Curriculum Vitæ

Nicholas James WELHAM

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Education and qualifications

1987-1991	Royal School of Mines, Imperial College, University of London	Doctor of Philosophy, awarded 1993 'Electrochemistry of Gold Dissolution from Pyrite in Chloride Electrolytes'
1987-1991	Royal School of Mines, Imperial College, University of London	Diploma of Imperial College, 1993
1983-1986	Dept. of Mining and Minerals, University of Leeds	Bachelor of Engineering (Honours) in Minerals Engineering

Skill set

general: testwork design and interpretation, pilot plant management, feasibility studies, complex process development, process troubleshooting, flowsheet design, small project management, client representation, due diligence, technical report writing, report editing, review of metallurgical reports, technical review of NI43-101 reports, reporting of technical work to non-technical people, drafting of patents, assessment and commercialisation of novel technology, production of high purity products

hydrometallurgy: leaching, solvent extraction, ion exchange, precipitation, electrowinning, cementation, disposal of wastes, recycling of metallic materials, process modelling, technical appraisal of hydrometallurgical processes;

physical processing: crushing, grinding, sizing, gravity, flotation, dewatering, process simulation

geometallurgy: interpretation of mineralogical reports, development of hydrometallurgical processes using mineralogical data, optimising and troubleshooting processes on the basis of mineralogy

commodity experience:

major: lithium, manganese, copper, nickel, cobalt, zinc, molybdenum, rhenium, gold, tungsten, high purity alumina, graphite

minor: uranium, vanadium, lead, titanium, zirconium, tantalum, niobium, arsenic, cadmium, gallium, indium, boron, rubidium, caesium, silicon and coal

training courses: numerous short (0.5-5 day) courses developed and presented, generic and site specific courses for operators working in lead-zinc, copper-gold, gold and copper; cross-skilling courses for non-metallurgical graduates; postgraduate level courses in hydrometallurgy and commodity specific courses at all levels. Introductory courses for non-metallurgists also provided to assorted clients in the minerals and finance sectors. Courses have been presented in Australia, South Africa, South Korea, Mongolia, Chile, Germany, UK and Canada. A very highly regarded short course on Lithium Ore Processing has been presented worldwide (3xAustralia, 2xUK, Germany, Chile, 2xSouth Africa).

Professional History

7/2018-6/2023

Adjunct Professor – Lithium Processing, West Australian School of Mines, Curtin University, Perth, WA

Collaboration with WASM staff on battery metals, particularly lithium. Participation in the Future Battery Industries Co-operative Research Centre.

10/2012-now

Principal and Director, Welham and Associates

Boutique consultancy specialising in development and evaluation of complex hydrometallurgical processes.

There have been a number of projects for junior, medium and major mining companies aiming to convert a reserve to a resource by the addition of an economic process route. This has involved extensive research of process options in academic and patent literature and preliminary assessment of the options based on ore mineralogical investigations. From this start, preliminary testwork programs have been designed, managed through commercial laboratories and the data analysed to feed into the Scoping Study. Progressive rounds of work have resulted in viable processes for several, as yet undeveloped, projects. Work is undertaken directly with mining companies, engineering consultancies and universities.

Current and recent projects include:

A) Process design for PFS covering purification of spheronised graphite using acid and caustic routes.
B) Scoping study on recovery of cobalt from flotation tailings by hydrometallurgical methods.
C) Options paper on production of cobalt from nonconventional resources.
D) Advising on development of process for recovery of vanadium from fly ash and black shale.
E) Developing a process for in-situ leaching of low grade copper ores in a collapsed block cave.
F) Advising on development of a novel nickel concentrate leaching process.
G) Advising on process design for disposal of arsenic from a novel copper process
H) Advising on aspects of process design for the PFS for a lithium brine project in South America.
I) Developing flowsheets and piloting process for high purity alumina and aluminium salts
J) Developing flowsheets and piloting process to produce high purity alumina and high purity iron oxide from red mud
K) Developing a high purity manganese sulphate processes (2 projects)
L) Developing a process to produce high purity nickel and cobalt salts from mixed hydroxide precipitate
M) Developing a process to produce high purity nickel and cobalt salts from sulphide concentrate

In addition to involvement in specific projects, a series of short courses have been presented around the world for a range of clients. Recently presented short courses include:

Lithium Ore Processing. Full day
Lithium Ore Processing, 2h summary for non-technical attendees
Gold Ore Processing
Heap Leach Testwork and Operation
Uranium Processing
Recycling of e-Waste

9/2016-8/2019

Adjunct Associate Professor, School of Engineering, Edith Cowan University

Collaboration with Dr. Ata Nosrati on minerals processing and hydrometallurgical projects.

Arranged for an overseas Associate Professor to undertake a one year, fully funded, research sabbatical at ECU. Project closed with a number of papers already published and several more in preparation.

10/2010-9/2016

Principal Hydrometallurgical Consultant, Environmetals, NZ

Preliminary assessment of the potential of recovery of valuable materials from geothermal waters using membranes and ion exchange. Design and management of testwork through external providers leading to preliminary economic assessment for various products. Finalisation of pilot plant parameters and liaison with engineering design. Review analysis of data from pilot plant and finalisation of design parameters for 5000tpa modular plant. Drafting of provisional patents and liaison with patent attorneys in order to protect critical stages of operation.

