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Reader in Geotechnical Engineering

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About

David Chapman is a Reader in Geotechnical Engineering. His research interests lie in the area of underground construction (from pipelines to tunnels). He has published over 100 papers in both refereed journals and conferences. He has an international reputation in the area of trenchless pipeline installation and renewal and is a member of the Trenchless Engineering International Research Advisory Committee.

He has been involved with numerous grants from EPSRC and industry. In particular, he is currently co-investigator on the multi-disciplinary, multi-university EPSRC funded Mapping the Underworld project, and principal investigator on an industry funded project investigating Real Time Network Instrumentation for water pipes (Smart Pipes).

He has been lecturing for nearly 20 years in the area of soil mechanics and geotechnical engineering. He is also the co-author of a book 'Introduction to Tunnel Construction' aimed at MSc and MEng students or early career engineers.

Qualifications

- Fellow of the Higher Education Academy, 2007
- Membership of the Institution of Civil Engineers (MICE) and Chartered Engineer status (CEng), 1996
- PhD in Geotechnical Engineering, Loughborough University, 1993
- BSc (Hons) in Civil Engineering, Loughborough University, 1988
- DIS (Diploma of Industrial Studies), Loughborough University, 1988

Biography

David Chapman qualified with a first class BSc(Hons) degree in Civil Engineering in 1988. He then went on to work in industry as a structural engineer (Oscar Faber Consulting Engineers), before returning as a research associate at Loughborough University for three years investigating ground movements associated with trenchless technologies for installing and renewing pipelines. As a result of this research he was awarded a PhD in 1993.

After spending six years as a lecturer at the University of Nottingham (1992-1998), he moved to the University of Birmingham as a lecturer in 1998. He was promoted to Senior Lecturer in 2002 and then Reader in 2008.

He became a member of the Institution of the Civil Engineers (MICE) in 1996 and also a Chartered Engineer (CEng).

He is an associate editor of the journal Tunnelling and Underground Space Technology. He is also currently a member of the Géotechnique Advisory Panel.

He is a Fellow of the Higher Education Academy.

Teaching

Teaching Programmes

- MSc in Geotechnical Engineering
- MSc in Geotechnical Engineering and Management
- BSc and MEng in Civil Engineering

More specifically my teaching includes:

Second Year BEng/MEng

- Soil Mechanics and Geotechnical Engineering (20 credits, 60 % involvement, module leader)

Third Year BEng/MEng

- Foundation Engineering (10 credits, 50% involvement, module leader)

MSc in Geotechnical Engineering
MSc in Geotechnical Engineering and Management

- Introduction to Tunnel Construction (10 credits, 20% involvement)

- Site Investigation (10 credits, 100% involvement, module leader)
- Soil Mechanics (20 credits, 10% involvement)

Also, supervision of research project at both undergraduate and MSc level.

Postgraduate supervision

David Chapman has successfully supervised to completion 13 PhD and 2 MPhil students. He is currently supervising 8 PhD and 2 MPhil students in the following areas:

- The influence of archaeological residues on the electromagnetic properties of soils
- The influence of soil conditions on the electromagnetic properties of soils and the impact on geophysical techniques
- The effects on iron content in soils on electromagnetic properties
- Resilience of geotechnical assets
- Using GPR to assess the condition of buried assets
- Investigation of the electromagnetic properties of soils in order to facilitate surveys with GPR and other geophysical methods
- The use of DEM and CFD modelling to investigate the behaviour of soils around leaking pipes
  The use of geophysical techniques for monitoring ground improvement techniques
- Investigating the effect on HDPE plastic pipes of embedded silicon chips
- Engineering properties of glacial tills in Cumbria

He is interested in supervising doctoral research students in the following areas:

- Trenchless technology for pipeline installation and renewal
- Geotechnical controls on buried pipeline behaviour and leakage
- Soil-structure interaction problems related to ground movements resulting from soft ground tunnelling
- Influence of different soils on geophysical sensing technologies when locating buried utilities or archaeology
- Use of underground space – how can we make the underground space resilient and sustainable for the future and identify novel ways of using the space
- Novel sensing technologies for infrastructure monitoring (pipes, tunnels etc), such as Smart Pipes technology

