

CURRICULUM VITAE

NAME	TYRER, Mark	YEAR OF BIRTH	1960
NATIONALITY	British	PROFESSION	Geochemist
CONTACT DETAILS	18 Lothair Road, Ealing, London W5 4TA	TELEPHONE	+44(0)7976 758 707 (M) +44(0)20 8567 1145 (H) +44(0)20 7594 5998 (W)
		e-mail	m.tyrer@mtyrer.net on MIRO business: m.tyrer@miro.co.uk
		MARITAL STATUS	Married, one son

SPECIALISATION Near Field geochemistry; Geomaterials, Environmental Engineering: Applied Cement and Clay chemistry; Application of these disciplines to waste management and resource efficiency

QUALIFICATIONS B.Sc., Geology; University of Liverpool (1982)
M.Sc., Radiochemistry; University of Salford (1985)
Ph.D., Cement chemistry; Aston University (1992)
AMI Geol. (Associate of the Institution of Geologists) (1985)
FGS (Fellow of the Geological Society) (transfer 1992)

KEY EXPERIENCE

Research into geomaterials, especially as they apply to the management of wastes. In particular, the hydration chemistry and leaching behaviour of blended cement systems, chemistry of waste encapsulation grouts, degradation mechanisms of cementitious materials, groundwater-rock and groundwater-cement interactions. Analysis by XRD, FTIR, ICP, AAS, GCMS, HPGC, HPLC, HPIC, DTA/DSC, TG/DTG, NMR, optical and electron microscopy, conduction calorimetry and by radiochemical and classical methods.

Fieldwork, including borehole methods, shallow seismics, power auger, radio-tracer studies, land surveying, hydrogeochemical and soil gas sampling. Experience of plant operation, Diesel engines, 4WD and lifting gear. Holds full, clean UK driving licence and is a registered first-aider.

Research into pore solution chemistry of low permeability media (clay sediments and cements) involving solution extraction and soil mechanics. Hydrogeochemical modelling, using equilibrium thermodynamic models and coupled chemical-transport codes to simulate the chemical evolution of cement and clay systems and migration of pollutants. Thermodynamic modelling of polyphase alloy, oxide and hydrate systems and finite element methods applied to static mechanical systems. Research and development of mineral processing methods including novel techniques including molten salt systems, pulsed ultrasonics, electrokinetics and microwave technology.

Project management experience (5 years in industry and 10 years in universities) Line management experience (10 years) and a sound knowledge of marketing, standards, legislation and risk analysis.

PRESENT POSITION Consulting Geochemist

Research Manager, Minerals Industry Research Organisation, Concorde House, Trinity Park, Solihull, Birmingham, B37 7UQ.

Senior Research Fellow, Department of Chemical Engineering, University College London, Torrington Place, London, WC1E 7JE

Hon. Research Fellow (Geomaterials) Department of Materials, Royal School of Mines, Imperial College of Science, Technology and Medicine, London, SW7 2BP.

Research Fellow (Geomaterials) Department of Civil and Environmental Engineering, Imperial College of Science, Technology and Medicine, London, SW7 2BP.

Visiting Research Fellow, School of Earth and Environmental Sciences, University of Greenwich, Chatham Maritime, Chatham, Kent, ME4 4TB

CONTRIBUTIONS TO IMPERIAL COLLEGE 1996 - 2007

Department of Materials, Royal School of Mines

Undergraduate Teaching (Student-Lecturer Evaluation Score: Good = 33.3% Very Good = 66.7%)

- i) 1st Year Undergraduate tutorials - Personal tutor, Group B; Subject tutor MSE 102 Materials Stability & MSE 105 Solid State Chemistry and Physics.
- ii) 2nd Year Undergraduate tutorials – Lecturer and subject tutor MSE202A Materials Chemistry & Process Engineering
- iii) 2nd Year Laboratory Class - MSE302 Materials Characterisation (*SEM I & II*)
- iv) 3rd Year Undergraduate lectures / practical - Computational Thermodynamics module in MSE317 - Modelling of Materials Processing and Behaviour.
- v) 3rd Year Project Supervision. Three M.Eng. and one B.Eng. students, now graduated
- vi) UROP student supervision on BNFL funded laboratory study of cement mineral synthesis.

