JOHN HILL THERMOCHEMISTRY TREE

John Hill

Emeritus Professor of Chemistry & Chemical Education,

Department of Chemistry & Physics/La Trobe Institute of Molecular Sciences (LIMS),

Bundoora, Victoria 3086, Australia

jce.hill@bigpond.com

'Thermodynamics' and its experimental manifestation 'thermochemistry' have never been popular science study areas in schools and higher education institutions (**P 142**) despite their obvious correlation with contemporary concerns on energy production versus consumption and in recent times, with concerns relating to the world-wide 'energy crisis' and the looming consequences of 'global warming'. So it was somewhat surprising that I chose to undertake a thermochemistry research project for my PhD at Battersea College of Technology (BCT) London in late 1963. My supervisor in the Department of Chemistry was Roger Irving. Roger had recently returned from sabbatical leave at the Thermochemical Centre/University of Lund, Sweden and he brought back with him a prototype calorimeter along with a set of plans for setting up a solution calorimetry system at BCT and he was eager for a graduate student to assist him and to test the system. He convinced me that data analysis in thermochemistry was 'relatively simple' and only involved the first law (Hess's Law) of thermodynamics, which states that 'enthalpies' are 'state functions' and are 'additive'. However, he did point out that 'precision' was paramount in calorimetric measurements and I quickly had to understand the difference between 'precision' and 'accuracy'. Since the proposed project was pioneering in scope and challenging in content, I decided to accept it, particularly since the determination of metal - ligand bond energies was the ultimate objective and this had never been achieved previously be solution calorimetry.

The Irving solution calorimetric system (Mk1) established circa 1963 - 4 is best described as 'primitive' with much of the periphery equipment, such as the calorimeter thermostat the calorimetric calibration system and the wheatstone bridge temperature measuring system were 'in-house' constructions by Roger initially and later (Mk2) by Ron Schulz – a fellow PhD student in the Irving group. Only the 'precision potentiometer', 'galvanometer', 'calorimeter thermostat temperature controller' and the essential stopwatch were obtained commercially. The crucial glass ampoule inserts into the calorimeter had to be 'hand-blown' into a mould and the weighing thereof was achieved using a pan microbalance which had to be calibrated with 'standard weights'. It became obvious that my glassblowing skills were limited and my patience with balance calibration was seriously tested. Time data were obtained using a precision stop-watch. Temperature/time data output were recorded and graphed by hand since commercial chart recorders were only just becoming readily available at that time along with a paucity of electronic calculators which did not have data printout systems. However, despite these compromises and limitations, the overall system worked well and produced thermochemical data of admirable precision **(P 1).**

'Metal-ligand bond energies' had previously only been derived from combustion enthalpy measurements of coordination compounds using a bomb calorimeter. This was and still is a very tedious and time-consuming experimental exercise and is associated with multiple errors. By comparison, the solution calorimetric method is less tedious and more reliable than the combustion counterpart and later applications have shown that it is applicable to a wider range of compounds, particularly inorganic compounds. My PhD project produced 5 publications (**P 1 - 4** and **7**), the first four of which relate to the solution calorimetric determination of the formation enthalpies of Al(III), Cr(III), Fe(III) and Mn(III)–2,4-

pentanedionate complexes with subsequent derivation of the 'homolytic' and 'heterolytic' metal-oxygen bond energies and correlation of these with 'crystal field theory' predictions.

My contemporaries at this time were Ted Charsley, Peter Laye, Ron Schulz, Geoff Walter and Hugh McKerrell, the latter three of which all worked on thermochemistry research projects with Roger Irving. Ted Charsley was a postgraduate student working with John Redfern, who was developing thermal analysis techniques and had a prototype simultaneous thermogravimetric analysis (TGA) – differential thermal analysis (DTA) system, which was based on a Stanton HT-D thermobalance set up in the BCT Chemistry Department. The Redfern/Charsley collaboration in the early 1960's led to major pioneering developments in this emerging field and in conjunction with the Irving thermochemistry group laid the foundation of a unique thermal studies centre at BCT. In the late 1960's, Redfern left BCT to take up a partnership/directorship of 'Stanton Instruments Ltd.', based in Wimbledon, who were to become the leading UK manufacturer of thermal analysis instruments.

In 1967, I was a awarded a NATO research fellowship which allowed me to accept a post-doctoral one year appointment in the Thermochemical Centre/University of Lund, Sweden with Professor Ingemar Wadsö as mentor. This world-renowned centre was an established centre of excellence in bomb calorimetry (Sunner) and solution/titration calorimetry and micorcalorimetry (Wadsö) and had an advisory/collaborative agreement with 'LKB Produkter AB', Stockholm, who were a recognised leading manufacturer of scientific equipment. In particular at this time, LKB was developing a solution calorimetric system which could be adapted for titration calorimetry. This prototype system overcame all the shortcomings and tediousness of the BCT system used previously, particularly since temperature/time data output was automatically recorded on a chart recorder. Wadsö had already established tris(hydroxymethyl)aminomethane ('TRIS') as a calibrant for solution calorimetry via determination of the enthalpy of the TRIS/HCl neutralisation reaction at 298K. I was fortunate to be able to extend this study by determining this parameter at 0, 15 and 30^{o}C (**P 8**), thereby endorsing 'TRIS' as a suitable solution calorimetry calibrant over a wide operating temperature range. Also, I was introduced to 'vaporisation calorimetry' and was involved in the determination of the vaporisation enthalpy of N, N, N-triacetylammonia (**P 5**) and subsequently calculated a suite of thermochemical properties of this compound.

My contemporary post-doctoral fellows at Lund were Peter Howard, Paul Monk, Peter Sellers, Pepe Layenef and Haru Watanabe, all of whom had Stig Stunner or Ingemar Wadsö as mentors.

At the beginning of 1968, I was awarded an NSF research fellowship which allowed me to accept a post-doctoral appointment in the thermochemistry laboratory/University of Louisville, USA with Professor Loren G. Hepler as mentor. Loren had built what he called 'a large scale solution calorimetric system' with the calorimeter being of five litres capacity and the overall system was developed 'in-house', which he had brought to Louisville from his previous position at Pittsburgh. I and a fellow PDF Ian Worsley used this somewhat primitive system to determine the 'distribution coefficient' of bromine in water and carbon tetrachloride (**P 6**). This was the first time that calorimetry had been used to determine this parameter. Loren was also a prolific writer of reviews of the thermodynamic properties of the elements and I was involved with the literature search of the thermodynamic properties of vanadium, niobium and tantalum (**P 9**). It was this exercise which gave me considerable confidence in 'review writing' in the future, despite involving exhaustive literature scanning without the aid of computers or the now common 'search programmes'.

My contemporary post-doctoral fellows at Louisville were Ian Worsley, Jim Pearce and 'Rajagopalan'. The higher degree students in the Hepler group at that time were Tom Zordan and John Larsson both of whom had transferred to Louisville with Hepler from Pittsburgh.

In mid-1969, I was awarded a further NSF research fellowship which allowed me to accept a one year post-doctoral appointment at the thermochemical centre/Brigham Young University, Provo, Utah with Professors Reed Izatt and Jim Christensen as mentors. This world-renowned thermochemical centre was an established centre of excellence in 'titration calorimetry' ('thermometric titrimetry') and at this time was embarking on an intensive study of the 'ion-binding' thermodynamics of metal ions with synthetic macrocyclic compounds. The latter had been discovered by Pedersen in the mid -1950's. I was involved with writing a review of this new field (**P 10**) and in synthesising many new macrocyclic compounds to be used in subsequent titration calorimetric studies. Later in 1994, I was invited to contribute to a book chapter titled 'Continuous Titration Calorimetry' in 'Solution Calorimetry'/'Experimental Thermodynamics', published by IUPAC (**P 158**) as a consequence of my experience in titration calorimetry gained at BYU.

Izatt and Christensen had an advisory/collaborative agreement with 'Tronac Inc.' based in Orem. At that time, this company were developing a thermometric titrimetry system based on the multiple 'in-house' constructions operating very successfully in the Izatt/Christensen thermochemistry centre for many years. The Tronac titration calorimetry system was later installed in the thermochemistry centre in the Chemistry Department of La Trobe University, Melbourne and had an operating life-span of some 20 years.

My contemporary post-doctoral fellows at Provo were Austin Yingst and Ian Worsley and higher degree students in the Izatt/Christensen group at that time were Barry Haymore, Lyn Kimball, Dennis Nelson and Dale Slade.

In September, 1970 I moved to Melbourne, Australia and accepted the position of Research Fellow in the Chemistry Department of La Trobe University. Over the next 20 years, I supervised many Honours and Higher Degree students undertaking projects in thermochemistry, which included studies in solution and titration calorimetry, simultaneous thermal analysis (STA) and differential scanning calorimetry (DSC). Initially, the solution calorimetry system was an 'in-house' construction, which was superseded by a Tronac solution/titration calorimetric system. The STA system employed was a Rigaku-Denki (Japan) commercial instrument.

Honours projects supervised included thermal analysis of coordination compounds – Ni(II) and Cu(II) thiourea chloride complexes (Martin Attard) **(P 47, 78)** : titration calorimetric studies – phenols, Fe(III) and Ag(I) ferricyanide complexes (Susan Korce) **(P 97, 99, 137)**, Cd(II) ferricyanide and Ag(I) thiosulphate systems (Sharon Lim) **(121, 122)** : solution calorimetric studies of metal dithiocarbamate complexes (David McIvor) **(P 15)** and sublimation enthalpy determination of metal 2, 4 – pentanedionate complexes (John Sachinidis) **(P 39).**

MSc projects supervised included an exhaustive thermal analysis study of tin dithiocarbamate complexes (Graham Bratspies) **(P 21 – 24, 28, 34, 41, 42, 92).** In conjunction with academic colleague John Smith, who was a specialist in mass spectrometry, Graham developed a 'novel' thermal analysis technique whereby the 'sample' was flash-heated in the mass spectrometer probe and the decomposition products analysed 'in-situ'. This technique was later formally approved by the International Confederation of Thermal Analysis and Calorimetry (ICTAC) and named 'Programmed Probe Analysis' (PPA). John Murray was an academic member of the chemistry staff at Ballarat College of Advanced Education (later to become University of Ballarat and is now Federation University) and he determined the sublimation enthalpies of a series of metal 2, 4 – pentanedione complexes by DSC, initially proposing benzoic acid as a new calibration standard for this technique **(P 40, 57, 62, 82, 83, 152 – 5).**

PhD projects supervised included thermal analysis of Cu (II) dithiocarbamate complexes and Ni (II) and Pd (II) xanthate complexes (Greg Sceney) **(P 11, 12, 18, 20)** : thermal analysis of Ni (II) alkyl xanthate complexes, sublimation enthalpies of Ni (II), Cu (II) and Co (III) dithiocarbamate complexes by

DSC, and standard formation enthalpy of Ni (II) and Co (III) diethyldithiocarbamate by solution calorimetry and subsequent derivation of the nickel-sulphur bond energy (Kingsley Cavell) **(P 11, 14, 36, 37, 40, 43, 146):** thermal analysis of metal dithiocarbamate complexes and organometallic complexes (Bookhari Annuar) **(P 13, 15, 17):** thermometric titrimetric studies of the complexation of alkaline earth metal ions with linear and macrocyclic polyamino carboxylic acids (Gavin Ewin) **(P 46, 55, 73)**: DTA study of cis-platin (Stephen Roe) **(P 77)**: DTA studies of phenols and binary phenol systems (Nellie Buckman) **(P 106, 107, 110, 113 – 5, 143):** thermometric titrimetric studies of the interaction of metal ions with metallo-chromic indicators (Rozali bin Othman) **(P 87, 88, 110) :** thermal analysis studies of Victorian brown coal (Shengping Ma) **(P 72, 98, 102 – 5, 111, 126, 127, 134).**

During my tenure in Chemistry at La Trobe University, two periods of sabbatical leave were taken, the first of which was with the Loren G. Hepler thermochemistry group at the University of Lethbridge in 1978. Loren had received extensive funding from the Alberta Oil Sands Authority to undertake thermochemical studies on 'oil sands', which supported my accommodation costs in Lethbridge. I collaborated with Earl Woolley – a recent PhD graduate from the Izatt/Christensen thermochemical centre at BYU, to undertake thermodynamic studies of aqueous iodic acid **(P 27)**. A contemporary postdoctoral fellow at Lethbridge was Inger Olofsson, sister of Gerd Olofsson, who was co-director with Stig Sunner of the Lund Thermochemical Centre. The second period of sabbatical leave was taken in 1986 and involved 3 months with the Arthur Finch thermochemistry group in the Department of Chemistry at Royal Holloway College/University of London, Egham, UK. I was involved in the derivation of the thermochemical properties of substituted ureas and pyridinium bromide using an LKB solution calorimetric system **(P 38, 116, 117).** A further 3 months was spent in the Research and Development laboratory at Stanton-Redcroft Ltd., Wimbledon. At this time, Ted Charsley was the head of this laboratory. I was extensively involved in a TMA study of a variety of compounds and in an investigation of potential TMA temperature calibration standards **(P 72, 107, 129, 133).** This was my first introduction to the principles and applications of a 'less common' thermal analysis technique.

In 1989, Stanton-Redcroft sponsored my visit to Chulalongkorn University, Bangkok and I gave a short course of 8 lectures on 'Thermal analysis – techniques and applications' in the Chemistry Department there to promote thermal analysis techniques and to reveal their wide range of possible applications in many fields of particular significance to 'developing countries' **(P 100)**. It was fortuitous that at that time, Professor Siri Varothai was Head of Chemistry at 'Chula', since we were both PhD students at Battersea College of Technology in the mid -1960's. I subsequently collaborated with Sopa Chirawongaram, Director of the Scientific and Technological Research Equipment Centre (STREC) at 'Chula' to promote thermal analysis education and research opportunities in Thailand **(P 140)**.

