomas Telford Limited
9. **"Dams and Earthquake"**
(A conference held at the ICE 1-2 October 1980)
Price : £35.00 (Spring 1988) from Thomas Telford Limited
10. **"Earthquakes" (Bibliography 87/1)**
(Books, pamphlets & serial publications of interest to earthquake engineers)
Price : £8.00 (Spring 1988, to ICE members) from Thomas Telford Limited

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BOOK REVIEWS

Historical Seismograms and Earthquakes of the World. Papers presented at the Symposium on Historical Seismograms and Earthquakes, held August 27-28 1985, Yokyo, Japan edited by W.H.K. Lee, H. Meyers, K. Shimazaki.

Academic Press Inc 1250 Sixth Avenue, San Diego, California

This a lot of book, and good value at that. The 'rapid manuscript reproduction' gives you 513 pages with as much as 700 words on a page for the modest sum of £28.

The book includes 51 of the 60 papers presented at the symposium which was held during the General Assembly of the International Association of Seismology and Physics of the Earth's Interior (IASPEI). Papers are set in eight groups following an introduction (I) by W.H.K. Lee; II Analysis of Historical Seismograms, III. Earthquake Catalogues and Data Bases, IV. Individual Historical Earthquakes, V. Earthquake History, VI Seismicity and Tectonics, VII. Filming and Processing Historical Seismograms, and VIII. Historical Seismograms from Various Observatories. The editors recognize the problems in imposing order to the varied collection and have chosen to concentrate on

the less accessible pre 1963 seismograms.

The contributions vary in length from a pithy two pages by Ambraseys on magnitude fault length relationships in the Middle East to the meaty scholarship of the twenty pages by Ambraseys and Melville on the Eastern Mediterranean Earthquake of 20 May 1202.

Hiroo Kanamori contributes a thoughtful paper on the importance of historical seismograms with a useful appendix summarising the instrumental constants and amplitude response curves of nine historical seismographs.

Especially interesting to the SECED in this Mallet Milne Year is the paper by Katsuyuki Abe on the magnitude and origin times from the Milne seismograph for earthquakes in China and California between 1898 and 1912. These undamped instruments have been calibrated so as to give on average M_s values only 0.02 lower than values derived from damped seismographs responding to shallow earthquakes between 1910 and 1912, so extending the period of useful observations in the two regions back a decade bringing another thirty two Chinese events and another twenty one Californian events into play.

Deli Cheng, Yushou Xie and Zhifeng Ding contribute a catalogue of Chinese earthquakes (M_s 6.5) from 1900 to 1948 using an empirical expression relating magnitude to maximum recorded distance of P waves ultimately yielding a Unified Magnitude M_s .

Although there are several papers dealing with pre instrumental information the emphasis on methodology is largely confined to the papers on historical instrumental seismicity and the contributions and constraints of historiography are only touched upon.

Strong motion seismography is represented by a paper by Inoue and Matsumoto on the digitisation and processing of the JMA strong motion records in the period of 2 to 20 seconds from nine great earthquakes. It is rather a pity that there was not a paper on the reworking of some other more familiar strong motion records with benefit of hindsight but perhaps that seam has already been worked out.

The book is a treasure house to be dipped into; the reviewer has already made use of several papers and it is gratifying to see the weight of the UK presence with six contributions out of the fifty.

The papers are of a generally high standard, reflecting a proper refereeing procedure and the book is well produced with a dense but pleasing aspect and a useful index with more than 1200 main and sub entries.

"Stochastic Structural Dynamics - Progress in Theory and Applications"

Edited by S.T. Ariaratnam, G.I. Schueller and I. Elishakoff
(Elsevier Applied Science, 1988)

This book, which contains a series of original contributions in the area of Stochastic Dynamics, is dedicated to Professor U.K. Lin by some of his friends, colleagues and students on the occasion of his sixty-fifth birthday.

The eighteen papers which comprise the book are entitled:

1. Dynamic Snap-Buckling of Structures under Stochastic Loads.
2. Spatial Correlation in Structural Response to Wide-Band Excitation.
3. One-Dimensional Waves in Media with Slowly Varying Random Inhomogeneties.

