THE UNIVERSITY OF AUCKLAND
FACULTY OF SCIENCE

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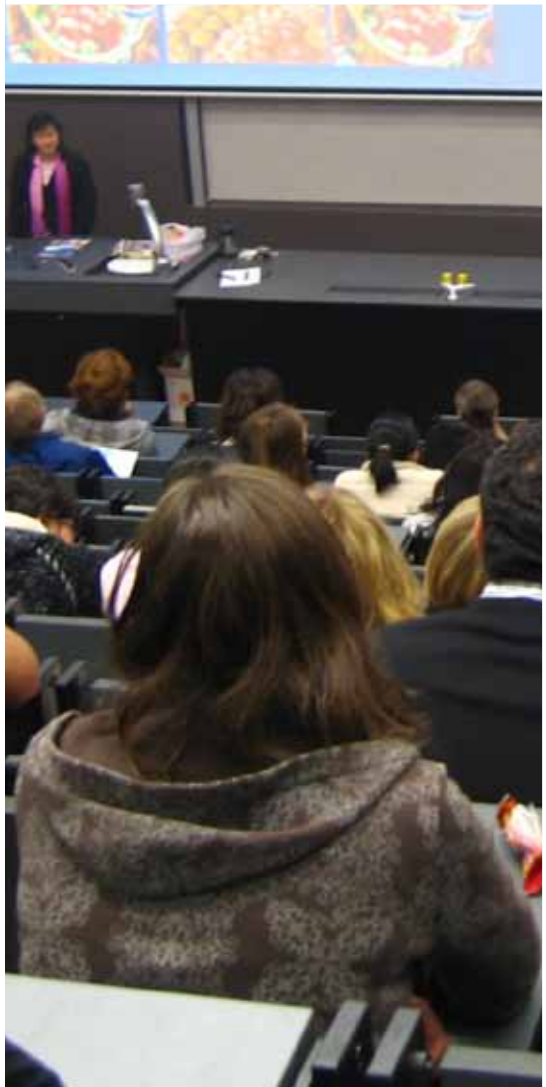
Faculty of Science
Chemistry Handbook
2011

Contents

Cover Photo: Sarah Thompson, current PhD student in the Department of Chemistry

Chemistry



Welcome from the Head of Department

Chemistry is involved in the understanding of processes, and the production of molecules and materials essential to modern life. It sits at the cross-roads between disciplines such as medicine, nutrition, forensic science, and materials science. Future developments and advances in our understanding of these areas will enrich our lives and provide employment opportunities for graduates who have practical skills and a sound understanding of their underlying chemical principles.

The Department of Chemistry at The University of Auckland is the largest university chemistry department in the country. It offers a comprehensive range of courses in pure and applied chemistry, and operates programmes in medicinal chemistry, forensic science, food science and wine science. Chemistry courses may be taken as part of a chemistry major within a BSc, or as part of another degree or programme in which chemistry is a desirable or essential component.

Our Department is an exciting place to be. Over 30 academics are active in a wide range of

fundamental or applied research programmes, many of the latter in collaboration with New Zealand and overseas industries. Our postgraduate programme currently involves over 200 students who participate in this research effort and contribute to the advancement of chemical knowledge. Our research greatly enhances our teaching programmes, and you can expect to be taught by academics who are leading researchers in their fields. A strong commitment to research ensures that our teaching keeps abreast of the latest developments in the subject.

This Handbook describes the full range of courses offered by the Department, together with information to assist you in planning your degree programmes. On behalf of all members of the Department, I am very pleased to welcome you and to wish you enjoyment and success in your studies.

James Metson
Head of Department

Important dates

Closing dates for applications for admission in 2011	
1 December 2010	Deadline for new students to submit Application for Admission if 2011 programme includes Summer School courses. Application for Admission also closes 1 December for all students applying to Optometry and to Sport and Exercise Science.
8 December 2010	Deadline for new students to submit Application for Admission if 2011 programme includes Semester One and Semester Two courses only. If you are a new student, only one Application for Admission is required. This form is due on either 1 December or 8 December, depending on whether you want to take Summer School courses as well. Applications received after these dates may be accepted if there are places available.