In mid-1990, I was seconded from La Trobe Chemistry to the Department of Chemistry, National University of Singapore as a Senior Teaching Fellow for 4 years. Whilst I was not committed to undertake research in this role, I collaborated with several members of the academic staff and with their research students undertaking projects in thermochemistry **(P 124, 125, 136, 138, 139, 144 and 145).** My most significant achievement whilst at NUS was a successful DSc submission to the University of London based mainly on my thermochemistry research profile **(P 132)** which was conferred in London in 1992.

From mid-1994 until I retired at the end of 2005, I was redeployed to La Trobe University at its Wodonga campus at which I joined the Department of Environmental Management and Ecology and delivered courses in chemistry and environmental science. Whilst this deployment did not offer opportunities or facilities to allow research in thermochemistry, I was still able to publish in this field mainly in the form of invited reviews of thermal analysis and calorimetric techniques and their current applications **(P 160, 164, 168, 170, 173 – 7, 180 – 83, 185, 194 – 97).**

In 2001, I was appointed Visiting Professor to the Centre for Thermal Studies (CTS), Department of Chemistry at the University of Huddersfield, UK. Peter Laye was also a Visiting Professor in this Centre and the Director was Ted Charsley. These appointments facilitated a professional reunion of our time together in the mid - 1960's as postgraduate students in the Chemistry Department at Battersea College of Technology. The CTS was well established and recognised as a centre of excellence in the thermal sciences, both in the UK and overseas and was well-equipped with a wide range of state-of-the-art thermal analysis equipment and thermal activity monitors (TAM). In addition to undertaking academic research, the centre attracted a range of externally funded contracts. I was invited to spend limited periods at the centre in 2001, 2002 and 2005 and to be involved with thermal analysis projects in progress. The CTS team over this period included Ted Charsley (Head/Director), Gareth Parkes, Jim Rooney, Sarah Goodall and Hayley Markham along with Peter Laye (Visiting Professor). In 2001, I gave a keynote lecture on some pioneering (historical) applications of classical calorimetry in the CTS **(P 164)** which effectively summarised my career achievements in thermochemistry to date. During the first two visits to the CTS I gained experience with an emerging technique 'Sample Controlled Thermogravimetric Analysis' (SCTA) and applying this to study the combustion characteristics of a range of coals **(P 168)**. The 2005 visit involved a DSC study of the equilibrium temperatures and enthalpies of solid-solid transitions of rubidium nitrate **(P 180, 185)**.

Throughout my career, I have been a member of the International Confederation for Thermal Analysis and Calorimetry (ICTAC) and I have attended and presented at several ICTAC Congresses: 1974, ICTA 4, Budapest: 1980, ICTA 6, Bayreuth: 1985, ICTA 8, Bratislava **(P 72)**: 1988, ICTA 9, Jerusalem: 1992, ICTAC 10, Hatfield. I am a continuing member of the ICTAC Awards Committee and the ICTAC Education Committee. In 1991, I produced and edited 'For Better Thermal Analysis and Calorimetry (III)' **(P 130)** which was the widely regarded as an indispensable handbook for those professionals practicing thermal analysis and calorimetry. In 2012 and in conjunction with Professor Ranjit K. Verma, Chair of the ICTAC Education Committee, I published definitive papers on education in thermal analysis and calorimetry **(P 195 – 7).** These were presented in abstract form at an 'Education in Thermal Analysis and Calorimetry' workshop as part of ICTAC 15, Osaka in 2013. In 2002, I attended the European Society for Thermal Analysis and Calorimetry (ESTAC) conference in Barcelona at which **(P 168)** was presented as a poster. I have attended several Indian Thermal Analysis Society (ITAS) conferences: 1987 ITAS 6, New Delhi **(P 89)**: 1989, ITAS 7, Srinagar **(P 101):** 1991, ITAS 8, Bhubaneswar **(P 124, 129):** 1993, ITAS 9, Goa **(P 150):** 2006, ITAS 15, Jaipur **(P 180).** I have also attended a few US 'CALCON' conferences: Midland, 1968, Bartlesville, 1988 and Honolulu, 2003. In 1963, I attended my first international conference (along with Ron Schulz and Geoff Walter) an IUPAC Chemical Thermodynamics conference in Exeter, UK and in 1979, I was invited by the conference chair, Professor C. N. R. Rao to give a plenary review lecture entitled 'Thermal Analysis applications in solid-state chemistry' at the Winter School in Solid-State Chemistry, Indian Institute of Chemistry, Bangalore. In 1982, I was invited to the 'Parton Memorial Chemical Thermodynamics conference' in Auckland in honour of Professor Parton, a leading thermodynamics researcher in the Department of Chemistry at the University of Otago in Dunedin in the latter half of the 20th century.

In conclusion and in my attempts to make contributions to the advancement of thermochemistry over more than half a century, I have been exceedingly fortunate to have had outstanding mentors, dedicated collaborators and, most importantly, diligent and enthusiastic postgraduate students. Without their commitment, passion and dedication to research, my thermochemistry tree would not have developed and been sustained. My successes are simply a reflection of their inspiration, enthusiasm and professionalism.

(February, 2018)

JOHN HILL: PUBLICATION LIST

1 The heat of formation of Aluminium acetylacetonate.
J.O. Hill and R.J. Irving.
J. Chem. Soc., **A**, 971-974 **(1966)**.

2 Standard heat of formation of tris(acetylacetonato)Chromium(III) at 25^{o}C
and the metal-oxygen bond energy.
J.O. Hill and R.J. Irving.
J. Chem. Soc., **A**, 1413-1416 **(1967)**.

3 The heat of formation of tris(acetylacetonato)Iron(III)
and the metal-oxygen bond energy.
J.O. Hill and R.J. Irving.
J. Chem. Soc., **A**, 1052-1054 **(1968)**.

4 The heat of formation of tris(acetylacetonato)Manganese(III)
and the manganese-oxygen bond energy.
J.O. Hill and R.J. Irving.
J. Chem. Soc., **A**, 3116-3118 **(1968)**.

5 Some thermochemical properties of N, N, N - triacetylammonia.
J.O. Hill and I. Wadsö.
Acta Chem. Scand., **22** 1590-1594 **(1968)**.

6 Calorimetric determination of the distribution coefficient and thermodynamic properties of bromine in water and carbon tetrachloride.
J.O. Hill, I.G. Worsley and L.G. Hepler.
J. Phys. Chem., **72** 3695-3697 **(1968)**.

7 Thermodynamics of ionisation of aqueous acetylacetone.
J.O. Hill and R.J. Irving.
J. Chem. Soc., **A**, 2759-2761 **(1969)**.

8 Thermochemical results for ‘TRIS’ as a test substance in solution calorimetry.
J.O. Hill, G. Ojelund and I. Wadsö.
J. Chem. Thermodyn., **1** 111-116 **(1969)**.

9 Thermochemistry and oxidation potentials of vanadium, niobium and tantalum.
J.O. Hill, I.G. Worsley and L.G. Hepler.
Chem. Rev., **71** 127-137 **(1971**).

10 Ion binding by synthetic macrocyclic compounds.
R.M. Izatt, **J.O. Hill** and J.J. Christensen.
Science, **174** 459-467 **(1971)**.

11 Thermal studies on nickel alkyl xanthate complexes.
K.J. Cavell, C.G. Sceney, **J.O. Hill** and R.J. Magee.
Thermochim. Acta, **5** 319-328 **(1973)**.

12 Thermal studies on palladium alkyl xanthates.
C.G. Sceney, **J.O. Hill** and R.J. Magee.
Thermochim. Acta, **6** 111-117 **(1973)**.

13 Thermal studies on Nickel (II) and Copper (II) complexes of monoethanol- and diethanol-dithiocarbamic acids.
B. Annuar, **J.O. Hill** and R.J. Magee.
Thermochim. Acta, **8** 439-446 **(1974)**.

14 Solution thermochemistry of some nickel alkyl xanthates.
K.J. Cavell, **J.O. Hill** and R.J. Magee.
Thermochim. Acta, **8** 447-453 **(1974)**.

15 Solution thermochemistry of diethyldithiocarbamato-Iron (III).
B. Annuar, **J.O. Hill**, D.J. McIvor and R.J. Magee.
Thermochim. Acta, **9** 143-148 **(1974)**.

16 Nickel (II) and Copper (II) complexes of mono-ethanol and diethanoldithiocarbamic acid.
B. Annuar, **J.O. Hill** and R.J. Magee.
J. Inorg. Nucl. Chem., **36** 1253-1257 **(1974)**.

17 Thermal analysis of dicyclopentadienyl zirconium diborohydride and bis(triphenylphosphine)borohydride Copper(I).
B.D. James, B. Annuar, **J.O. Hill** and R.J. Magee.
Analytical Calorimetry, R.S. Porter and J.F. Johnson (Editors), Plenum Press, USA, **3** 777-785 **(1974)**.

18 Thermal analysis of copper dithiocarbamates.
C.G. Sceney, **J.O. Hill** and R.J. Magee.
Thermochim. Acta, **11** 301-306 **(1975)**.

19 The synthesis of 2-phenyl-2-imidazoline via a dithionamide intermediate.
G. Ewin and **J.O. Hill**.
Aust. J. Chem., **28** 909-912 **(1975)**.

20 A TG/GC/MS study of copper dimethyl- and diethyldithiocarbamates.
C.G. Sceney, J.F. Smith, **J.O. Hill** and R.J. Magee.
J. Therm. Anal., **9** 415-423 **(1976)**.

21 A Thermogravimetry/Differential Thermal Analysis, Evolved Gas Analysis and Pyrolysis/Gas Chromatography-Mass Spectrometry study of dihaloTin(IV)bisdiethyldithiocarbamates.
G.K. Bratspies, J.F. Smith, **J.O. Hill** and R.J. Magee.
Thermochim. Acta, **19** 335-348 **(1977)**.

22 A Pyrolysis/Gas Chromatography-Mass Spectrometry and Thermogravimetry/Differential Thermal Analysis study of bis(diethyldithiocarbamato)diphenyl Tin(IV).
G.K. Bratspies, J.F. Smith, **J.O. Hill** and R.J. Magee.
Thermochim. Acta, **19** 349-360 **(1977)**.

23 A Thermogravimetry/Differential Thermal Analysis, Evolved Gas Analysis and Pyrolysis/Gas Chromatography-Mass Spectrometry study of tetrakis(diethyldithiocarbamato)Tin(IV).
G.K. Bratspies, J.F. Smith, **J.O. Hill** and R.J. Magee.
Thermochim. Acta, **19** 361-371 **(1977)**.

24 A Thermogravimetry/Differential Thermal Analysis and Pyrolysis/Gas Chromatography-Mass Spectrometry study of several Tin (IV) dithiocarbamate complexes in an air atmosphere.
G.K. Bratspies, J.F. Smith and **J.O. Hill**.
Thermochim. Acta, **19** 373-382 **(1977)**.

25 Reaction between Chromium (III) oxide and oxygen in the presence of sodium carbonate: A DTA study.
M.N. Sastri and **J.O. Hill**.
J. Therm. Anal., **11** 323-326 **(1977)**.

26 Thermal properties of molten sulphur - oxyanionic salts.
B.J. Meehan, S.A. Tariq and **J.O. Hill.**
J. Therm. Anal., **12** 235-244 **(1977)**.

27 Thermodynamics of ionization of aqueous iodic acid, an 'almost-strong' electrolyte.
E.M. Woolley, **J.O. Hill**, W.K. Hannan and L.G. Hepler.
J. Solution Chem., **7** 385-393 **(1978)**.

28 The thermal decomposition of bis(diethyldithiocarbamato)Tin(II).
G.K. Bratspies, J.F. Smith, **J.O. Hill** and R.J. Magee
Thermochim. Acta, **27** 307-317 **(1978)**.

29 Bis(thioimidates): Structure and reactivity
G. Ewin and **J.O. Hill**
Aust. J. Chem., **32** 435-440 **(1979)**.

30 Amine reactions with bis(thioamides).
G. Ewin and **J.O. Hill**.
Aust. J. Chem., **32** 441-444 **(1979)**.

31 Synthesis and characterisation of some secondary (amine)dithiocarbamate salts.
K.J. Cavell, **J.O. Hill** and R.J. Magee.
J. Inorg. Nucl. Chem., **41** 1277-1280 **(1979)**.

32 Synthesis and characterisation of
bis-(di-2,2,2-trifluoroethyldithiocarbamato)Nickel(II) and
bis(2,2,2,-trifluoro-ethylhydrogen-dithiocarbamato)Nickel(II).
K.J. Cavell, R.J. Magee and **J.O. Hill**.
J.Inorg. Nucl. Chem., **41** 1281-1284 **(1979)**.

33 A Lewis base adduct of bis(di-2,2,2-
trifluoroethyldithiocarbamato)Nickel(II).
K.J. Cavell, **J.O. Hill** and R.J. Magee.
J.Inorg. Nucl. Chem., **41**, 1379-1380 **(1979)**.

34 A thermal synthesis of a new Tin (IV) dithiocarbamate.
G.K. Bratspies, J.F. Smith, **J.O. Hill** and P.J. Derrick.
J. Therm. Anal., **16**, 369-379 **(1979)**.

35 Solution thermochemistry of diethylammonium diethyldithiocarbamate.
K.J. Cavell, **J.O. Hill** and R.J. Magee.
Thermochim. Acta, **33** 377-381 **(1979)**.

36 A vacuum DSC study of Ni (II), Cu (II) and
Co (III) diethyldithiocarbamate complexes.
K.J. Cavell, **J.O. Hill** and R.J. Magee.
Thermochim. Acta, **33** 383-386 **(1979)**.