1/2008- 10/2012

Xstrata Zinc Alliance Associate Professor of Metallurgy, University of Ballarat

Head of Metallurgy Department. Reopening of metallurgy department, comprehensive course design in collaboration with industry partner and relevant professional body. Recruitment and mentoring of junior academic and research staff. Delivery of specialist short courses to Xstrata Zinc and industry. Survey and assessment of process operations at Mount Isa, including copper and lead smelting. Preparing and presenting a total of six lecture units per annum to undergraduate students. Limited research undertaken due to emphasis on teaching.

7/2006-12/2020

Principal Technologist, MetaLeach™ (formerly Alexander Mining plc)

Technical review of process options for high acid consuming copper ore. Review of first pilot plant operations and detailed analysis of unusual mass transport effects observed. On-site "post mortem" of trial heap leach pads to recommend improvements in process chemistry and design. High level overview of process and potential applications leading to move from mining company to hydrometallurgical technology company. Specification of parameters for second pilot scale test heaps. Design, management and analysis of laboratory scale testwork on over 100 different ores from around the world at in-house, university and commercial laboratories. Management of pilot plant design and operation on three different target ores. Drafting of patents in close liaison with patent attorneys.

Inventor of AmmLeach® and HyperLeach™ processes for base metal oxides and for sulphide ores respectively. From these primary inventions and associated secondary inventions, there are around 50 patents in various stages of progress, 20 have been granted, around 25 more have yet to complete examination and the remainder are yet to proceed to PCT stage. The patents cover a range of different processes although are primarily concerned with leaching and solvent extraction.

1/2002-12/2007

Murdoch University, MCA Senior Lecturer,

Development, delivery and maintenance of an on-line course in Hydrometallurgy. Preparation and delivery of full semester course on Pyrometallurgical Engineering. Research into hydrometallurgical processes. Developed and partially presented half and one-day hands-on courses in extractive metallurgy for high school teachers and students.

7/1994-12/2001

Fellow, Australian National University

Responsible for mineral processing by mechanical activation program, development of metal / ceramic composites and crystallisation phenomena associated with early life. Work on materials characterisation of minerals, metals, ceramics, polymers, composites etc. Lecturer on Materials Characterisation. Occasional consultancies.

7/1993-6/1994
Research Fellow, A.J.Parker CRC for Hydrometallurgy
Project on electrochemical processing of arsenopyrite in order to recover gold.

Professional Affiliations :

Member of Australasian Institute of Mining and Metallurgy since 1993
2012- Transferred to Fellow
2002-now Member, editorial board of TransIMM Section C.
1999-now Member, editorial board of the AusIMM Proceedings

Minerals Engineering Society, UK
1987 Fellow
Former member of TMS, SME, SAIMM, CIM, IMM (now IoM3) and MSA.

Professional Activities :

10/2015-now Editorial Board Member, Mongolian Journal of Chemistry

3/2014-12/2015 Co-organiser, Symposium on solvent extraction: fundamentals and applications, PacifiChem 2015 - Honolulu, Hawaii, December 15 - 20, 2015

1/2013-now Editorial Board Member, Hydrometallurgy journal, Elsevier

6/2012-6/2014 Technical Board member, Hydrometallurgy 2014, Victoria, B.C.
Solicitation of papers for conference, reviewing papers, copyediting papers and chairing session at conference.
5/2012-4/2015 Advisor to Mongolian Association of Chemists and Chemical Engineers
Provision of advice to President of MACCE concerning formation of new professional society.
4/2012-3/2014 Consultant to Mongolian Academy of Science
Provision of advice to President concerning development of minerals industry education in Mongolia. Provision of expert level short courses to university academics. Liaison with Australian companies operating in Mongolia.
1/2003-12/2012 Editor-in-Chief of the journal Hydrometallurgy (A*, ERA 2010), Elsevier
Reception, review and editing of papers submitted. Retired at the end of 2012 after ten years.

Organising committee, Solution Chemistry 2007
Secretary, SIMC-XI Conference, Canberra, July 2000
Deputy convenor, Southern Africa - Australia Minerals Sector Synergies Symposium, Canberra, March 2000

Honours and Awards

2001 Rossiter W. Raymond Award of the American Institute of Mining, Metallurgical, and Petroleum Engineers for the best paper published by AIME in 2000

2003 Plenary speaker at International Conference on Mechanochemistry, INCOME, Braunschweig, Germany

2005 Plenary speaker at International Conference on Rational Utilization of Natural Minerals, Ulaanbaatar, Mongolia

2008 Joint winner of CRC Association Excellence in Innovation prize for “Teacher Professional Development Program” operated by Centre for Sustainable Resources Processing and Murdoch University

2012 Invited speaker at “Fundamentals and Applications in Hydrometallurgy: From the Molecule to the Process", 243rd ACS National Meeting, San Diego, CA, March 25-29, 2012

Publication summary

4 books
2 edited proceedings
over 80 refereed journal publications
over 50 conference presentations
over 300 confidential industry reports