Academic year 2011	
Summer School – 2011	
Lectures begin	Thursday 6 January
Auckland Anniversary Day	Monday 1 February
Deadline to withdraw from summer school courses	1 week before the end of lectures
Waitangi Day	Saturday 6 February
Lectures end	Friday 11 February
Study break/exams*	Monday 14 February - Wednesday 16 February
Summer School ends	Wednesday 16 February
Semester One – 2011	
Semester One begins	Monday 28 February
Mid-semester break/Easter	Monday 11 April - Tuesday 26 April
ANZAC Day	Sunday 25 April
Graduation	Thursday 28 April - Friday 6 May
Deadline to withdraw from first semester courses	3 weeks before the end of lectures
Lectures end	Saturday 4 June
Study break/exams*	Saturday 4 June - Monday 27 June
Queen's Birthday	Monday 6 June
Semester One ends	Monday 27 June
Inter-semester break	Tuesday 28 June - Saturday 16 July
Semester Two – 2011	
Semester Two begins	Monday 18 July
Mid-semester break	Monday 29 August - Saturday 10 September
Graduation	Tuesday 20 September - Thursday 22 September
Deadline to withdraw from second semester courses	3 weeks before the end of lectures
Lectures end	Saturday 22 October
Study break/exams*	Saturday 22 October - Monday 14 November
Labour Day	Monday 24 October
Semester Two ends	Monday 14 November
Semester One – 2012	
Semester One begins	Monday 27 February 2012

* Aegrotat and Compassionate Applications must be submitted within 1 week of the date that the examination affected took place.

Deadline for withdrawal from double semester courses is three weeks before the end of lectures in the second semester.

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Basement, B033

Michael Schmitz, ext 88286

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Steve Warrington
Clive Hughes

Introduction

Chemistry has been taught at The University of Auckland since 1883. The Department, initially headed by a Professor of Chemistry and Experimental Physics, was housed in a disused District Court House in Eden Street. After the First World War, the Chemistry Department was moved to the Old Choral Hall in 1918, on a supposedly temporary basis. "Temporary" meant until 1968. Since then, the Department of Chemistry has been located at 23 Symonds Street. It shares the building with the School of Environment, the Department of Electrical and Computer Engineering, and the Faculty of Science Office.

Why Study Chemistry?

Chemistry is a central science. It deals with the world around us from a molecular point of view, playing a vital part in our understanding of the structure and interactions of matter in the universe. It impacts on fields as diverse as biology, medicine, geology, environmental studies, engineering, and materials science.

Chemistry affects us all

Studying chemistry will help you understand and appreciate the world in which you live. Advances in chemistry have had an enormous influence on our modern lifestyle and standard of living. Inventions such as semiconductors, polymers, pharmaceuticals, and advanced materials of all kinds are based on chemical science. The study of chemistry leads to a deep appreciation of the scientific method; particularly the intellectual skills needed to develop new theories and design experiments to test the validity of these theories.

Chemistry will help you to develop the ability to think logically, be creative, numerate, computer-literate and analytical. Such skills are sought after in many walks of life. Career opportunities for chemistry graduates are many and varied. In industry you might be employed in research and development, quality control, marketing, sales or management. Some of the industries that regularly employ chemists are those involving food, paper, brewing, paint, plastics, ceramics, metals, pharmaceuticals, agricultural products, and fertilisers.

Chemists have an amazing variety of jobs

The public sector employs chemistry graduates for research, analysis and development, both in Government laboratories and with Regional Councils. The work covers such areas as research into new export crops, pollution control, environmental monitoring, water purification, food quality, forensic investigations for solving crimes, and analysis of foods and drugs. Many Chemistry graduates enter the teaching profession; others work in the field of health, working in hospital laboratories or biomedical research. Some of our most creative graduates become specialist research workers, contributing directly to advances in science in New Zealand or overseas.

Give yourself an edge

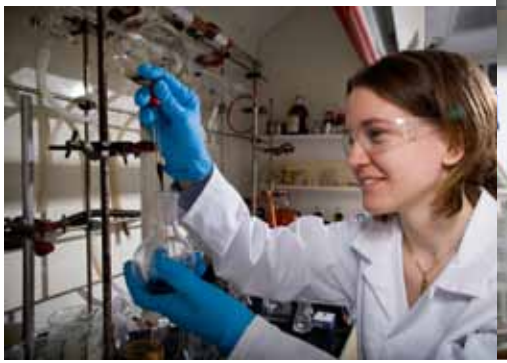
Of course, having studied chemistry, you are not limited to employment that requires detailed chemical knowledge. An education in chemistry will ensure that you are good at handling information (whether it is in numerical, written, graphical, verbal or computer form), and are capable of dealing with complex concepts. People with these qualities are in demand by many different employers. Hence, chemistry graduates are found in such diverse areas as management, finance, law, politics, retailing, information technology, journalism and the business world.

You will find some suggestions later in this handbook for courses which could enhance your employment opportunities.