37 Sublimation enthalpy of Ni (II) and Cu (II) diethyldithiocarbamate and diethylammonium diethyldithiocarbamate by the sublimation bulb technique.
K.J. Cavell, **J.O. Hill** and R.J. Magee.
Thermochim. Acta, **34** 155-160 **(1979)**.

38 Some thermochemical data for pyridinium bromide.
J.O. Hill.
Thermochim. Acta, **35** 129-131 **(1980)**.

39 A re-evaluation of the enthalpy of sublimation of some
metal acetylacetonate complexes.
J. Sachinidis and **J.O. Hill**.
Thermochim. Acta, **36** 59-66 **(1980)**.

40 A DSC study of benzoic acid: A suggested calibrant compound.
J.P. Murray, K.J. Cavell and **J.O. Hill**.
Thermochim. Acta, **36** 97-101 **(1980)**.

41 Mass spectrometric investigation of the thermal decomposition of tetrakis(N, N - diethyldithiocarbamato)Tin(IV) in vacuum.
G.K. Bratspies, J.F. Smith and **J.O. Hill**.
J. Anal. Appl. Pyrolysis, **2** 35-44 **(1980)**.

42 The thermal decomposition of some tetrakis(dithiocarbamato)Tin(IV) complexes in vacuum.
G.K. Bratspies, J.F. Smith and **J.O. Hill**.
Thermal Analysis, Proceedings of Sixth International Conference on Thermal Analysis, W. Hemminger, Ed., Birkhhauser Verlag, Basel, **2** 147-152 **(1980)**.

43 Standard enthalpy of formation of bis(diethyldithiocarbamato)Nickel (II) at 298K and the nickel-sulphur bond energy.
K.J. Cavell, **J.O. Hill** and R.J. Magee.
J. Chem. Soc., Dalton Trans., 763-766 **(1980)**

44 Standard enthalpy of formation of bis(diethyldithiocarbamato)Copper(II) at 298K and the copper-sulphur bond energy.
K.J. Cavell, **J.O. Hill** and R.J. Magee.
J. Chem. Soc., Dalton Trans., 1638-1640 **(1980)**.

45 Australian Thermal Analysis Society (ATAS): Symposium proceedings, **J.O. Hill** (Editor), La Trobe University Press,
Melbourne, Australia, 55 pp. **(1980).**

46 A thermometric titrimetric study of the complexation of alkaline-earth metals by linear poly(amino)carboxylic acids.
G. Ewin and **J.O. Hill.**
Proceedings of the 2nd Australian Thermodynamics Conference, Royal Australian Chemical Institute, Physical Chemistry Division, Melbourne, Australia, pp. 422-428 **(1981).**

47 The thermal decomposition of some Nickel (II) thiourea chloride complexes.
M.P.B. Attard and **J.O. Hill**.
Proceedings of the 2nd European Symposium on Thermal Analysis (ESTA 2),
D. Dollimore, Ed., Heyden, London, pp. 206-210 **(1981)**.

48 Cyclophane bis(sulphoxides): A thermal analysis study.
J.O. Hill, P.J. Jessup and J.A. Reiss.
J. Therm. Anal., **21** 271 - 276 **(1981)**.

49 Thermal analysis of Mercury (I) sulphate and Mercury (II) sulphate.
S.A. Tariq and **J.O. Hill**.
J. Therm. Anal., **21** 277-281 **(1981)**.

50 Applications of thermo-analytical techniques in pharmaceutical science.
J.O. Hill.
'Thermochemical methods in pharmaceutical manufacturing',
Symposium Proceedings, Institute of Drug Technology Ltd.,
Parkville, Victoria, Australia, pp. 5-27 **(1981)**.

51 The thermochemistry of metal dithiocarbamate complexes and related compounds.
J.O. Hill and R.J. Magee.
Revs. Inorg. Chem., **3** 141-197 **(1981)**.

52 Field Desorption Mass Spectrometry of [6,6,7,12,13,13-hexamethyl-1,4,8,11- tetraazacyclotetradeca-7,11-diene]Nickel(II) and -Copper(II) perchlorates.
S.P. Roe, P.G. Cullis, P.J. Derrick and **J.O. Hill**.
Aust. J. Chem., **35** 287-292 **(1982)**.

53 Application of the ring-oven technique to orthophosphate anion analysis.
N. G. Buckman, E. Kaiser, R.J. Magee and **J.O. Hill**.
Anal. Proceedings, 394-396 (**1982)**.

54 Identification and determination of microgram amounts of phenol and chlorophenols by the ring-oven technique.
N.G. Buckman, **J.O. Hill** and R.J. Magee.
Microchem. J., **28** 470-478 **(1983)**.

55 A thermometric titrimetric study of the complexation of alkaline-earth metals by linear poly(amino)carboxylic acids.
G. Ewin and **J.O. Hill.**
J. Chem. Soc., Dalton Trans., 865-868 **(1983)**.

56 Identification and determination of microgram amounts of phenol and chlorophenols with methylbenzothiazolinone hydrazone using the ring - oven technique.
N.G. Buckman, **J.O. Hill** and R.J. Magee. Analyst, **108** 573-580 **(1983)**.

57 DSC determination of the fusion and sublimation enthalpy of bis(2,4-pentanedionato)Beryllium(II) and tris(2,4-pentanedionato)Aluminium(III).
J.P. Murray and **J.O. Hill**.
Thermochim. Acta, **63** 211-218 **(1983)**.

58 Determination of Selenium (IV) in biological samples by Cathodic Stripping Voltammetry.
R. bin-Ahmad, **J.O. Hill** and R.J. Magee.
Analyst, **108** 835-839 **(1983)**.

59 The synthesis and characterisation of some novel β – aminodiketones.
S.P. Roe and **J.O. Hill**.
Proceedings, Indian Acad. Sci., **92** 189-196 **(1983)**.

60 A kinetic study of the oxidation of phenols and chlorophenols by metaperiodate.
N. G. Buckman, R.J. Magee and **J.O. Hill**.
Anal. Chim. Acta, **153** 285-290 **(1983)**.

61 Data analysis in thermometric titrimetry.
R. bin Ahmad, **J.O. Hill** and R.J. Magee.
Thermochim. Acta, **71** 25-41 **(1983)**.

62 DSC determination of the fusion and sublimation enthalpy of tris(2,4-pentanedionato)Chromium(III) and -Iron(III).
J. P. Murray and **J.O. Hill**.
Thermochim. Acta, **72** 341-347 **(1984)**.

63 Separation of substituted phenols including eleven priority pollutants by High-Performance Liquid Chromatography.
N.G. Buckman, **J.O. Hill**, R.J. Magee and M.J. McCormick.
J. Chromatog., **284** 441-446 **(1984).**

64 Determination of arsenic in biological samples by Cathodic Stripping Voltammetry.
R. bin Othman, **J.O. Hill** and R.J. Magee.
J. Electroanal. Chem., **168** 219-227 **(1984)**.

65 The analytical chemistry of metal dithiocarbamate complexes.
R.J. Magee and **J.O. Hill.**
Reviews in Anal. Chem., **8** 5-72 **(1985)**.

66 An X-ray photoelectron and infrared spectroscopic study of nickel squarate dihydrate and bis(2,4-pentanedionato)Nickel(II).
S.P. Roe, **J. O. Hill** and J. Liesegang.
J. Coord. Chem., **14** 1 - 8 **(1985).**

67 An X-ray photoelectron spectroscopic study of some Nickel (II) tetra-aza macrocyclic complexes.
S.P. Roe, **J.O. Hill** and J. Liesegang.
Trans. Met. Chem., **10** 100-106 **(1985)**.

68 X-Ray photoelectron spectroscopy and infrared absorption spectroscopy correlations.
S.P. Roe, **J.O. Hill**, J. Liesegang and A.R. Lee.
Applications Surf. Sci., **22** 299-308 **(1985)**.

69 An X-ray photoelectron spectroscopic study of some Nickel (II) amine complexes.
S.P. Roe, **J.O. Hill**, J. Liesegang and A.R. Lee.
J. Elect. Spectros. Relat. Phenomena, **35** 131-143 **(1985)**.

70 Correlation of X-ray photoelectron spectroscopic core level binding energies with melting point for a series of diamine dihydrochlorides.
S.P. Roe, **J.O. Hill** and J. Liesegang.
Proceedings Indian Acad. Sci., **95** 397-408 **(1985)**.

71 Photoelectron spectroscopy of metal dithiocarbamate, xanthate and dithiophosphate complexes: A review.
J.O. Hill, R.J. Magee and J. Liesegang.
Comments in Inorg. Chem., **5** 1-27 **(1985)**.

72 Thermal analysis of Victorian brown coal
J.O. Hill, E.L. Charsley and M.R. Ottaway.
Proceedings: ICTA 8, Bratislava, Czechoslovakia, (1985).
Thermochim. Acta, **93** 741-744 **(1985)**.

73 A thermometric titrimetric study of the complexation of alkaline-earth metals by macrocyclic poly(amino)carboxylic acids.
G. Ewin and **J.O. Hill**.
J. Chem. Research, (S) 334-335 **(1985)**: (M) 3501-3519 (**1985)**.

74 'Chemical change', P. Fensham, Ed.,
P. Fensham, D. Gaulke, **J.O. Hill** and R. Roe.
Victorian Institute for Secondary Education (VISE),
Melbourne, Australia **(1985)**. **[ISBN 0908253 78 8].**

75 Determination of sulfide in natural waters by thermometric titrimetry.
R. bin Ahmad, R.J. Magee and **J.O. Hill**.
Thermochim. Acta, **98** 127-137 **(1986)**.

76 Electrochemical and spectroscopic studies on some pyridyl and morpholyl adducts of (meso-tetraphenylporphyrin) Chromium (III) chloride.
S.P. Roe, **J.O. Hill** and R.J. Magee.
Proceedings Indian Acad. Sci., **96** 1-8 **(1986)**.

77 A DTA and XPS study of cis-platin.
S.P. Roe, **J.O. Hill** and R.J. Magee.
Inorg. Chim. Acta, Letters. **115** L15 - L17 **(1986)**.

78 A thermal decomposition study of some Nickel (II) thiourea chloride complexes.
M.P.B. Attard, **J.O. Hill**, R.J. Magee, S. Prakash and M.N. Sastri
J. Therm. Anal., **31** 407-420 **(1986)**.

79 An X-ray photoelectron spectroscopic study of some Cu (II) tetra-aza complexes.
S.P. Roe, **J.O. Hill** and J. Liesegang.
Polyhedron, **5** 723-730 **(1986)**.

80 Spectroscopic studies on some pyridyl and morpholyl adducts of (meso-tetraphenylporphyrin)Chromium (III) chloride.
S.P. Roe, **J.O. Hill** and R.J. Magee.
Aust. J. Chem., **39** 1377-1383 **(1986)**.

81 Studies on substituted phenols by Differential Pulse Cathodic Stripping Voltammetry: I, Pentachlorophenol.
R. bin Othman, **J.O. Hill** and R.J. Magee.
Mikrochim. Acta, **1** 171-182 **(1986)**.

82 DSC determination of the sublimation enthalpy of tris(2,4-pentanedionato)Cobalt(III) and bis(2,4-pentanedionato)Nickel(II) and Copper(II).
J.P. Murray and **J.O. Hill**.
Thermochim. Acta, **109** 383-390 **(1987)**.

83 DSC determination of the sublimation enthalpy of bis(2,4-pentanedionato)oxoVanadium(IV) and tetrakis(2,4-pentanedionato)Zirconium(IV).
J.P. Murray and **J.O. Hill**.
Thermochim. Acta, **109** 391-396 **(1987)**.

84 The determination of lead and cadmium in biological samples by Potentiometric Stripping Analysis.
R. bin Othman, **J.O. Hill** and R.J. Magee.
Freszenius Z. Anal. Chem., **326** 350-353 **(1987)**.

85 Studies on substituted phenols by Differential Pulse Cathodic Stripping Voltammetry: Chlorophenols and Nitrophenols.
R. bin Othman, R.J. Magee and **J.O. Hill**.
Proceedings, RACI: 9th Analytical Conference, (Sydney) **2** 608-611 **(1987).**

86 Spectroscopic and electrochemical study of some Copper (II) tetraaza macrocyclic complexes.
S.P. Roe, **J.O. Hill** and R.J. Magee.
Monatshefte Chemie, **118** 463-476 **(1987)**.

87 A thermometric titration study of the interaction of $A1^{3+}$, Co^{2+}, Ni^{2+} and Zr^{4+} with xylenol orange.
R. bin Othman, **J.O. Hill** and R.J. Magee.
Mikrochim. Acta, **111** 337-350 **(1987)**.

88 A thermometric titration study of the interaction of Co^{2+} with metallo-chromic indicators.
R. bin Othman, **J.O. Hill** and R.J. Magee.
Thermochim. Acta, **122** 163-170 **(1987)**.

89 A TMA study of selected compounds.
E.L. Charsley and **J.O. Hill**.
6th Indian Thermal Analysis Society: Symposium proceedings, New Delhi, India, pp. I 18 - I 25, **(1987)**.

90 Thermomechanical Analysis (TMA): Technique, instrumentation and applications.
E.L. Charsley and **J.O. Hill.**
6th Indian Thermal Analysis Society Symposium: Workshop proceedings, New Delhi, India, pp. 6-14 **(1987)**.

91 'Chemistry for the Biological Sciences: An introductory text'.
R.W. Cattrall, **J.O. Hill,** M.F. Mackay and J.B. Peel.
La Trobe University Press, Melbourne, Australia, **(1987)**.