If you are interested in studying any of these subject areas please contact David Chapman on the contact details above, or for any general doctoral research inquiries, please e-mail civil-research@contacts.bham.ac.uk

Research

RESEARCH THEMES

Mapping the Underworld
Smart Pipes
Trenchless Technology
Ground Movements Associated with Underground Construction
Buried Infrastructure

RESEARCH ACTIVITY

Mapping the Underworld

The Mapping the Underworld initiative was first initiated in 1996 when the term ‘Body Scanner in the Street’ was coined. This was followed with an EPSRC ideas factory in 2004 and the feasibility project started in 2005 investigating the abilities and limitations of a range of locating technologies to locate all buried utilities in all ground conditions, look at alternative technologies as well as investigate the mapping and data fusion of utility records. The feasibility study showed that a number of technologies have the potential to locate buried assets when used in combination and also combined with some information on the soil to optimise any survey strategies. This lead to the MTU Phase 2 Location project (2009-2012) with the focus of this project on the development of a multi-sensor device to locate all buried utilities in all ground conditions using Ground Penetrating Radar (GPR), low frequency electromagnetics, vibro acoustics and leakage current fields. In addition, the project aims to develop specifications for a National Test Facility and after presenting at the No Dig Roadshow in December 2009, a contractor came forward who had an interest in developing a UK test site and is now in the process of starting construction worth approximately £1.0m. The MTU idea is a 25 year vision with both condition assessment using a multi-sensor device and sustainable use of the underground infrastructure being addressed in the future.

Smart Pipes (Real Time Network Instrumentation)

The interest in monitoring and mapping of underground infrastructure led to a project in 2006 funded by UK Water Industry Research (UKWIR), the American Water Research Foundation (WRF) and the University of Birmingham on which Nicole was a co-investigator. The project (Real Time Network Instrumentation or Smart Pipes) researches smart sensor technologies using micro/nano sensors to investigate the condition of underground utility pipelines. These sensors would provide additional information on the condition of buried pipes so that any management strategies can be proactive. It culminated in the burial of a “Smart Pipe” demonstrator with successful data retrieval proving the concept of this approach. Follow on funding has been secured from UKWIR with Phase 2 starting in October 2010 and negotiations are underway with WRF for further follow on funding from next year’s budget allocations; the Americans are retaining a strong interest in this work.

Trenchless Technology, Ground Movements Associated with Underground Construction and Buried Infrastructure

Research in these areas has been a continuous theme of my research since my PhD research in this area. Projects have included:

- Investigating microtunnelling technology for boulder clays
- Remote positional control of steerable moles
- Ground movements associated with pipe splitting techniques
- Effects on tunnelling ground movements on existing tunnels
- Investigating horizontal directional drilling and impact moling
- Effect of tunnel-induced ground movements on existing tunnel linings
- Network in trenchless technology
- OFSTUNN: Optical Fibre Sensors for Tunnel monitoring

- Feasibility study on pipe failures in wet clay
- Tunnel installations and operating systems for buried high voltage cables
- Ground movements associated with twin tunnel constructions in clay
- Effect of soil conditions on leakage from cast iron water mains
- Resilience through innovation: critical local transport and utility infrastructure

Other activities

- Associate editor of the journal Tunnelling and Underground Space Technology
- Member of the Geotechnique Advisory Panel (2010-2012)
- Invited member of the Trenchless Engineering International Research Advisory Committee (TEIRAC)
- Member of the ITA/AITES (International Tunnelling Association) Working Group 2 on 'Research'
- Member of the British Geotechnical Association
- Member of the British Tunnelling Society

Publications

Book

Chapman DN, Metje N and Stark A (2010), 'Introduction to Tunnel Construction', Published by Taylor and Francis (416 pages)

Selected Journal Articles

Kolonko A.M., Metje N. , Chapman D.N. and Kukureka S.N. (2012) ' Tensile Properties of Polymer Samples Containing Millimetre Scale Silicon Microchips', Polymers & Polymer Composites, Vol. 20, No. 6, 505-516 .