Offices, Research Laboratories and Services

The offices of academic staff and the research laboratories are spread out over floors 4 to 7 Building 301. A list of all staff appears on page 6 of this handbook. We currently have about 50 MSc and 100 PhD students carrying out research under the supervision of the academic members of staff.

The department's research and teaching activities are supported by a number of facilities and technical services, including the glass blowing studio, an instrument workshop, the Faculty of Science workshop, and the Chemistry Stores.



General Education

What is General Education?

Courses in General Education are a distinctive feature of The University of Auckland bachelors degrees. General Education is aimed at producing graduates with flexibility, critical thinking skills, and an appreciation and understanding of fields outside of their usual area of study. The General Education programme consists of high quality, intellectually challenging courses taught by some of the University's best teachers and researchers.

What must I take?

BSc students must take two General Education courses (30 points) in their degree. These can be taken at any time during the degree, but it may be preferable to take these in Year 2 and 3.

Students will choose General Education courses from schedules which list courses available to their particular degree. The schedules have been developed so that students will take General Education courses that allow them to explore areas of interest outside of their degree subjects. The General Education schedules are:

A) Music, Art and Contemporary Society
B) Humanities and Social Sciences
C) Business and Society
D) Life Sciences
E) Physical Sciences
F) Mathematical and Information Sciences
G) Communication
H) Languages

The courses available to BSc students will depend on the subjects in which they are enrolled. For example, students enrolled in a Chemisty programme will not be able to take General Education courses from Schedule E Physical Sciences.

In some cases, courses are available both as part of the General Education programme and as part of the portfolio of regular degree courses. If students are taking a dual purpose course as part of the General Education programme, they will enrol in the G version of the course (e.g. HISTORY 103G). The classes and programme of study will be the same for all students.

A General Education website, **www.auckland.ac.nz/generaleducation** can be accessed from the University webpage and enables students to view the courses available to them and provides the information needed for course selection.

Students are encouraged to seek advice on General Education in their degree from the Science Student Centre.

Undergraduate Programmes in the Department of Chemistry

Chemistry

The basic qualification in chemistry at The University of Auckland is the three-year BSc degree. A major in Chemistry requires that a student take a specified number of chemistry courses each year (usually 2-4 out of the 8 total courses a student takes each year). This degree provides a solid grounding in chemistry, but also allows students to explore their other interests.

Medicinal Chemistry

A major in Medicinal Chemistry is more prescriptive, and requires courses in chemistry, biology and pharmacology. The Medicinal Chemistry specialisation provides students with training appropriate for entry into the pharmaceutical industry. For further information, please refer to the Medicinal Chemistry on page 31.

Food Science

Food Science is a new science that includes the study of all aspects of food that make it safe and attractive as well as those aspects that lead to improvement in quality and preservation. Food Science is about understanding the chemical, biological and physical attributes of food and the changes that occur during storage and processing procedures, such as canning and freezing. For further information, refer to page 48 and to the Food Science Handbook.

Major in Chemistry

Single or First Major must include:

Stage I
- 30 points: CHEM 110, 120

Stage II
- at least 45 points from CHEM 210-240

Stage III
- 30 points from CHEM 310-340
- at least 30 further points from CHEM 310 - 392

Second major must include:

Stage I
- 30 points: CHEM 110, 120

Stage II
- at least 45 points from CHEM 210-240

Stage III
- 30 points from CHEM 310-340
- at least 15 further points from CHEM 310-392

Tertiary Foundation Certificate

If you are entering the University after a break from formal education and wish to study chemistry for the first time, the pre-degree bridging programme known as the Tertiary Foundation Certificate may suit your needs.

The course CHEM 91F and/or CHEM 92F (15 points each semester) can be chosen as part of the 120-point The University of Auckland Tertiary Foundation Certificate. Students must include at least 15 points from each of English and Mathematics in their programme. The two courses in Chemistry will prepare students to tackle the Stage I Chemistry courses. This programme gives a sound preparation for embarking on a degree or other tertiary study.

For all general inquires
Phone +64 9 373 7599 ext 87020
Email: scifac@auckland.ac.nz

For information about the Tertiary Foundation Certificate Programme contact tfc@auckland.ac.nz.