92 The oxidation of bis(diethyldithiocarbamato)Tin(II).
G.K. Bratspies, **J.O. Hill** and J.F. Smith.
Thermochim. Acta, **133** 383-387 **(1988)**.

93 Advanced undergraduate laboratory experiments in thermoanalytical chemistry.
J.O. Hill and R.J. Magee.
J. Chem. Educ., **65** 1024-1026 **(1988)**.

94 An X-ray photoelectron spectroscopic study of some bis(diamine)Copper(II) complexes.
S.P. Roe, **J.O. Hill** and J. Liesegang.
J. Electron Spectros. & Related Phenomena, **46** 315-324 **(1988)**.

95 Thermochemical Analysis: Technique, instrumentation and applications.
J.O. Hill.
In: Thermal Analysis Short Course, R.A. Shanks, Ed., Technisearch Ltd., Royal Melbourne Institute of Technology, Melbourne, Australia, pp 1-12 **(1989)**.

96 A survey of analytical methods available for the determination of phenols.
N.G. Buckman, **J.O. Hill** and R.J. Magee.
Irish Chem. News, 26-30 **(1989)**.

97 Phenol determination by thermometric titrimetry.
J.O. Hill and S. Korce.
Thermochim. Acta, **148** 341-346 **(1989)**.

98 Derivation of the specific energy of Victorian brown coal from proximate and ultimate analyses.
S. Ma and **J.O. Hill.**
Thermochim. Acta, **149** 269-273 **(1989)**.

99 A thermometric titrimetric study of the Fe^{3+}/SCN^- and Ag^+/SCN^- systems.
J.O. Hill and S. Korce.
Thermochim. Acta, **154** 49-55 **(1989)**.

100 A short course in 'Thermal Analysis', Parts 1-8.
J.O. Hill.
Chulalongkorn University Press, Bangkok, Thailand, 95 pp. **(1989).**

101 Data analysis procedures: TG and DTG.
J.O. Hill.
7th Indian Thermal Analysis Society (ITAS) Symposium: Workshop proceedings, Srinagar, Kashmir, India, pp 73-82 **(1989)**.

102 A thermal analysis study of Victorian brown coal.
S. Ma, **J. O. Hill** and S. Heng.
J. Therm. Anal., **35** 977 – 988 **(1989).**

103 A thermal analysis study of brown coal chars.
S. Ma, **J. O. Hill** and S. Heng.
J. Therm. Anal., **35** 1611 – 1619 **(1989).**

104 A thermal analysis study of the combustion characteristics of Victorian brown coals.
S. Ma, **J.O. Hill** and S. Heng.
J. Therm. Anal., **35** 1985-1996 **(1989)**.

105 Thermal analysis studies of Australian coals: A short review.
J.O. Hill, S. Ma and S. Heng.
J. Therm. Anal., **35** 2009-2024 **(1989)**.

106 A DTA study of phenols: Part I, Halophenols.
N.G. Buckman, **J.O. Hill** and R.J. Magee.
J. Therm. Anal., **36** 289-308 **(1990)**.

107 A thermomechanical analysis study of selected compounds.
E.L. Charsley, N.G. Buckman and **J.O. Hill**.
J. Therm. Anal., **36** 309-317 **(1990)**.

108 An XPS study of the pressure effects on core level binding energies in Nickel (II) oxide and bis(2-hydroxy-1,3-diaminopropane)Copper(II)-tetrafluoroborate.
S.P. Roe, **J.O. Hill** and J. Liesegang.
Science International, **2** 199-203 **(1990)**.

109 South East Asian Thermal Analysis Symposium proceedings: 'Modern thermal analysis techniques', Parts 1-8.
J.O. Hill.
PL (Thermal Sciences) Ltd., Epsom, Surrey, U.K., 103 pp. **(1990)**.

110 A thermometric titration study of the interaction of $A1^{3+}$, Cd^{2+}, Pb^{2+} and Zn^{2+} with ethylenediaminetetraacetic acid.
R. bin Othman, N.G. Buckman, **J.O. Hill** and R.J. Magee.
Thermochim. Acta, **157** 335-345 **(1990)**.

111 Influence of exchangeable metal cations on the thermal behaviour of Victorian brown coal.
S. Ma, **J.O. Hill** and S. Heng.
4th Australian Coal Science Conference proceedings, Brisbane, Australia,
pp. 192-199 **(1990).**

112 Applications of analytical solution calorimetry in environmental chemistry:
A short review.
J.O. Hill.
Bull. Singapore Natl. Inst. Chem., **18** 5-11 **(1990)**.

113 A DTA study of phenols: Part 2, Methyl-phenols and methyl-halo-phenols.
N.G. Buckman, **J.O. Hill** and R.J. Magee
J. Therm. Anal., **36** 2555-2566 **(1990)**.

114 A DTA study of phenols: Part 3, Polyhydroxy-phenols and naphthols.
N.G. Buckman, **J.O. Hill** and R.J. Magee.
J. Therm. Anal., **37** 79-94 **(1991)**.

115 A DTA study of phenols: Part 4, Nitro-phenols and amino-phenols.
N.G. Buckman, **J.O. Hill** and R.J. Magee.
J. Therm. Anal., **37** 95-110 **(1991)**.

116 The thermochemistry of 1, 3 -dimethylurea and 1, 3 -dimethylurea nitrate.
R.H. Davies, A. Finch and **J.O. Hill**.
Thermochim. Acta, **184** 243-250 **(1991)**.

117 Correlation of some thermochemical data for ureas with the degree of N-substitution.
R.H. Davies, **J.O. Hill** and A. Finch.
Thermochim. Acta, **188** 321-325 **(1991).**

118 An infrared and electronic spectroscopic study of some Nickel (II) amine complexes.
S.P. Roe, **J.O. Hill** and R.J. Magee.
Monatshefte Chemie, **122** 467-478 **(1991)**.

119 A spectroscopic study of some Cu (II) amine complexes.
S.P. Roe, **J.O. Hill** and R.J. Magee.
Science International, **3** 45-49 **(1991).**

120 An electrochemical study of some Ni (II) tetra-aza macrocyclic complexes.
S.P. Roe, **J.O. Hill** and R.J. Magee.
Science International, **3** 129-132 **(1991)**.

121 A thermometric enthalpy titration study of the cadmium ferricyanide system.
J.O. Hill and S. Lim.
Thermochim. Acta, **188** 249-254 **(1991)**.

122 A thermometric enthalpy titration study of the silver thiosulphate system.
J.O. Hill and S. Lim.
Thermochim. Acta, **188** 255-263 **(1991).**

123 Thermal analysis studies of coordination compounds:
Metal 2, 4-pentanedionate and related complexes: A review.
J.O. Hill.
Therm. Anal. Reviews: Abstracts, **20** 1-7 **(1991)**.

124 A thermal analysis study of some Mercury (II) carboxylates.
T.S.A. Hor, Y. Quah and **J.O. Hill**.
8th Indian Thermal Analysis Society Symposium Proceedings,
Bhubaneswar, India, pp. 141-145 **(1991)**.

125 Synthesis and a thermal analysis study of metal complexes of cacodylic acid.
Ben L.W. Lup and **J.O. Hill.**
Proceedings, Science Research Congress, Singapore, pp. 101-106 **(1991)**.

126 'KNIS' - A computer program for the systematic kinetic analysis of non - isothermal TG data.
S. Ma, G. Huang and **J.O. Hill**.
Thermochim. Acta, **184** 233-241 **(1991)**.

127 A kinetic analysis of the pyrolysis of some Australian coals by non - isothermal thermogravimetry.
S. Ma, **J.O. Hill** and S. Heng.
J. Therm. Anal., **37** 1161-1177 **(1991)**.

128 DSC determination of coal specific energy.
S. Ma, **J.O. Hill** and S. Heng.
Thermochim. Acta, **190** 291-297 **(1991)**.

129 'Thermal Analysis going to extremes':
A review of recent 'extended temperature range' applications.
J.O. Hill and J.P. Redfern.
8th Indian Thermal Analysis Society Symposium: Workshop proceedings, Bhubaneswar, India, pp. 46-66 **(1991)**.

130 'For Better Thermal Analysis and Calorimetry', Edition III.
J.O. Hill, Editor,
International Confederation for Thermal Analysis (ICTA),
93 pp. **(1991)**. **[ISBN 0 9517624 0 0]**

131 How to teach university chemistry effectively.
J.O. Hill and K.Y. Sim.
Seminar Proceedings: 'Teaching of Science at the Tertiary Level',
M.A. Karolewski and Y.M. Teo, Eds., Faculty of Science,
National University of Singapore, Singapore, pp. 24-27 **(1991)**.

132 The synthesis, thermochemistry and analytical chemistry of selected systems.
J.O. Hill.
DSc Thesis, Vols. 1-4, **University of London**, UK, **(1992)**.

133 An investigation of the ICTA 'Certified Reference Materials' for DTA as potential standards for the temperature calibration of thermomechanical analysis equipment.
E.L. Charsley, **J.O. Hill**, P. Nicholas and S.B. Warrington.
Thermochim. Acta, **195** 65-71 **(1992)**.

134 A thermal analysis study of the influence of exchangeable cations on the pyrolysis of Victorian brown coal.
S. Ma, **J. O. Hill** and S. Heng.
Thermochim. Acta, **197** 79 - 89 **(1992)**.

135 Twenty-five years of thermochemistry research: A personal review.
J. O. Hill.
Thermochim. Acta, **200** 187 - 194 **(1992)**.

136 A thermal analysis study of pinus radiata and its radiation-induced wood polymer composites.
S. N. Wong, N. Binti Abdul Rahim, L. Chia and **J. O. Hill**.
Proceedings, Science Research Congress, Singapore, pp 68 - 76 **(1992)**.

137 A thermometric enthalpy titration (TET) study of some Australian wines.
J. O. Hill, S. Korce, S. Lim and G. R. Scollary.
Thermochim. Acta, **209** 301 - 311 **(1992)**.

138 Thermal analysis applications in materials science: A short review.
H. S. O. Chan and **J. O. Hill**.
Bull. Singapore Natl. Inst. Chem., **20** 55 - 73 **(1992)**.

139 Classical calorimetry: Selected applications in inorganic chemistry.
J. O. Hill.
Bull. Singapore Natl. Inst. Chem., **20** 75 - 91 **(1992)**.

140 Thermal Analysis in a South East Asian context: Education and research perspectives.
J. O. Hill and S. Chirawongaram.
Proceedings, Malaysian Silver Jubilee Chemical Congress, Kuala Lumpur, Malaysia, 13pp. **(1992)**.

141 Thermal Analysis in an Australian context: Educational perspectives.
J. G. Dunn and **J. O. Hill**.
Proceedings, RACI: 12th Australian Symposium on Analytical Chemistry (12AC), Perth, Australia, 7pp. **(1993)**.

142 Thermochemistry - the traditional 'ugly-duckling' of the High School science curriculum.
J. O. Hill.
Australian Chemistry Resource Book, C. L. Fogliani, Ed., Mitchell Printery, Charles Sturt University, Bathurst, Australia, **12** 48 - 52 **(1993)**.

143 An analytical DTA study of some binary phenol systems.
J. O. Hill, N. G. Buckman and R. J. Magee.
J. Therm. Anal., **39** 795 - 801 **(1993)**.

144 A DSC compositional analysis of some binary organic systems of pharmaceutical significance.
G. Becket, S. B. Quah and **J. O. Hill**.
J. Therm. Anal., **40** 537 - 542 **(1993)**.

145 A thermal analysis evaluation of the low temperature synthesis of $BaBiO_3$.
G. K. Chuah, S. Jaenicke, K. S. Chan, S. T. Khor and **J. O. Hill**.
J. Therm. Anal., **40** 1157 - 1164 **(1993)**.

146 A solution calorimetric study of tris(diethyldithiocarbamato)cobalt(111).
J. O. Hill and K. J. Cavell.
Thermochim. Acta, **223** 187 - 191 **(1993)**.

147 20 years of synthetic chemistry research: A personal review.
J. O. Hill.
Science International (Lahore), **5** 33 - 34 **(1993)**.

148 10 years of research in analytical chemistry: A personal review.
J. O. Hill.
Science International (Lahore), **5** 35 **(1993)**.

149 Tutorial assessment: A blessing in disguise.
J. O. Hill.
Seminar proceedings: 'Excellence in Science Teaching at the Tertiary Level', Y. M. Teo and S. C. Ng, Eds., Faculty of Science, National University of Singapore, pp. 86 - 89 **(1993)**.

150 Some less common thermal analysis techniques and their application in the mining, mineral and metallurgical industries.
J. O. Hill.
9th Indian Thermal Analysis Society (ITAS) Symposium:
Workshop proceedings,
Goa, India, pp. 49 - 66 **(1993)**.

151 Thermal analysis of Australian brown coal.
J. O. Hill.
ICTAC NEWS, **26** (2) 27 - 36 **(1993)**.

152 The sublimation enthalpies of metal complexes of
pentane - 2, 4 - dione and related ligands: An assessment review.
J. O. Hill and J. P. Murray.
Revs. Inorg. Chem., **13** 125 - 156 **(1993)**.

153 Metal-oxygen thermochemical bond dissociation enthalpies for metal pentane - 2, 4 - dionate complexes: A review.
J. O. Hill and J. P. Murray.
Reviews Inorg. Chem., **13** 157 - 181 **(1993)**.

154 The solution calorimetric determination of the standard formation enthalpies of metal dithiocarbamate complexes: A review.
J. O. Hill and J. P. Murray.
Reviews Inorg. Chem., **13** 183 - 197 **(1993)**.

155 The thermochemistry of the metal dithiocarbamate and xanthate complexes: A review up-date.
J. O. Hill, J. P. Murray and K. C. Patil.
Reviews Inorg. Chem. **14** 363 - 387 **(1994)**.