Post Graduate Teaching

- i) M.Sc. Corrosion - Modules on Cement, Concrete and Masonry
 - ii) M.Sc. Module - Welding
 - iii) M.Sc. Module - Adhesion and Adhesives
 - iv) M.Sc. Module - Cement and Concrete
 - v) M.Sc. Module - Computational Thermodynamics
 - vi) Ph.D. and M.Eng. Project supervision; Currently one doctoral student.
- } (University of London External Programme)
} course now ceased
} (Jointly with Tabbin Institute, Cairo)

Research

Major Contracts

- Novel Composite Landfill Liners incorporating clays and mineral processing wastes (*ENTRUST/MIRO*)
- MTDATA Aqueous System Modelling with National Physical Laboratory (*Castle Cements / MIRO*)
- MTDATA Modelling Oxide Systems with National Physical Laboratory (*Castle Cements / MIRO*)
- Controlled Low Strength Materials – A pilot study concerning red gypsum trench fill (*Huntsman Tioxide*)
- The performance of cementitious barriers for radioactive waste encapsulation (*CEC*)
- A Virtual Engineering System for the Geological Isolation of Nuclear Waste (*AIT, Japan*)
- Synthesis of cement clinker minerals in a state of high purity (*BNFL, UK*)
- Review of Probabilistic Risk Assessment methods for Nuclear Waste Disposal. Production of a Glossary of terms for Risk Assessment in Nuclear Waste Management (*APTEC, Japan*)
- Critical evaluation of PHREEQE thermodynamic equilibrium codes (*ENTERPRIS, UK*)
- Chemistry of blended cements for radioactive waste encapsulation (*HMIP, UK*)
- Aluminium - cement interactions (Supervision of M.Eng. project) (*AEA, UK*)
- Arsenic leaching and sorption (UROP and M.Eng. project) (*Rowan House Environmental Ltd./ MIRO*)
- Reactivity of Caustic drosses from Lead Refining (B.Eng. project) (*BRM Ltd.*)
- Aqueous Speciation Modelling (Observer and former sponsor) (*National Physical Laboratory / MIRO*)
- “Gypsum Waste Reduction” (*Mini-Waste, with Huntsman Tioxide and Lafarge Plaster Products*)
- “Fluid Abstraction from Liquid Wastes for Waste Minimisation and Resource Recovery” (*Mini-Waste, with Universities of Birmingham and Newcastle, Tarmac Southern and MIRO*)
- Aggregate Grading in an Ultrasonically Maintained Suspension (*MIRO – DTI “MIST” Programme*)

Turnover at Imperial College approximately £1.3 million

Department of Earth Science and Engineering, Royal School of Mines

Post Graduate Teaching

European Minerals Extraction Course. 'EMEC' M.Sc. Thermodynamics: An introduction to PHREEQC-I for mineral technologists. (One module as part of a larger course on modelling methods). I have run a university and commercial short course in computational thermodynamics aimed at both new and experienced users to thermodynamic modelling. This has focused on *MTDATA*, *Thermocalc* and *PHREEQC-I* but also introduces users to *Visual-MINTEQ*, *EQS4WIN*, *UralChem* and *HSC Chemistry for Windows*. The object of the course is to introduce scientists and engineers to thermodynamic modelling using a range of codes and illustrating the constraints of data availability and the methods by which new data may be assessed and included. The course is largely practical and examples are tailored to meet the needs and reflect the interests of the attendees.

This course evolved out of a growing need for postgraduate tuition in this field and attempts to meet the requirements of the many people who seek technical advice over a typical year. I was invited to give similar short courses at Greenwich which were well attended and I felt, were well received. Subsequently, I have run the course at the University of Aberdeen and for commercial clients.

Department of Civil and Environmental Engineering

Research

I am presently engaged as a Research Fellow on projects examining mineral sorbents, low embodied energy construction materials and recycling of aggregate fines in construction (2006-2008) In collaboration with Drs. C.R. Cheeseman, N. Voulvoulis and A.W. Dudeney. Currently supervising one Ph.D. student and one Research Associate.