Further information regarding the Chemistry courses is available from the coordinator, Dr Malini Arewgoda

Preparatory Chemistry

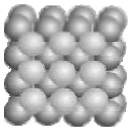
17-22 February 2011

This four-day course is designed to assist prospective students who intend enrolling in first-year chemistry couses after they have had some years away from formal study, or who do not have a strong background in chemistry. It will focus on basic principles of chemistry, providing a background for the Stage I courses CHEM 150 and CHEM 110. No points are given toward any degree. The course runs for four days: 17-18 February and 21-22 February 2011. Registration will be accepted up to 15 February 2011, subject to places being available. Please see http://www.che.auckland.ac.nz for further information about this course. A course fee applies.

If you have any further questions please contact:

Dr Malini Arewgoda (373 7599 ext 87318)
Dr Judy Brittain (373 7599 ext 88292)
Dr David Salter (373 7599 ext 84957)

BestChoice



BestChoice
An Interactive Chemistry Website

www.bestchoice.net.nz

The content of BestChoice

- 2500 screen pages (and growing) which are a mixture of information and interactive question pages
- Relevant to Year 11, Year 12 and Year 13 Chemistry as well as Chemistry 1 at university (bonding, stoichiometry, organic, inorganic, equilibrium, redox and much more to come)

The philosophy of BestChoice

- Read a little and then answer a lot of questions on what you have read
- Learn even more from the feedback given with every response you make to the questions

Admission and enrolment procedures

New Students

For ALL students not enrolled at The University of Auckland in 2010, apply online at www.auckland.ac.nz/apply_now. If you are unable to access our website, please call 0800 61 62 63 or visit the Student Information Centre at 22 Princes Street, Auckland. This is open Monday to Friday from 8am – 6pm and Saturday 9am – 12noon during peak times.

Student Information Centre
Room 112
Level 1 (Ground Floor)
The ClockTower Building
22 Princes Street
Auckland City Campus

Phone: +64 9 373 7599 ext 88199
or 0800 61 62 63
Fax: +64 9 367 7104
Email: studentinfo@auckland.ac.nz

The closing date for most undergraduate Science applications is 8 December 2010.

If you want to take courses at Summer School, or wish to apply to Sport and Exercise Science or the Bachelor of Optometry, applications close 1 December 2010.

Only one application is required.

After submitting your application:

Your application will be acknowledged by email. Your application will be assessed and, if successful, an "Offer of a place in a programme" letter will be mailed to you. You may receive a conditional offer, but final approval will be dependent on fulfilment of the conditions of admission to the University and the programme.

During the application process, you will be given a Net ID and password, which will allow you to access Student Services Online. Here you will be able to monitor the progress of your application and check if further documentation is required.

Once you have accepted an offer of place, you will gain access to the Enrolment module on Student Services Online. You can then proceed to enrol in courses online. Postgraduate students may need to contact their department for enrolment to be completed.

Returning Students

If you are currently enrolled at The University of Auckland in 2010 and are applying for a new programme (for example MSc after completion of BSc(Hons)), you should apply using Student Services Online. Visit www.auckland.ac.nz/apply_now.

You will be able to enrol through Student Services Online, but if you would like help, please call 0800 61 62 63 or visit the Student Information Centre or the Faculty of Science Student Centre (Ground Floor, Building 301, 23 Symonds Street). Postgraduate students may need to contact their department for enrolment to be completed.

The University of Auckland will be open for enrolment from November 2010 to the end of February 2011. You are welcome to attend at any time during normal office hours to seek academic or enrolment advice or assistance in completing your enrolment.

Undergraduate Enrolment - where to from here?

Enquire

Visit www.auckland.ac.nz or contact our student advisers for any information you need.
Phone: 0800 61 62 63 | **Email:** studentinfo@auckland.ac.nz
Student Information Centre: Room 112, ClockTower, 22 Princes St, Auckland

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Apply for a place in a programme(s)

Do you have internet access, or can you come on to campus to our help labs?

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Yes

- Log on to www.auckland.ac.nz
- Click on Apply Now.
- Complete the online Application for a place in your programme(s) of choice.
- You will receive an acknowledgement email asking you to provide specific certified documents (and in some cases to complete other requirements*) before your application can be assessed. The letter or email will also tell you how to complete the next steps.

No

Phone: 0800 61 62 63
(or +64 9 923 1969 (if overseas)
Email: studentinfo@auckland.ac.nz

The ClockTower Call Centre will forward required information to you.

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Offer

Your application will be assessed and, if successful, you will receive an "Offer of a place in a programme" letter will be mailed to you. This normally happens from mid January.**
You may receive a conditional offer but final approval will be dependent on fulfilment of the conditions of admission to the University and the programme.

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Accept

Accept or decline your offer of a place in a programme online. Remember – you still need to enrol in your courses!