156 Thermal Analysis studies of tin dithiocarbamate complexes: A short review.
J. O. Hill and S. Chirawongaram.
J. Therm. Anal., **41** 511 - 518 **(1994)**.

157 An assessment of tesla luminescence spectroscopy as a potential analytical technique.
J. O. Hill, J. M. Overbeek, R. J. Magee and J. P. Murray.
Science International (Lahore), **6** 15 - 24 **(1994)**.

158 'Continuous Titration Calorimetry'.
J. L. Oscarson, R. M. Izatt, **J. O. Hill** and P. R. Brown.
Chapter 10 in 'Solution Calorimetry', Vol. 4 of 'Experimental Thermodynamics', K. N. Marsh and P. A. G. O'Hare, Eds., IUPAC/Blackwell Scientific Publications, Oxford, UK.
pp. 211 - 241 **(1994)**. [**ISBN 0 - 865 - 42852 – 2]**

159 30 years of research in thermal analysis and calorimetry: A personal review.
J. O. Hill.
J. Therm. Anal., **42** 607 - 621 **(1994)**.

160 THERMAL ANALYSIS: Overview, Thermogravimetry and Evolved Gas Analysis, Differential Thermal Analysis, Differential Scanning Calorimetry, Thermomechanical methods.
J. O. Hill.
ENCLYCLOPEDIA OF ANALYTICAL SCIENCE, Academic Press Ltd., London, UK. pp. 5136 - 5167 **(1995)**. **[ISBN 0-12 - 226700 - 1]**

161 Environmental water quality indicators.
J. O. Hill.
'Wise Water Ways': Conference Proceedings,
The Wangaratta Centre for Adult Education Inc.,
Wangaratta, Victoria, Australia **(1998)**.

162 Environmental trace element analysis.
J. O. Hill.
3rd Joint Yunnan/La Trobe University Research Conference Proceedings, Kunming, China **(1998)**.

163 The Year 1 Chemistry course in Australian universities: A Crisis of Confidence.
J. O. Hill and R. T. Cross.
Chemical Education Journal (CEJ) (The Japanese Chemical Education e-Journal) 4 - XX **(2000).**
http://chem.sci.utsonomiya-u.ac.jp/v4n1/indexE.html

164 Some pioneering applications of classical calorimetry:
A selective review.
J. O. Hill.
Keynote Lecture: Calorimetry Workshop, University of Huddersfield, UK, 48pp, August **2001**.

165 A report on a comprehensive review of the 'Year 1 Chemistry' course in Australian universities.
J. O. Hill and R. T. Cross.
Arena Printing & Publishing, Fitzroy, Australia, 41pp. **(2001)**.

166 Shaping the future of chemical education to meet the challenges of the new millennium.
J. O. Hill and R. T. Cross.
Chemistry in Sri Lanka, **19** (3) 18 - 21 **(2002)**.
Also:

Chemical Education Journal (CEJ) **6** (2) Registration No. 6-10 **(2002)**
http://www.juen.ac.jp/scien/cssj/cejrnlE.html

167 Learning from the past: Looking towards the future.
J. O. Hill and R. T. Cross.
Huaxue Jiaoyu (Chinese Journal of Chemical Education),
Chinese Chemical Society, **23** (12) 34 - 36 **(2002)**.

168 Development and applications of a preparative scale Sample Controlled Thermogravimetric (SCTA) system.
E. L. Charsley, J. J. Rooney, **J. O. Hill**, G. M. B. Parkes, P. A. Barnes and E. A. Dawson.
J. Thermal Anal. Calorim., **72** 1091 **(2003)**.

169 University chemical education: Demise, delusion and destiny.
J. O. Hill and R. T. Cross.
Proceedings of the Australasian Science Education Research Association (ASERA) Conference, Melbourne, pp. 3 **(2003).**

170 Thermal analysis trends in the 21st century.
J. O. Hill.
Chemistry in Sri Lanka, **20** (3) 19 - 26 **(2003).**

171 The Chemistry 1 course: A critical element for change.
J. O. Hill.
Chemistry in Australia, **70** (11) p. 16-17, 30 **(2003).**

172 Raising the status of chemical education.
W. S. Price and **J. O. Hill**.
U. Chem. Ed., **8** 13 - 20 **(2004).**

173 Thermal Analysis: Overview.
J. O. Hill.
Encyclopedia of Analytical Science (2nd Edition), Elsevier, Oxford, UK.
9 17 – 22 **(2005)**.

174 Thermal Analysis: Temperature modulated techniques.
J. O. Hill.
Encyclopedia of Analytical Science (2nd Edition), Elsevier, Oxford, UK.
9 22 – 29 **(2005)**.

175 Thermal Analysis: Coupled techniques.
J. O. Hill.
Encyclopedia of Analytical Science (2nd Edition), Elsevier, Oxford, UK.
9 29 – 34 **(2005)**.

176 Thermal Analysis: Sample-controlled techniques.
J. O. Hill.
Encyclopedia of Analytical Science (2nd Edition), Elsevier, Oxford, UK.
9 35 – 43 **(2005).**

177 Thermal Analysis: Non-basic techniques.
J. O. Hill.
Encyclopedia of Analytical Science (2nd Edition), Elsevier, Oxford, UK,
9 44 – 50 **(2005)**.

178 Fensham's 'Science for All' vision: A chemistry perspective.
J. O. Hill.
Sains Malayasiana, **34** (1) 139 – 142 **(2005)**.

179 Scientific literacy and the reform of science education in Australia: A chemistry perspective.
J. O. Hill.
PhD Thesis, University of Melbourne, 300pp. **(2005)**.
<https://repository.unimelb.edu.au/10187/15337>

180 A preliminary determination of the equilibrium temperatures of the solid-solid transitions of rubidium nitrate by Differential Scanning Calorimetry.
E. L. Charsley, **J. O. Hill**, P. G. Laye and H. M. Markham.
Proceedings of the 15th National Symposium on Thermal Analysis (THERMANS 2006), G. A. Rama Rao, S. C. Parida, P. V. Ravindran (Editors), Perfect Prints, Mumbai, India: pp. 8 - 11 **(2006).**

181 Differential Scanning Calorimetry.
J. O. Hill.
Encyclopedia of Chemical Processing, Sunggyu Lee (Editor), Dekker Encyclopedias, Taylor & Francis Books/CRC Press, (www.taylorandfrancis.com) New York, pp. 699 – 706 **(2006)**.

182 Thermal Analysis techniques: Overview.
J. O. Hill.
Encyclopedia of Chemical Processing, Sunggyu Lee (Editor), Dekker Encyclopedias, Taylor & Francis Books/CRC Press, (www.taylorandfrancis.com) New York, pp. 2965 – 2973 **(2006)**.

183 Thermogravimetric Analysis (TGA).
J. O. Hill.
Encyclopedia of Chemical Processing, Sunggyu Lee (Editor),
Dekker Encyclopedias, Taylor & Francis Books/CRC Press,
(www.taylorandfrancis.com) New York, pp. 3009 – 3021 **(2006).**

184 Correlations of aquatic chemistry, water quality and aquaculture.
J. O. Hill.
Proceedings of the International Conference on Coastal Oceanography and Sustainable Marine Aquaculture (ICCOSMA 2006),
University Malaysia Sabah, Kota Kinabalu, Malaysia, pp. 9 **(2006)**.

185 Determination of the equilibrium temperatures and enthalpies of the solid-solid transitions of rubidium nitrate by differential scanning calorimetry.
E. L. Charsley, P. G. Laye, H. M. Markham, **J. O. Hill**,
B. Berger and T. T. Griffiths.
Thermochim. Acta, **469** 65 – 70 **(2008)**.

186 An alternative curriculum framework for the Chemistry 1 course in Australian universities: Chemistry enabling sustainability.
John Hill and David Warren.
ChemEd NZ, **115** 4 – 9 **(2009)**

187 A roadmap for a green chemical industry in Australia
J. Ananda, G. Domazetis and **J. O. Hill**.
J. Environmental Development and Sustainability, **11** 1051 – 1071 **(2009)**.

188 Science education must inform and influence climate change policy.
John Hill.
ChemEd NZ, **118** 9 – 13 **(2010)**.

189 'Seafood security in a changing climate',
Saleem Mustafa,
Lambert Academic Publishing, Saarbrucken, (2010).
Reviewed by: **John Hill** in:
Environmental Biotechnology, 6 (1) V – V1 **(2010)**.

190 Atkins' 'Nine principal ideas of chemistry':
Cornerstone concepts of a tertiary foundation chemistry course.
John Hill.
ChemEd NZ, **121** 12 - 13 **(2010).**

191 'Green World Order: Delaying the doom in a changing climate'.
Saleem Mustafa and **John Hill**.
Lambert Academic Publishing, Saarbrucken, 110 pp. **(2011)**.
[ISBN: 978 – 3 – 8443 – 2193 – 7]

192 A curriculum framework for a tertiary sustainability course.
John Hill and Saleem Mustafa.
ChemEd NZ, **124** 12 - 22 **(2011).**

193 Natural resources management and food security in the context of sustainable development.
John Hill and Saleem Mustafa.
Sains Malaysiana, **40** (12) 1331 – 1340 **(2011)**.

194 'Principles and practices of thermal analysis and calorimetry'.
John Hill.
In: 'Characterisation of Materials', (2nd Edition), Kaufmann, E. N. (Editor), Vol. 1, pp. 463 – 471, John Wiley & Sons, Inc., Hoboken, NJ **(2012).**

195 A curriculum framework for education in thermal analysis.
Ranjit K. Verma, **John Hill**, Lauri Niinisto, S.C. Mojumdar, David Kumar.
J. Materials Education, **34** (3 – 4) 133 – 150 **(2012).**

196 A curriculum framework for education in calorimetry.
Ranjit K. Verma, **John Hill**, Lauri Niinisto, S.C. Mojumdar, David Kumar.
J. Materials Education, **34** (5 – 6) 161 – 174 **(2012).**

197 Challenges for education in thermal analysis and calorimetry.
Ranjit K. Verma and **John Hill**.
Proceedings of Workshop in ICTAC 15 (Osaka, August 2012).
J. Thermal Analysis & Calorimetry, **112** (1) **(2013):**
[DOI 10.1007/s10973-013-3135y]

198 Challenges for chemical education: Engaging with green chemistry and environmental sustainability.
John Hill, David Devraj Kumar and Ranjit Verma.
'The Chemist' – Journal of the American Institute of Chemists,
86 (1) 24 - 31 **(2013).**

199 Challenges for chemical cducation: Traversing the chemical sciences/materials science interface.
John Hill, Ranjit K. Verma and David Devraj Kumar.
J. Materials Education, **35** (1 – 2) 1 – 16 **(2013).**

200 Recollections of the chemistry experience at Battersea College of Technology (BCT) in the 1960's.
John Hill
'Forever Surrey', (April): e-Network News bulletin, 10 pp. **(2013).**
http://www.smartbulletin.co.uk/view/bulletinfinal/283

201 Challenges for chemical education: Implementing the 'Chemistry for all' vision.
John Hill and David Devraj Kumar.
'The Chemist' – Journal of the American Institute of Chemists,
86 (2) 27 – 32 **(2013).**

202 Designing core concepts for the tertiary 'Basic Chemistry' course.
John Hill, David Devraj Kumar and Ranjit K. Verma.
'The Chemist' – Journal of the American Institute of Chemists,
87 (1) 14 – 22 **(2014).**

203 The development, implementation and quality assurance of a tertiary course on carbon-neutral fuels, energy and environmental sustainability.
John Hill and David Devraj Kumar.
Chemical Educator, **20** 157 - 166 **(2015).**

204 La Trobe University Chemistry: The first fifty years.*
***** In association with La Trobe 50th Anniversary celebrations.
Bob Brownlee and **John Hill**.
https://50years.latrobe/chemistry-first-50-years
eBook: https://doi.org/10.4225/22/59fba954a0f4c

205 The Life and Times of La Trobe's Department of Environmental Management and Ecology: A reflective review.
John Hill and Phil Suter.
https://50years.latrobe/history-department-environmental-management-ecology:
eBook: https://doi.org/10.4225/22/5a1504d3e9403

MY THERMOCHEMISTRY JOURNEY INSPIRED AND ENRICHED BY MY MENTORS, COLLABORATORS AND POSTGRADUATE STUDENTS

Battersea College of Technology, established in SW London in 1891 and became the foundation institution of the University of Surrey, established in Guildford in 1967.

Greetings montage sent to Roger Irving for his 90th birthday by the 1960's BCT thermochemistry group.