Faculty of Engineering

Research Manager, The Mini-Waste Faraday Partnership 2002-2004

Mini-Waste was a partnership between Imperial, Cambridge and Birmingham universities and C-Tech innovation (formerly Capenhurst Laboratories) and funded by the DTI, NERC and EPSRC. Its objective was to minimize industrial waste arisings in the UK through improved resource efficiency and re-use. The partnership (300+ members, mainly industrial companies and 7 academic partners) supported collaborative research, funded jointly by its members and the research councils. At its conclusion, the research budget was £6M. As Research Manager for Imperial, I acted as a conduit for information flow; ensuring that members of College were aware of the activities of the Partnership and that external inquiries reach the most appropriate member of College. In addition, I was responsible for the training of Faraday Associates at Imperial and Greenwich and for ensuring the College benefited from its involvement with the partnership.

*N.B. Mini-Waste has since evolved into the **Resource Efficiency Knowledge Transfer Network***

See: http://ren.globalwatchonline.com/epicentric_portal/site/UKREN/

Imperial College Residences

Warden of the Imperial College Post Graduate Village at Clayponds, Ealing, West London, 1997-2006

Heading a welfare and management team in a student hall of residence. This post involved committee work at many levels, a degree of tact and sympathy when dealing with student problems, yet a firm hand when circumstances dictate. My responsibilities were both administrative and pastoral, I controlled my own budgets, recruited staff and was responsible for their training and conduct. In addition, I had a wider responsibility for maintaining high training standards of staff in all College residences and have had personal responsibility for mentoring of two new Wardens.

Other responsibilities and associations in College

- Member of the Royal School of Mines Association Committee
- Member of the Imperial College Exploration Board
- Member of Imperial College Environment Forum (through ICEO)
- Registered Examiner for the University of London
- External Examiner (Ph.D. & M.Sc.) Universities of Manchester, Warwick, Coventry and Aberdeen
- Member of Rector's Committee on Student Residences - Representing Outlying Halls. Elected 1998
- Member of the Rector's Committee on Student Welfare – Representing College Wardens

ACTIVITIES EXTERNAL TO COLLEGE

Society of Chemical Industry

Committee member of Construction Materials Group - Elected 1999

Conference Organiser

"Cementitious Materials in Waste Management" 26th April 2001

"Recent Advances in Concrete Durability" 25th April 2002

"Waste Materials in Construction" 1st April 2004 (see attached sheet)

University College, London

Research and Research Supervision

Visiting Senior Research Fellow on DTI Project "Optimise" (Sept 2006 – 2009) which is concerned with the low temperature refining of titanium dioxide ores using a novel molten salt route.

Senior Research Fellow on EPSRC Project "ULECeS" (Sept 2007 – 2010) which investigates the synthesis of cement clinker minerals in a molten salt environment.

Collaborator with the Materials Chemistry Centre, Departments of Chemistry and Chemical Engineering applications of TEDDI - Tomographic Energy Dispersive Diffraction Imaging of Cements and mineral hydrates (Daresbury Synchrotron)

Co-supervisor of a study on the Stabilisation of Industrial Wastes in the Department of Civil Engineering, looking at the stability of transition metal floccs in the carbonated cement environment.

University of Greenwich

Post Graduate Teaching

Visiting Fellow in the School of Earth and Environmental Sciences - appointed June 2000

Visiting Lecturer on M.Sc. Course in Geomaterials - appointed October 1998.

Research and research supervision

1 Ph.D. student (completed) on cement carbonation for waste management applications

1 M.Sc. Project student (completed) on leaching of cements for waste containment

Contributing author on the CASST project (Carbonation in Solidification and Stabilisation Technology on behalf of the Environment Agency.

Contributor to "Arsenic Speciation, Mineralisation and Mobility" project (thermodynamics topic)

University of Aberdeen

Visiting Lecturer: Short Course in Computational Thermodynamics and occasional tutor.