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Enrol in your choice of courses

Enrol in courses via Student Services Online using your login and password. This system can be accessed from www.auckland.ac.nz

For help with choosing courses you can:

- talk to staff for advice and listen to talks on various programmes at Course Advice Day in late January/February 2011
- refer to www.science.auckland.ac.nz or to publications relating to your programme, or to The University of Auckland Calendar. For programme publications call 0800 61 62 63. The Calendar is for sale in bookshops or can be accessed from www.auckland.ac.nz Click on "Current Students" then "University Calendar" in the Quick Links box
- go online to check the timetable for your chosen courses
- for more information visit the Faculty of Science Student Centre, Ground Floor, Building 301, 23 Symonds Street
- or call 0800 61 62 63.

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Pay your tuition fees.

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You are now a University of Auckland student. Congratulations!

**For some programmes, you may be required to submit supplementary information (eg, a portfolio of work, referee reports, an online form) or to attend an interview/audition. If you have not already done this, any outstanding requirements will be explained in the acknowledgement letter – ensure that you follow them up as quickly as possible.*

***You can also check the status of your application online using your login and password (if you don't know these, check the instructions on your acknowledgement letter). If you are not offered a place in the programme(s) of your choice, you will receive a letter outlining alternative options. Please follow the advice on the letter or get in touch with the ClockTower Call Centre. Your final offer of a place is dependent both on you gaining admission to the University (which for school leavers may be dependent on your final school results) and assessment by the faculty offering the programme.*

Undergraduate Courses

Year 1 Courses

Choosing first year chemistry courses:

CHEM 100 Molecules that Changed the World
CHEM 100G

CHEM 110 Chemistry of the Living World
CHEM 120 Chemistry of the Material World
CHEM 150 Concepts in Chemistry

CHEM 100G is a general education course that examines how particular molecules or chemical discoveries have had a dramatic impact on society. This summer school course is also available to physical science majors as CHEM 100. This course is not intended as background for other chemistry courses.

CHEM 110 and CHEM 120 taken together have been designed to provide you with a foundation in chemistry. They are the recommended preparation for advanced chemistry courses, and would also be an excellent component of any science degree. Prior knowledge of Year 13 school chemistry is assumed. CHEM 110 and CHEM 120 can be taken independently to complement your other science courses.

CHEM 150 is an appropriate choice if you do not have a good background in chemistry. CHEM 150 includes more introductory material than CHEM 110 and CHEM 120 and features all branches of chemistry. If you choose CHEM 150, you will be able to take CHEM 110 and/or CHEM 120 in your second semester.

A four-day Preparatory Chemistry course is offered in February, prior to the beginning of the first semester (see page 14 for details). This will provide you with an introduction to chemistry which may assist you in deciding which of CHEM 110 and CHEM 150 is appropriate for you.

For all general inquires:

Phone +64 9 373 7599 ext 87020
Email: scifac@auckland.ac.nz

For specific advice about Chemistry I courses contact:

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Email: c.arewgoda@auckland.ac.nz

Dr Judy Brittain (CHEM 110)
Phone 373 7599 ext 88292
Email: j.brittain@auckland.ac.nz

Dr David Salter (CHEM 120 & 150)
Phone 373 7599 ext 84957
Email: d.salter@auckland.ac.nz

CHEM 100/100G
Molecules that Changed the World
(15 Points)
Summer School

Prerequisite: No formal prerequisite, but the course assumes a science background at Year 11 or higher.

The impact of chemistry on the modern world will be explored by focussing on the stories of specific molecules, including penicillin, DDT and nylon. Their discovery, the underlying chemical principles that explain their behaviour, their impact on our lives including social and scientific issues that arise from their use, and their likely impact on the future will be investigated. Not intended as background for other chemistry courses.

Coordinator: Mr Neil Edmonds
Assessment: Final exam 60%;
2 assignments 40%

CHEM 150
Concepts in Chemistry
(15 Points)
First Semester

Restriction: May not be taken with or after any other Chemistry course

The fundamentals of chemistry are explored with a view to enhancing appreciation of the chemical nature of the world around us, as well as providing the foundation for further study in chemistry. Special attention is paid to familiarisation with the language of chemistry and the chemist's perspective of the properties of matter and its transformations.

It is recommended that students with a limited background in chemistry take this course prior to CHEM 110 or CHEM 120.