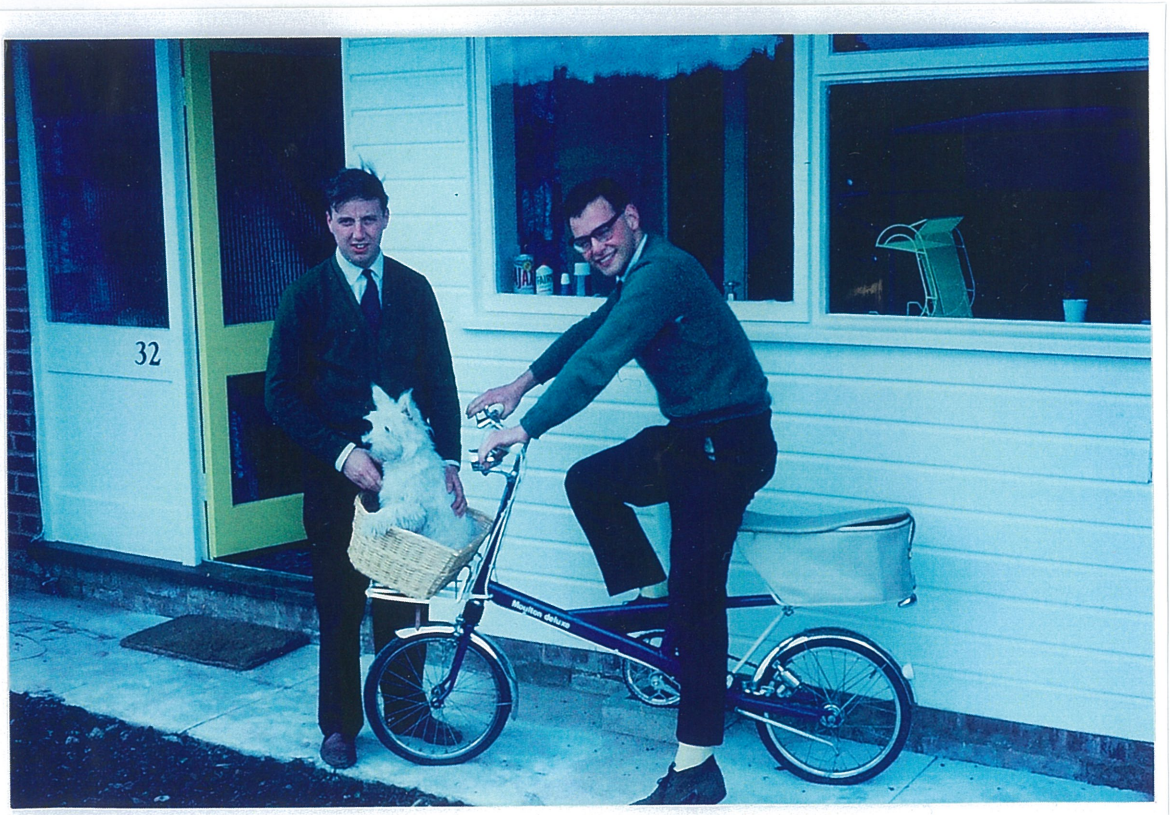
BCT Chemistry class of 1962: Reunion, Iver, October, 2012. Back row, from left: Fred Parrett, Les Larkworthy, Joe Bullock, Joe Hegarty, Herb Askew, Malcolm Hogarth, Gordon Johnston, John Sherlock, Mike Abraham, Norman Boyland, Keith Goddard, Tony Butcher, Roger Mulberge. Front row, from left: Diane Askew, Margaret Cross (Waldron), Jean Larkworthy, Helen Hegarty, Ann Sherlock.

BCT Chemistry: Reunion, Sydney, January, 2013. From left, John Hill, Tony Butcher, Margaret Cross, and Keith Goddard

The Irving/Hill/Schulz solution calorimetric system (Mk 1) circa 1964.

The Irving/Hill/Schulz solution calorimetry system (Mk 2) circa 1967/8.

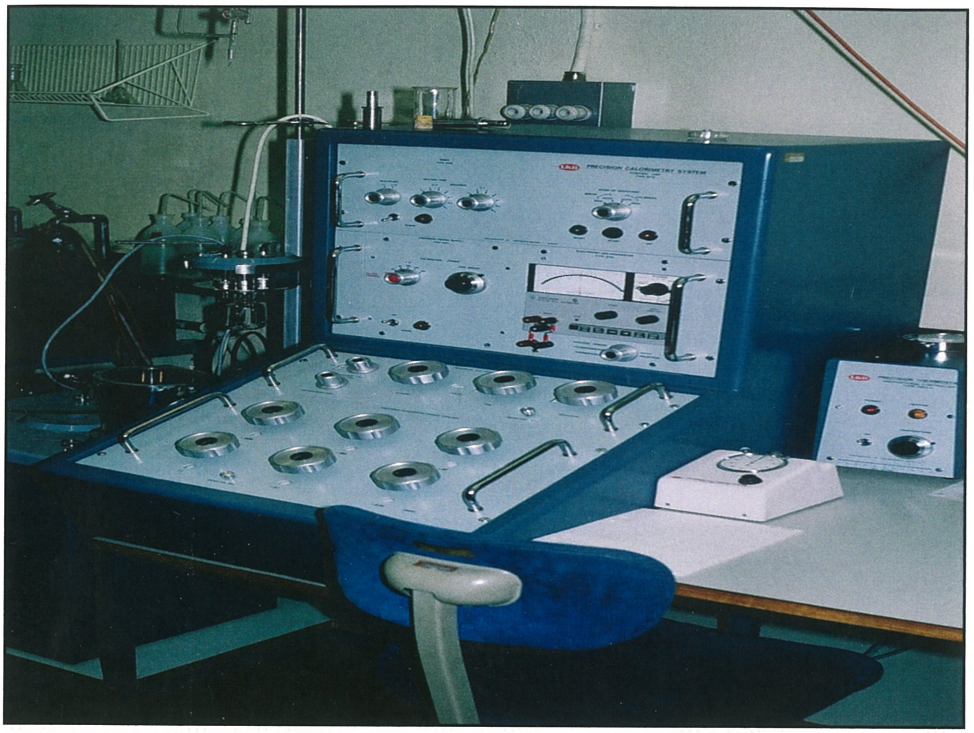
Geoff Walter and Ron Schulz at Exeter Cathedral 1965.



Hugh McKerrell and Geoff Walter: 1965.

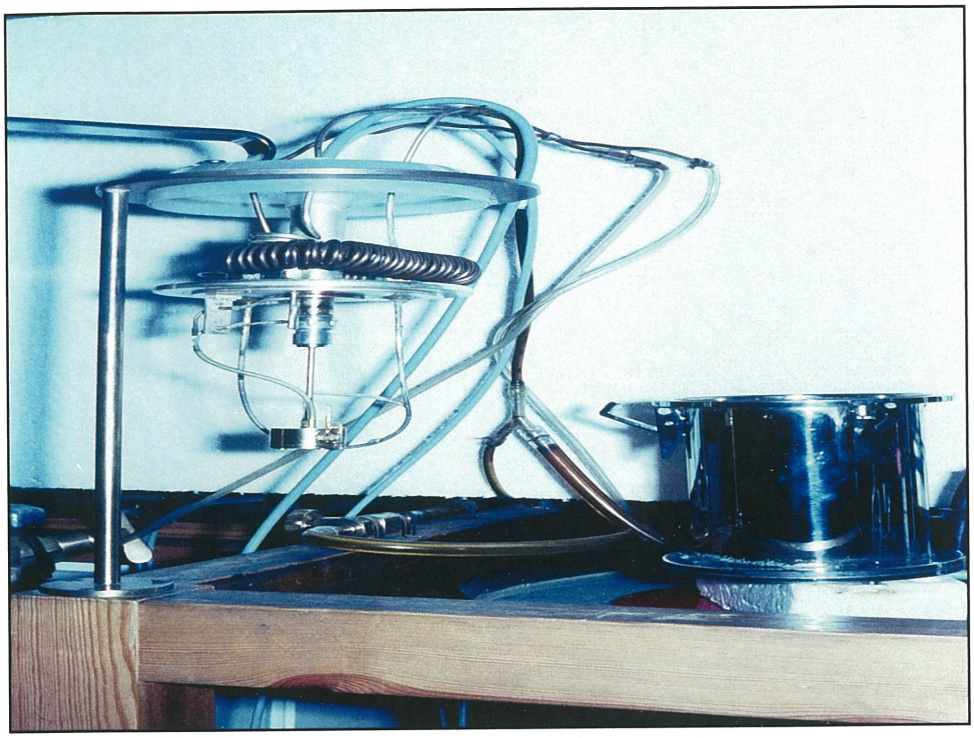
Jeff Walter and John Hill: 1965.

Ian Worsley at his home in Winnipeg: 2015.

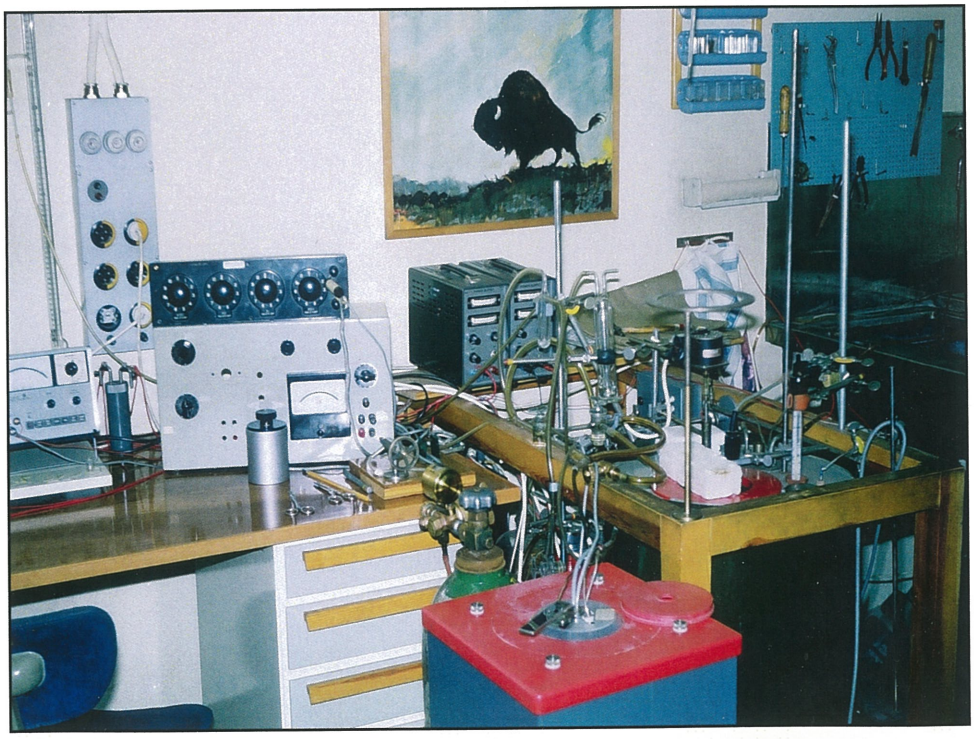


Prototype LKB solution calorimetric system, Lund Thermochemical Centre, 1967.

Prototype LKB titration calorimetric system, Lund Thermochemical Centre, 1967.



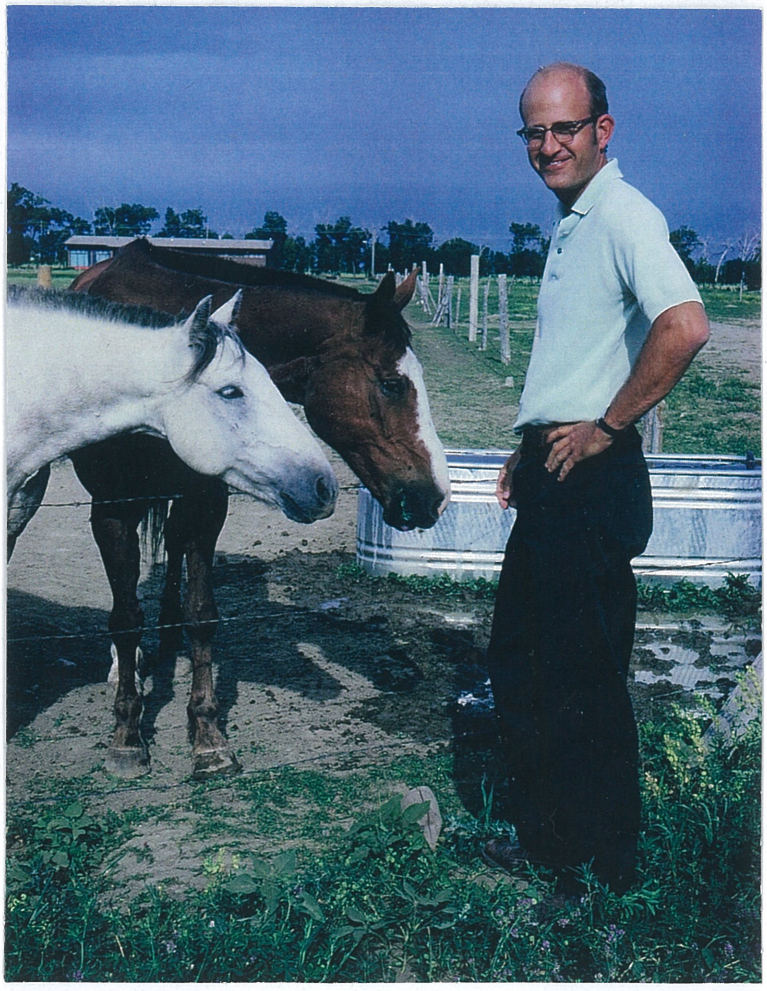
Prototype LKB vapourisation calorimeter, Lund Thermochemical Centre, 1967.