MIRO (Mineral Industry Research Organization)

Research Manager. I have worked closely with MIRO for over ten years and am both a Research Manager and research contractor. In addition I have been involved with several MIRO initiatives:

Member of Research Advisory Panel with responsibilities for mineral wastes and cements.

Member of AIMRAP: Aggregates and Industrial Minerals Research Advisory Panel

Contributor to NPL thermodynamic modelling initiatives using MTDATA.

Member of MiMeMiP Network (Minerals and Metals, Mining and Processing)

Participant in MIST project "Aggregate grading in an ultrasonically maintained suspension."

I am a research contractor for MIRO on the *OPTIMIZE* project (see above) conducted at UCL, where I am involved in high temperature solubility experiments, crystallography, calorimetry and computational thermodynamics.

NPL (National Physical Laboratory)

Research Contractor on DTI Portfolio project "Thermodynamic Modelling of Cement Minerals and their Hydrates" (2005-08)

BSI (British Standards Institution)

Member of Standards Committee B/516 EN 197-1 (Cement), Sub Committee B/516/6 (Cement Specifications) as a member of the Society of Chemical Industry delegation.

MEMBERSHIPS AND ASSOCIATIONS

Geological Society (Fellow)

Geologists Association (Ordinary Member)

Concrete Society (Member)

Materials Research Society (Member)

Institute of Materials (IM3) (Associate)

Royal Society of Chemistry: Molten Salts Discussion Group (Member)

Company Associate: Enterpris Ltd. Reading, Berkshire UK

Company Associate: Land and Mineral Surveys Ltd, Bristol, UK

WARMNET (Waste and Recycling of Materials network) University of Northampton

MINMETNET (Minerals and Metals industries network) University of Cambridge

AIMRAP (Minerals Industry Research Organisation)

FORWARD/NetSWaM (Forum for Waste and Resource Research and Development) Golder Associates and DEFRA

RWIN (Radioactive Waste Immobilisation Network) ISL Laboratories, University of Sheffield

Common Thermodynamic Database Project – Member of Cement Minerals Working Party (Chaired jointly by Prof. Denis Damidot and Dr. Jan Van der Lee)

Joint founding secretary (with Dr. Jos Brouwers, University of Twente, Netherlands) International Working Group on the Thermodynamics of Cements and their Hydrates

INDEPENDENT CONSULTANCY

Acting on behalf of commercial clients in a range of technical and advisory capacities, including BP; Shell; Britannia Refined Metals; Health and Safety Executive; Castle Cements; Tarmac Quarry Products Ltd, Tarmac Southern Ltd., The Minerals Industry Research Organisation, National Physical Laboratory, Westminster Abbey (Cosmati Pavement Committee) and others. Most of this work is technical, arising from a specific problem identified by a client and has included desk studies, site investigations and process simulation. Occasionally, this has extended to preparation of expert witness evidence, prior to litigation.

EDITORIAL RESPONSIBILITIES

- Editorial Board: *"Mineral Processing & Extractive Metallurgy"* (Editor-in-Chief: Dr. V. Kumar, Camb.)
- Regular reviewer for *"Waste Management"* *"Journal of Materials Science"* and *"Cement and Concrete Research"*,
- Occasional Reviewer for *"Powder Technology"* , *"Science of the Total Environment"* and *"Environmental Science and Technology"*
- Member of Editorial Board and Organising Committees for *"Sustainable Construction Materials and Technologies"* Conference 11th-13th June 2007. Coventry, UK
- Member of Editorial Board and Organising Committees for *"Sustainable Construction Materials and Technologies"* Conference June 2010. Ancona, Italy

EXPERIENCE PRIOR TO PRESENT POSITION

SENIOR GEOCHEMIST, W.S. ATKINS ENVIRONMENT Ltd. (1990 - 1995)

Contract research and consultancy into cement chemistry and geochemistry with particular reference to the nuclear waste industry. Five major contracts with three years project management experience. Much of our group's work at Atkins was on behalf of the UK nuclear regulators (HMIP and the Environment Agency) in support of their Disposal Assessments activities. This divided equally between contract research (especially simulation of repository behaviour; cement-groundwater-rock-waste interactions) and review work. The latter involved both recruiting experts to undertake commissioned review work and in reviewing commissioned work and proof of evidence by third parties. In addition, we co-ordinated a large (12M Euro) programme "CHEMVAL" on behalf of the European Commission, which compared and to an extent harmonised codes and data used in geochemical modelling within the European Community.