Coordinator: Dr David Salter
Textbook: S. Zumdahl and D. Decoste, Introductory Chemistry: A Foundation (6th ed), 2008, Houghton Mifflin Co.
Laboratory: 6 laboratories (6 x 3 hours)
Assessment: Final exam 50%;
2 one-hour tests 30%;
laboratories 20%

CHEM 110
Chemistry of the Living World
(15 Points)
First Semester / Second Semester

A foundation for understanding the chemistry of life is laid by exploring the diversity and reactivity of organic compounds. A systematic study of reactivity focuses on the site and mechanism of reaction including application of chemical kinetics. A quantitative study of proton transfer reactions features control of pH of fluids in both living systems and the environment.
It is recommended that students with a limited background in chemistry take CHEM 150 prior to CHEM 110.

Coordinator: Dr Judy Brittain
Textbook: J McMurry, Fundamentals of Organic Chemistry, 7th, 6th or 5th ed., Thomson(Brooks/Cole)
Laboratory: 6 laboratories (6 x 3 hours)
Assessment: Final exam 50%;
2 one-hour tests 30%;
laboratories 20%

CHEM 120
Chemistry of the Material World
(15 Points)
Second Semester

The chemistry of the elements and their compounds is explored. The relationship between molecular structure and reactivity, the role of energy, concepts of bond formation and chemical equilibrium are discussed. Issues such as sustainability, energy and fuels, and the creation of new materials are also discussed.

It is recommended that students with a limited background in chemistry take CHEM 150 prior to CHEM 120.

Coordinator: Dr David Salter
Textbook: M Silberberg, Chemistry: The Molecular Nature of Matter and Change, 5th ed, 2008, International Edition (McGraw-Hill)
Laboratory: 10 laboratories (10 x 2 hours)
Assessment: Final exam 50%;
2 one-hour tests 30%;
laboratories 20%

Year 2 Courses

Coordinator for Stage II Chemistry:
Dr David Ware
Level 4, Room 429A ext 88270
Email: d.ware@auckland.ac.nz

The coordinator is available for consultation on all matters concerning Stage II courses.

The following courses are recommended for those who wish to major in Chemistry:

First semester core courses:

CHEM 220 Inorganic Compounds: Structure, Bonding and Reactivity
CHEM 240 Measurement and Analysis in Chemistry and Health Sciences

Second semester core courses:

CHEM 210 Physical and Materials Chemistry
CHEM 230 Molecules for Life: Synthesis and Reactivity

Laboratories:

You will have selected a laboratory time on enrolment on Students Services Online. Make sure you attend at the time you are enrolled for. If there are any problems with your timetable or laboratory stream, please consult David Ware as soon as possible to avoid delay in commencing laboratories. All labs are scheduled in Ground Floor laboratories.

CHEM 210
Physical and Materials Chemistry
(15 Points)
Second Semester

Prerequisites: Either CHEM110 and 120, or B- in CHEM110 or 120.

An understanding of basic mathematics at the level covered in MATHS 102 will also be assumed.

Restrictions: CHEM 243

Physical chemistry is essential for developing and interpreting the modern techniques used to investigate the structure and properties of matter. Materials chemistry is an increasingly important subject aimed at producing new or improved materials for a variety of practical applications. Covers topics involving the application of physical chemistry to the study of modern materials: polymer chemistry, electrochemistry and energy storage, and the electrical properties of solids.

Coordinator: Assoc Prof Jadranka Travas-Sejdic and Dr Tilo Söhnel
Textbook: PW Atkins, Physical Chemistry, 8th ed, Oxford University Press
Tutorials: In lecture times
Laboratory: 6 laboratories (6 x 3 hours)
Assessment: Final exam 50%; 2 tests 25%; laboratories 25%

CHEM 220
Inorganic Compounds: Structure, Bonding and Reactivity
(15 Points)
First Semester

Prerequisites: Either CHEM110 and 120, or B- in CHEM110 or 120.

Modern inorganic chemistry encompasses the study of compounds with a broad diversity of reactivities, structures and bonding types. Often these have widespread relevance for many other areas of science and technology. Fundamental concepts in atomic and molecular structure will be provided to give a foundation for examples drawn from coordination, bioinorganic, organometallic and main group chemistry. The associated laboratory course provides complementary experience in synthesis and measurement of physical properties for selected inorganic compounds.

Coordinator: Prof Penny Brothers
Textbook: CE Housecroft and AG Sharpe, Inorganic Chemistry, 3rd ed, Pearson
Recommended reading: DF Shriver and PW Atkins, Inorganic Chemistry, 4th or 5th ed, Oxford University Press
Tutorials: In lecture times
Laboratory: 6 laboratories (6 x 3 hours)
Assessment: Final exam 50%; 2 tests 25%; laboratories 25%

CHEM 230
Molecules for Life: Synthesis and Reactivity
(15 Points)
Second Semester

Prerequisites: No formal prerequisites, but knowledge of organic chemistry and basic laboratory practice at the level covered in CHEM 110 will be assumed.