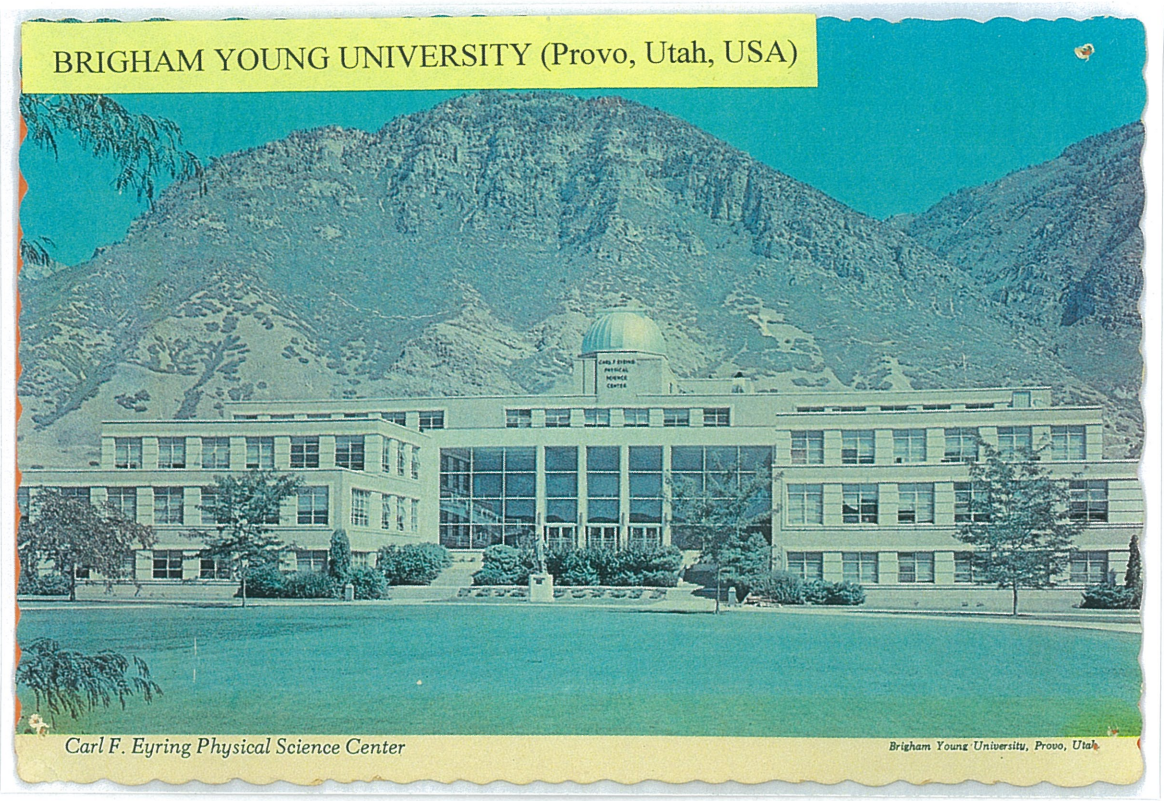
Prototype LKB vapourisation calorimetric system showing associated electronics.

Lund Thermochemical Centre Post-Doctoral Fellows 1967:

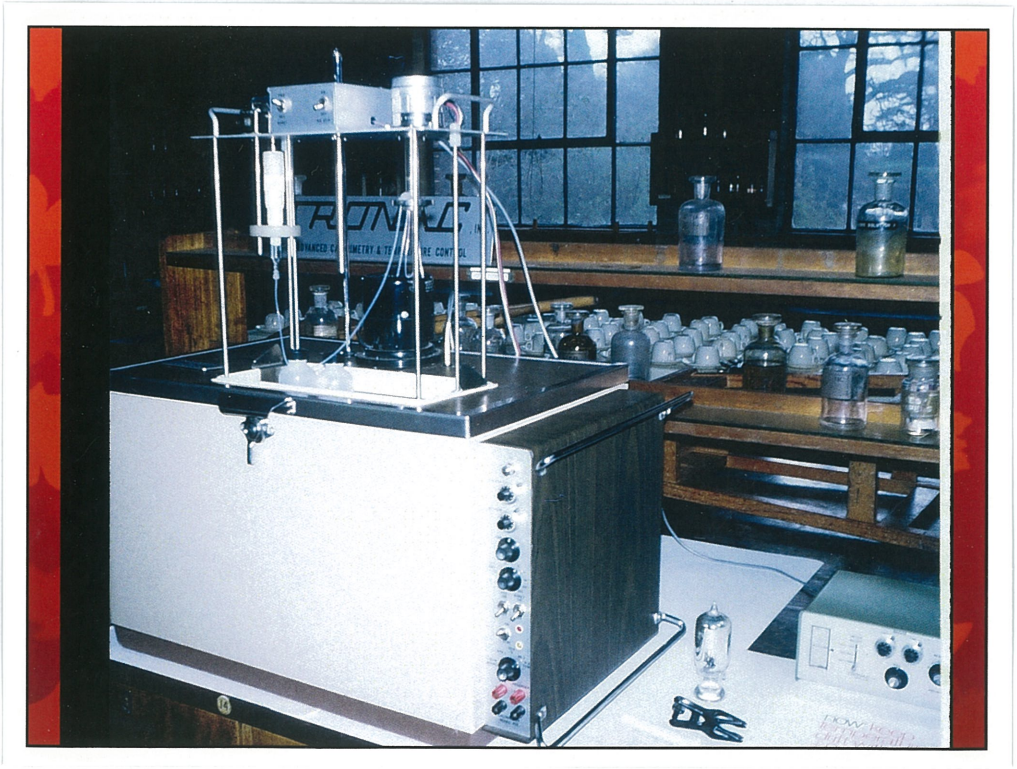
L → R: Peter Howard, Paul Monk, Peter Sellers, Pepe Layenef, Haru Watanabe, John Hill.



Loren G. Hepler: 1978



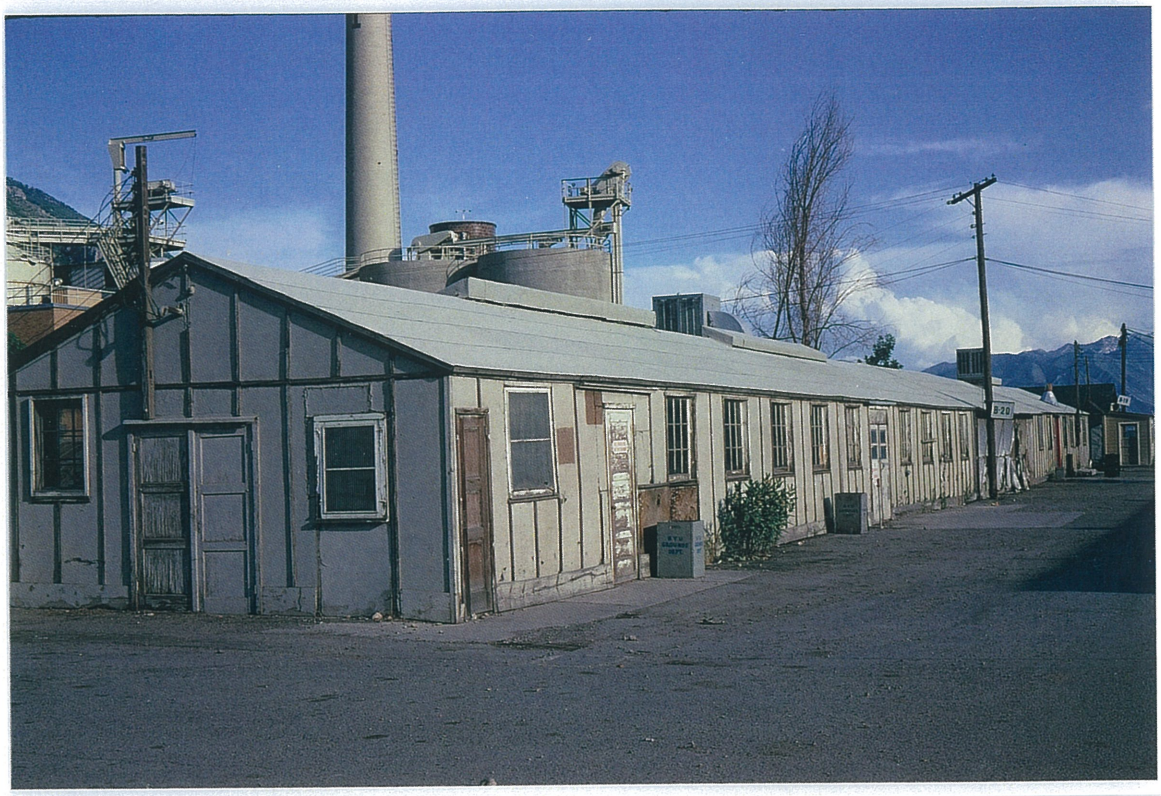
Eyring Science Centre (Chemistry Department), Brigham Young University, Provo, Utah: 1969.



Prototype Tronac titration calorimeter: Izatt/Christensen Thermochemical Centre, BYU: 1969.

Reed Izatt visiting our home in Panton Hill in 1989:

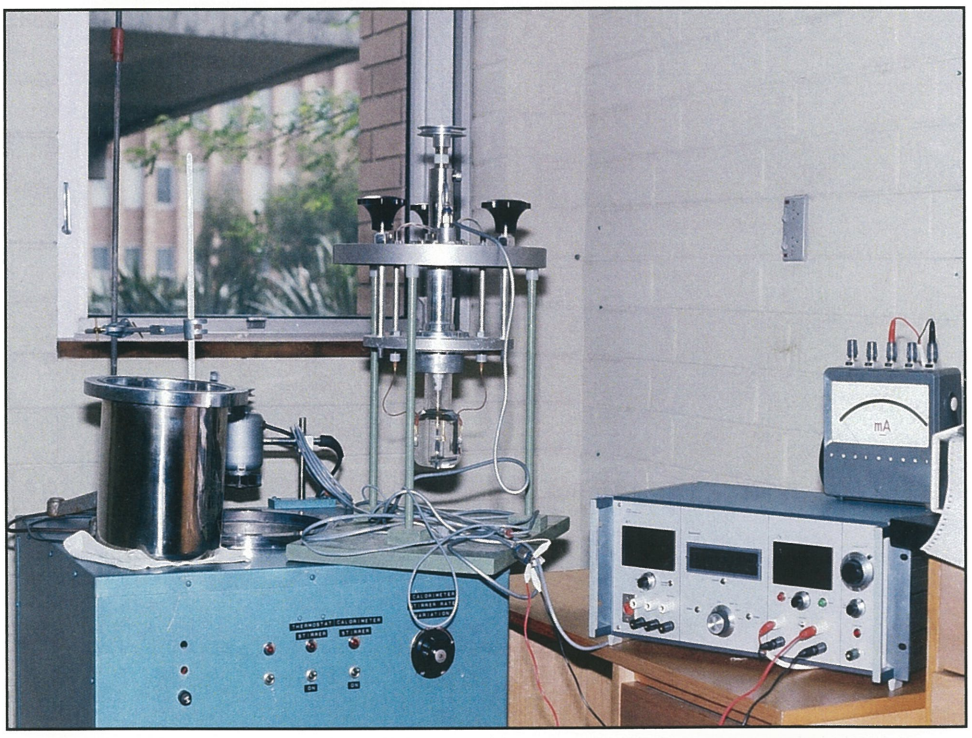
R → L: Reed Izatt, Sue Hill, Anne Izatt, Emma Hill (Aged 8).



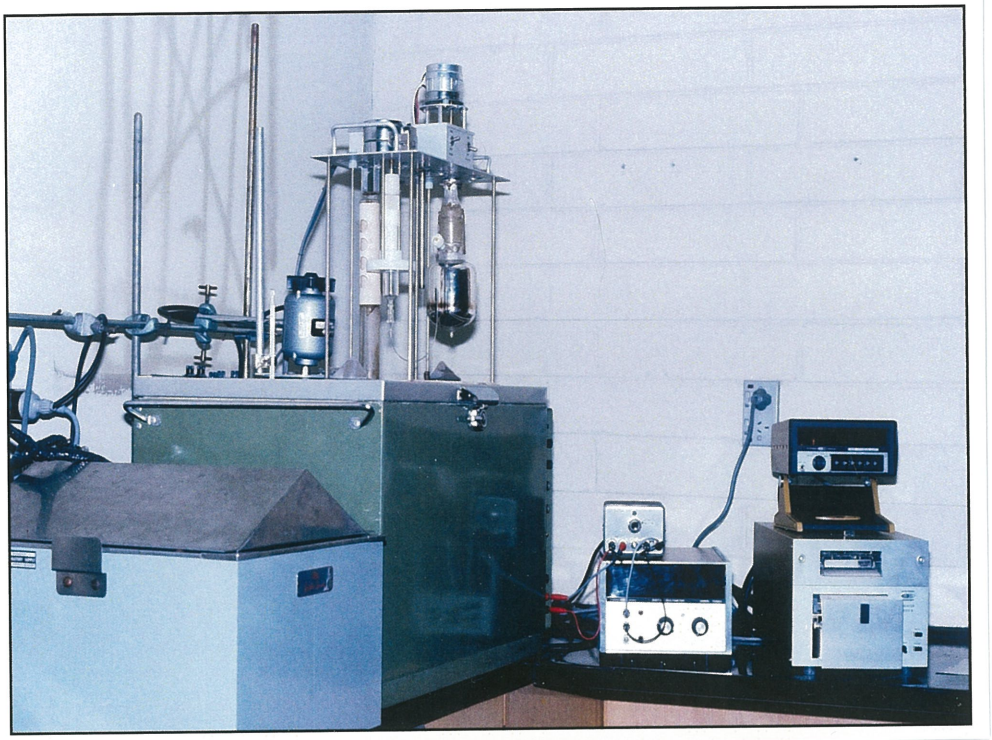
Izatt/Christensen Postdoctoral Fellows 'office', BYU: 1969.

My BYU contemporaries: R → L: Austin Yingst, Ian Worsley, Sally Yingst.