RESEARCH ASSOCIATE, UNIVERSITY OF BIRMINGHAM, Dept. GEOLOGY (1990)

Studies of contamination of an urban aquifer by heavy metals and organic solvents. Vadose zone sampling of volatile organics and dissolved metals and their subsequent analysis. This project considered both soil gas analysis, detecting volatile organics in the near surface environment and more conventional hydrogeochemistry.

RESIDENCE TUTOR, UNIVERSITY OF BIRMINGHAM (1990)

Pastoral and administrative duties in a traditional hall of residence. As a member of the Senior Common Room, I had direct pastoral and social responsibilities for 22 first year undergraduates in a traditional hall.

LECTURER, CITY OF BIRMINGHAM EDUCATION AUTHORITY (1989 - 1990)

Teaching Chemistry, Geology and Computing up to HND level.

RESIDENCE TUTOR, ASTON UNIVERSITY VILLAGE (1985 - 1990)

Pastoral and administrative duties in a student village of 700 residents.

CONSULTANT, ASTON MATERIALS SERVICES Ltd. (1988 - 1989)

Studies of the chemistry of building materials for industrial clients.

GEOLOGIST, BRITISH GEOLOGICAL SURVEY (1983 - 1984)

Studies of pore solution chemistry in clay sediments and development of stable temperature extraction methods. Radio-tracer studies of groundwater migration through boulder clay, borehole logging and maintenance. Based at AERA Harwell Laboratory, BGS, Keyworth and BNFL Sellafield/Drigg.

SCIENCE RESEARCHER, LANCASHIRE COUNTY COUNCIL (1982)

Production of scientific literature associated with rural development of an upland region.

LANGUAGES

English: Mother tongue. Basic French, Spanish and German

REFEREES

Current Group Heads, Imperial College

Professor Alan Atkinson
Director of Research
Department of Materials
Imperial College of Science, Technology and Medicine
Exhibition Road
London
SW7 2BP

Tel and Fax: +44 (0) 20 7594 6780
e-mail: alan.atkinson@imperial.ac.uk

Dr. Christopher Cheeseman
Reader in Waste Management
Department of Civil and Environmental Engineering
Imperial College of Science, Technology and Medicine
Exhibition Road
London
SW7 2BP

Tel and Fax: +44 (0)20 7594 5971
e-mail: c.cheeseman@imperial.ac.uk

Line Manager: Teaching at Imperial

Dr. David McPhail
(Formerly Senior Tutor)
Department of Materials
Imperial College of Science, Technology and Medicine
Exhibition Road
London
SW7 2BP

Tel and Fax: +44 (0) 20 7594 6721
e-mail: d.mcphail@imperial.ac.uk

Current Group Head, University College London

Professor Paul Barnes
Professor of Applied Crystallography
Materials Chemistry Centre
Department of Chemistry, Christopher Ingold Laboratories
20 Gordon Street
University College London
WC1H 0AJ

Tel: +44 (0) 20 7679 5585
Fax: +44 (0) 20 7679 7463
e-mail: barnes@img.cryst.bbk.ac.uk

Current Group Head, University of Greenwich

Dr. Colin D Hills
Reader in Cementitious Systems
Department of Earth and Environmental Sciences
University of Greenwich
Chatham Maritime
Chatham Kent
ME4 4TB

Tel: +44 (0) 20 8331 9820
Fax: +44 (0) 20 8331 9805
e-mail: c.d.hills@greenwich.ac.uk

Industrial Sponsor, Minerals Industry Research Organisation

Mr Alan Gibbon
Director
MIRO
75 Peppard Road
Sonning Common, Berkshire
RG4 9RN

Tel and Fax: +44 (0) 118 972 3048
e-mail: alan.gibbon@agcons.demon.co.uk