4. On Randon Vibrations of Structures with Complicating Effects.
5. Stochastic Aspects of Structural Dynamics in Aerospace Vehicles.
6. Response of Linear Systems to Random Series and Filtered Poisson Processes.
7. Application of the Extended Kalman Filter-WGI Method.
8. Nonlinear Response Phenomena in the Presence of Combination Internal Resonance.
9. Multiple Response Moments and Stochastic Stability of a Nonlinear System.
10. Stability of Flexible Structures with Random Parameters.
11. An Algorithm for Moments of Response from Non-normal Excitation.
12. Nonstationary Response of Oscillators with Bilinear Hysterisis.
13. Non-Gaussian Response of Systems under Dynamic Excitation.
14. Stochastic Finite Element Analysis : An Introduction.
15. Noise Transmission through Nonlinear Sandwich Panels.
16. Lyapunov Exponents of Stochastic Systems and Related Bifurcation Problems.
17. Random Vibration Applications to Soil-Structural Problems.
18. Modal Analysis of Nonclassically Damped Structural Systems.

This book is aimed mainly towards researchers and educators, and may only be of limited appeal to practising engineers in the field of Stochastic Dynamics. At a price of £65 for 375 pages (A5 size) it is possibly best to look at a copy before purchase.

J.R. Maguire
February 1989

MEMBERSHIP NOTES

Committee 1988-89

Elected Members

Dr. W.P. Aspinall - Mass Data Systems

Dr. C.W.A. Browitt - British Geological Survey

Dr. J.R. Maguire - WS Atkins Engineering Sciences

Dr. D. Papastamatiou - Delta Pi Associates Limited

C.R. Sharman - Allott and Lomax

Dr. R.J. Stubbs - Health & Safety Executive

Representatives

Institution of Civil Engineers

Professor H.A. Buchholdt - Polytechnic of Central London

Institution of Mechanical Engineers

Professor G.B. Warburton - University of Nottingham

Institution of Structural Engineers

Dr. D.E. Key - CEP Research

Geological Society

Dr. D.M. McCann - British Geological Survey

Immediate Past Chairman

Dr. R.R. Kunar - BEQE

Co-Options

Dr. R.D. Adams - International Seismological Centre

E. Booth - Ove Arup & Partners

Dr. A.S. Elnashai - Imperial College

D.J. Mallard - CEGB

Dr. B.O. Skip - Soil Mechanics Limited

Dr. B.R. Ellis - Building Research Establishment

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Name (block capitals please) : _____

Home Address (block capitals please) : _____

_____ Telephone : _____

Name & address of organisation with whom employed (block capitals please) : _____

Decorations, Degrees, Diplomas, Membership of Professional Bodies : _____

Date of birth _____

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Name of Organisation (block capitals please) : _____

Address (block capitals please) : _____

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We, being Corporate Subscribers, do hereby nominate the three undermentioned individuals to be our Nominated Representatives under the Constitution.

Name (block capitals please) : _____

Home Address (block capitals please) : _____

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Name (block capitals please) : _____

Home Address (block capitals please) : _____

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Name (block capitals please) : _____

Home Address (block capitals please) : _____

_____ Telephone : _____

STUDENT MEMBER

Name (block capitals please) : _____

Home Address (block capitals please) : _____

_____ Telephone : _____

Confirmation of student status : (To be signed by tutor or supervisor)

I confirm that this applicant is currently a full-time student

Date _____ Signature _____

Institution and position _____

Current Rates (1988-89)

Individual : £10

Corporate : £50

Student : Free

Please return form to :

The Secretary
SECED
Institution of Civil Engineers
1-7 Great George Street
London SW1P 3AA
(01-630 0726)

For details of price and how to order please see over.

Robert Mallet and John Milne – Earthquake Incorporated in Victorian Britain (Essay)
R. MUIR WOOD

Engineering Seismology (The 1987 Mallet-Milne Lecture)
N.N. AMBRASEYS

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**Special Issue:
THE 1987 MALLET-MILNE LECTURE**

Volume 17

**EARTHQUAKE ENGINEERING &
STRUCTURAL DYNAMICS**

**EARTHQUAKE
ENGINEERING &
STRUCTURAL
DYNAMICS**

EARTHQUAKE ENGINEERING & STRUCTURAL DYNAMICS

Vol. 16, No. 1, January 1988

General Editor: Ray W. Clough
Associate Editor: Geoffrey B. Warburton

WILEY
Publishers Since 1807
A John Wiley & Sons Company
WILEY-INTERSCIENCE
Publishers Since 1867

Earthquake Engineering and Structural Dynamics

The Journal of the International Association for Earthquake Engineering

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