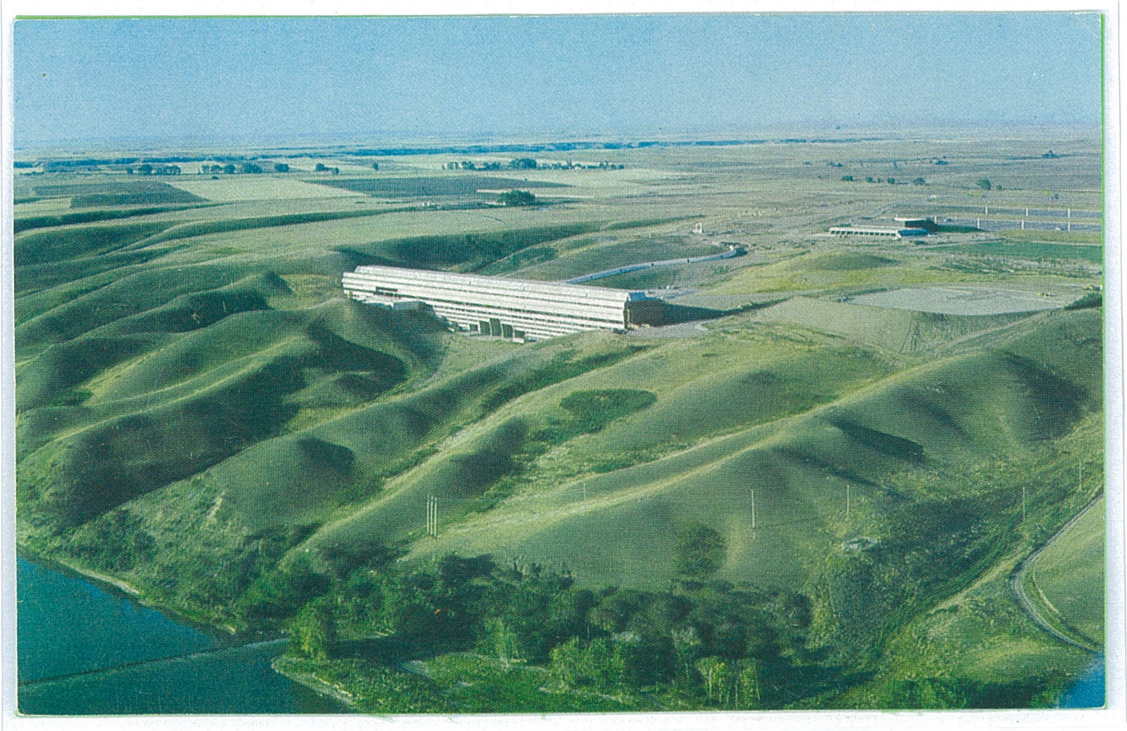
La Trobe University, Melbourne, Australia. I was appointed a Research Fellow in the Department of Chemistry in 1970.



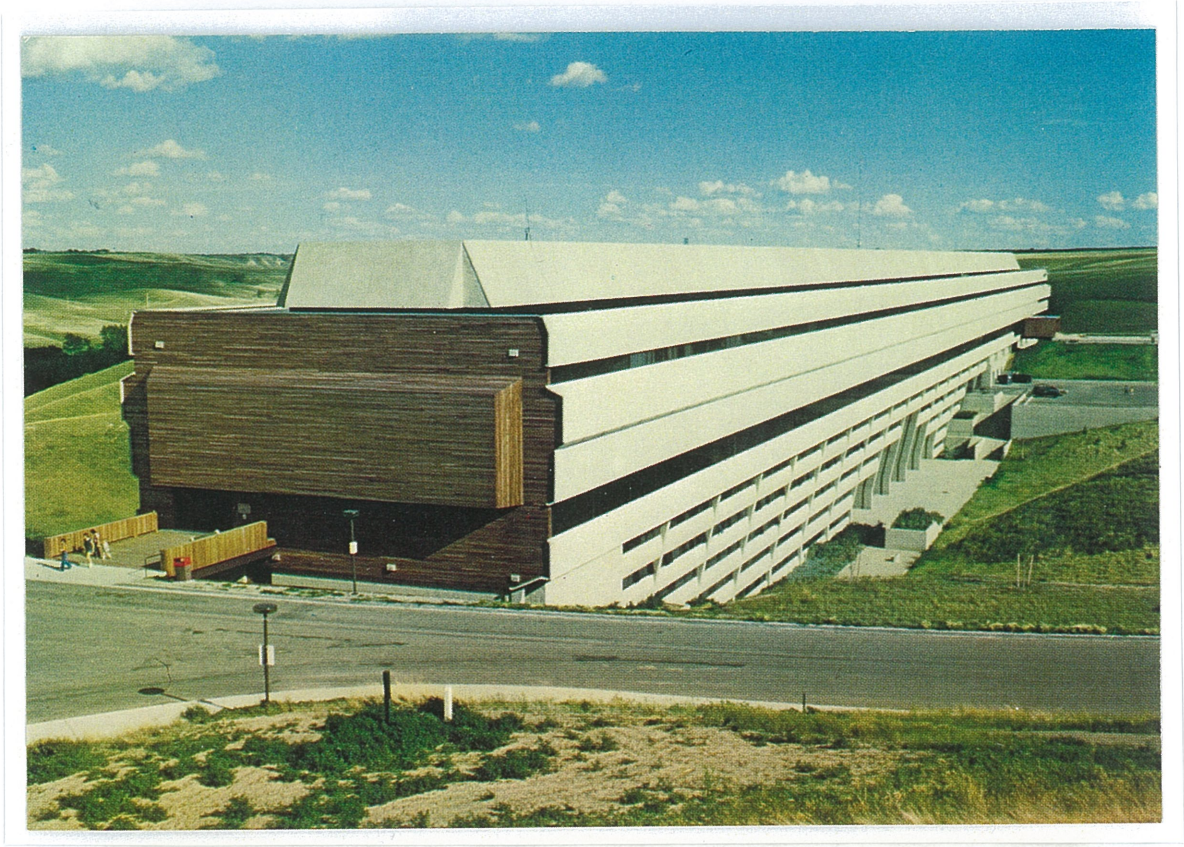
'In-house' constructed solution calorimeter, Hill Thermochemical Centre, LTU: 1970's.



Tronac solution/titration calorimetric system, Hill Thermochemical Centre, LTU: 1980's.



University of Lethbridge showing the sole building on campus in 1978.



University of Lethbridge: The only building on campus was 250m in length on 3 levels and accommodated the entire academic and administrative community.

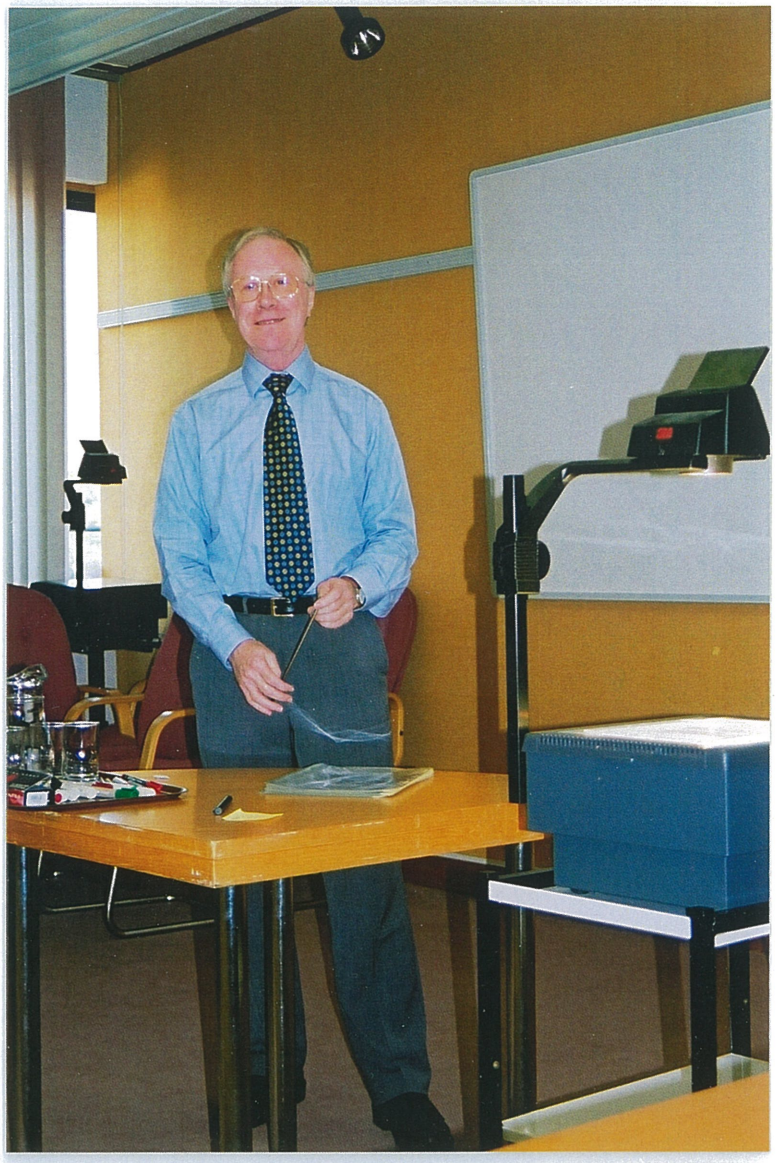
University of Lethbridge: The Hepler thermochemistry group: 1978.

Founders Building, Royal Holloway College (University of London), Egham, UK.

Royal Holloway College Chemistry Department building: 1986.

Arthur Finch (2nd from Left/Front Row) thermochemistry group: 1986.

DSc (University of London): Conferment Ceremony, Barbican Centre, London: February, 1994.



Ted Charsley, Director, Centre for Thermochemical Studies, University of Huddersfield, 2005.

Huddersfield CTS group: L → R: Ted Charsley, Peter Laye, Jim Rooney: 2005.

Huddersfield CTS group: L → R: Hayley Markham, Peter Laye, Jim Rooney: 2005.

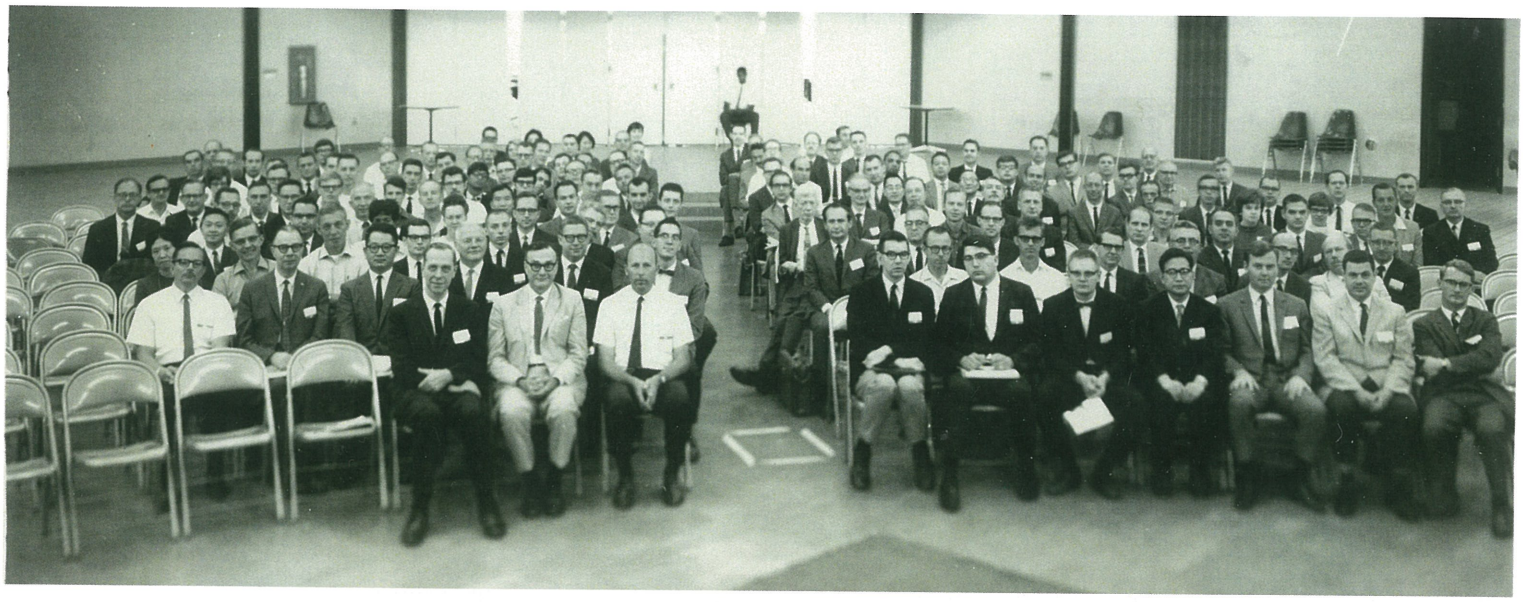
Huddersfield CTS group: L → R: Sarah Goodhall, Jim Rooney, Hayley Markham (2005).

IUPAC Chemical Thermodynamics Conference, Exeter: 1965.

Notable attendees included Max McGlashan, Hank Skinner, Roger Irving.

Parton Chemical Thermodynamics Conference, Auckland: 1982.

Attendees included Jim Pearce and John Hill.



23rd CALCON Conference, Midland, Michigan: 1968.

Notable attendees included: Hank Skinner, Max McGlashan, Ingemar Wadsö, Cecil Vanderzee, Reed Izatt, Jim Christensen and Delbert Eatough.

'6th ITAS', New Delhi, 1987.

'9th ICTAC', Jerusalem, 1988.

L → R: Jeff Dunn, Slade Warne, John Hill, Unknown, Mike Brown, David Morgan.

'9th ICTAC', Jerusalem, 1988. L → R: John Hill, Edith Turi.

'9th ICTAC', Jerusalem, 1988. L → R: Mike Brown, Unknown, Shmuel Yariv, Jeff Dunn, John Hill, Unknown.

'9th ICTAC', Jerusalem, 1988. L → R: Ted Charsley, John Hill, David Morgan.

'9th ICTAC', Jerusalem, 1988. Sightseeing in the 'Old City' (Tour guide at extreme right).

'9th ICTAC', Jerusalem, 1988. L → R: David Morgan, Ted Charsley, Jeff Dunn, John Hill.