Curioni G., Chapman D.N., Metje N., Foo K.Y., CrossJ.D. (2012) 'Construction and calibration of a field TDR monitoring station', Near Surface Geophysics, 10, 249-261, doi:10.3997/1873-0604.2011042

Cui X., Li J., Chan A.H., Chapman D.N., (2012) 'A 2D DEM–LBM study on soil behaviour due to locally injected fluid', Particuology, Volume 10, Issue 2, 242-252, doi:10.1016/j.partic.2011.10.002

Metje N, Chapman DN, Cheneler D, Ward M and Thomas AM, (2011) 'Smart Pipes – Instrumented water pipes, can this be made a reality?', Sensors 2011,11(8), 7455-7475; doi:**10.3390/s110807455 (http://dx.doi.org/10.3390/s110807455)** .

Madun A., Jefferson I., Chapman D.N., Culshaw M.G., Foo K.Y. and Atkins P.R. (2010), Evaluation of the multi-channel surface wave analysis approach for the monitoring of multiple soil-stiffening columns, Near Surface Geophysics, 8, 611-621.

Royal A.C.D., Riggall T.J. and Chapman D.N. (2010), Analysis of steering in horizontal directional drilling installations using down-hole motors, Tunnelling and Underground Space Technology, Special Issue on Trenchless Technology Research, 25, 754–765.

Royal A.C.D., Hunt D.V.L., Rogers C.D.F. and Chapman D.N. (2010), Numerical analysis to simulate the creation and performance of extruded concrete linings in microtunnelling, Tunnelling and Underground Space Technology, Special Issue on Trenchless Technology Research, 25, 745–753.

Holt D.G.A., Jefferson I., Braithwaite P.A., and Chapman D.N. (2010), Embedding Sustainability into Geotechnics: Part A methodology, Proceedings of the Institution of Civil Engineering Journal of Engineering Sustainability, 163, Issue ES3, 127-135.

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Thomas A.M., Chapman D.N., Rogers C.D.F., Metje N. (2010), Electromagnetic properties of the ground Part 1 – fine grained soils at the liquid limit, Tunnelling and Underground Space Technology, Special Issue on Trenchless Technology Research 25, 714-722.

Royal A.C.D., Polak M.A., Chapman D.N. and Rogers C.D.F. (2010), Estimating the Pull-in Forces Associated with Long Distance Horizontal Directional Drilling, Proceedings of the Institution of Civil Engineering Journal of Geotechnical Engineering, Vol. 163, Issue 3, 197-208.

Metje N., Little G.H., Kamtekar A.G. and Chapman D.N. (2008), Finding displacements from measured strains 2D frames, Proceedings of the Institution of Civil Engineering Journal of Engineering and Computational Mechanics, 161, Issue EM4, 157-167.

Valls-Marquez M., Chapman D.N. and Ghataora G.S. (2008), Preparation of Ko Consolidated Reconstituted Soil Specimens in the Laboratory, International Journal of Geotechnical Engineering Vol. 2, No. 4, 343-354. ISSN: 1938-6363.

Thomas A.M., Chapman D.N., Rogers C.D.F., Metje N., Atkins P.A. and Lim H.M. (2008), Broadband Apparent Permittivity Measurement in Dispersive Soils Using Quarter-Wavelength Analysis, Soil Science Society of America Journal, Vol. 72, No. 5, 1401-1409.

Metje N., Chapman D.N., Rogers C.D.F., Henderson P. and Beth M. (2008), An optical fibre sensor system for remote displacement monitoring of structures – prototype tests in the laboratory, Structural Health Monitoring Journal, Vol. 7, No. 1, 51-63.

Chapman D.N., Rogers C.D.F., Burd H.J., Norris P.M. and Milligan G.W.E. (2007), Research needs for new construction using trenchless technologies, Tunnelling and Underground Space Technology, Special Issue Trenchless Technology Research, Vol. 22, No. 5-6, 491-502.

Chapman D.N., Ahn S.K. and Hunt D.V. (2007), Investigating ground movements caused by the construction of multiple tunnels in soft ground using laboratory model tests, Canadian Geotechnical Journal, Vol. 44, No. 6 June, 631-643.

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