Students will build on their repertoire of fundamental reaction types that have previously been encountered with the introduction of new reactions and their application to more complex molecules of biological and medicinal importance. The laboratory course is an integral component of the course that emphasizes preparative chemistry and the use of modern spectroscopic methods for structure determination.

Coordinator: Dr Viji Sarojini
Textbook: J McMurry, Organic Chemistry, 7th ed. Brooks/Cole
Tutorials: In lecture times
Laboratory: 6 laboratories (6 x 3 hours)
Assessment: Final exam 50%; test 20%; laboratories 30%

CHEM 240
Measurement and Analysis in Chemistry and Health Sciences
(15 Points)
First Semester

Prerequisites: No formal prerequisites, but knowledge of aspects of chemistry and laboratory practice at the level covered in CHEM 110 will be assumed. An understanding of basic mathematics at the level covered in MATHS 102 will also be assumed.

Restrictions: CHEM 243

An introduction to physico-chemical principles and techniques underlying a wide range of modern analytical methods used in chemistry and biomedical science. Topics include chromatographic methods for the separation of complex mixtures, application of modern electrochemical and spectroscopic techniques to analytical problems, and methods for assessing the reliability of results. Experiments illustrating these principles are an integral part of this course.

Coordinator: Assoc Prof Paul Kilmartin
Textbook: DC Harris, Quantitative Chemical Analysis, 7th ed., Freeman
Tutorials: In lecture times
Laboratory: 6 laboratories (6 x 3 hours)
Assessment: Final examination 50%; 1 test 15%; assignments 10%; laboratories 25%

CHEM 243
Physicochemical Principles for the Biological and Health Sciences
(15 Points)
First Semester

Prerequisites: No formal prerequisites, but CHEM 110 is recommended preparation

Restrictions: CHEM 240, CHEM 210

Survey of physical chemistry and chemical measurement subjects relevant to bioscience and health science students. Topics include basic atomic theory, molecular bonding and structure, the behaviour of gases and other phases of matter, essential thermodynamics, electrochemistry, reactions at surfaces, and assay and chromatography principles. Associated laboratories focus upon reinforcing underlying principles through practical exercises using materials and concepts pertinent to biosciences and health sciences. Not suitable for chemistry majors.

Coordinator: Dr Cather Simpson
Textbook: DW Oxtoby. HP Gillis and A Campion: Principles of Modern Chemistry, 6th ed., Brook/Cole
Tutorials: In lecture times
Laboratory: 6 laboratories (6 x 3 hours)
Assessment: Final examination 50%; 1 test 15%; assignments 10%; laboratories 25%

Year 3 Courses

Coordinator for Stage III Chemistry:
Dr David Ware
Level 4, Room 429A,
Phone 373 7599 ext 88270
Email: d.ware@auckland.ac.nz

The coordinator is available for consultation and advice on all matters concerning Stage III courses.

Laboratories:

All Chemistry Stage III courses (except CHEM 310 and CHEM 392) have a laboratory component.

For most courses you should select a laboratory time on enrolment on Students Services Online. Make sure you attend at the time you are enrolled for. If there are any problems with your timetable or laboratory stream, please consult David Ware as soon as possible, to avoid delay in commencing laboratories. All labs are scheduled in Ground Floor laboratories.

CHEM 310
Structural Chemistry and Spectroscopy
(15 Points)
Second Semester

Prerequisites: No formal prerequisites, but knowledge of appropriate material at the level covered in CHEM 210 or CHEM 220 will be assumed. An understanding of basic mathematics at the level covered in MATHS 102 will also be assumed.

Molecular structure is fundamental to the understanding of modern chemistry. Molecular spectroscopy provides an important method for probing the structure of molecules, and the following aspects of this subject will be presented: molecular energies and molecular spectra, molecular symmetry and spectroscopy, surface spectroscopy and the structure and chemistry of surfaces.

There are no formal laboratory sessions; instead, students will have the opportunity to use modern computer-based techniques and software in the analysis of data obtained using state-of-the-art research equipment in the Department.

Coordinator: Prof Douglas Russell
Recommended Texts:
PW Atkins, Physical Chemistry 7th or 8th ed, Oxford University Press
Other reference books will be identified by lecturing staff

Computer workshops: Access to computers is available at any time during the University working day; staff and demonstrators will be available for assistance during Physical/Materials Chemistry laboratory hours.

Assessment: Final exam 50%; 2 tests 25%; computer workshops 25%

CHEM 320
Design and Reactivity of Inorganic Compounds
(15 Points)
First Semester

Prerequisites: CHEM 220

A selection of the most recent developments in contemporary inorganic chemistry will be covered. These will include ligand design and reactivity in coordination chemistry, macrocyclic chemistry, redox chemistry, photochemistry, construction of devices, organometallic chemistry, catalysis, and main group rings, chains, clusters and polymers. The laboratories provide complementary experience in synthesis and measurement of physical properties for selected inorganic compounds.

Coordinator: Assoc Prof L. James Wright
Textbook: CE Housecroft and AG Sharpe, Inorganic Chemistry, 3rd ed, Pearson
Recommended reading:
CH Elschenbroich and A Salzer, Organometallics, 2nd ed, VCH

DF Shriver and PW Atkins, Inorganic Chemistry, 4th or 5th ed, Oxford University Press
Tutorials: 12 hour tutorials
Laboratory: 6 laboratories (6 x 6 hours)
Assessment: Final exam 50%; two tests 25%; laboratories 25%

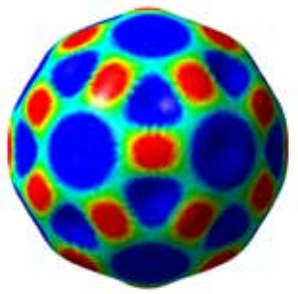
CHEM 330
Contemporary Organic Chemistry
(15 Points)
Second Semester

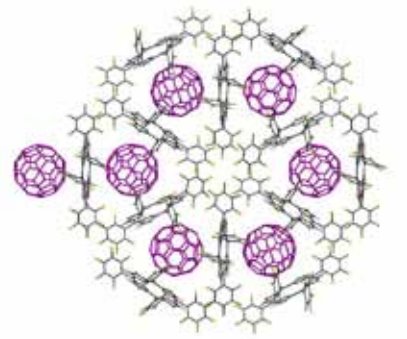
Prerequisites: CHEM 230

Topics in advanced organic chemistry, including the synthesis, reactions and uses of compounds containing phosphorus, selenium, boron and silicon. Organotransition metal chemistry. Asymmetric synthesis. Heterocyclic chemistry and pericyclic reactions. Laboratories emphasize synthetic and structural methods.

Coordinator: Prof Margaret Brimble
Textbooks: Oxford Science Primers: Organic Synthesis: The Roles of Boron and Silicon, Organometallic Reagents in Organic Synthesis, Reactive Intermediates, Aromatic Heterocyclic Chemisty, Pericyclic Reactions, J McMurry, Organic Chemistry, 7th ed, Brooks/Cole

Recommended reading:
J. Clayden, N. Greeves, S Warren and P. Wothers, Organic Chemistry, Oxford University Press
Laboratory: 9 laboratories (9 x 3 hours)
Assessment: Final exam 50%; test 20%; laboratory 30%





CHEM 340
Advanced Analytical Chemistry
(15 Points)
First Semester

Prerequisites: No formal prerequisites, but knowledge of analytical chemistry and laboratory practice at the level covered in CHEM 240 will be assumed.

Principles and applications of modern instrumental analytical chemistry. Statistical methods, quality control and assurance, sampling, instrumentation, chromatographic and other separation methods, spectrophotometric methods, electro-analytical methods.

Coordinator: Dr Gordon Miskelly
Textbook: DA Skoog, FJ Holler and SR Crouch, Principles of Instrumental Analysis, 6th ed., Saunders
Laboratory: 9 laboratories (9 x 3 hours)
Assessment: Final Exam 50%; 1 test 15%; problems and assignments 5%; laboratories 30%

CHEM 350
Topics in Chemistry (Modular Course)
(15 Points)
First and Second Semesters

Prerequisites: No formal prerequisites, but knowledge of appropriate aspects of Stage II chemistry and relevant laboratory experience will be assumed.

This course deals with a number of aspects of modern chemistry. To achieve a pass in this course, students are required to complete three of the modules offered. The seven modules available in 2011 are listed on following pages. Students must advise the overall coordinator of their choice of modules, prior to the start of Semester 1.

Students who intend to complete the course (three modules) in one semester should enrol in CHEM 350 (15 points). Students intending to take modules over two semesters should enrol in CHEM 350A and CHEM 350B sequentially.

Overall Coordinator:
Dr Jóhannes Reynisson

Assessment: 100% internally assessed, see each module for details

Information on lecture schedule for modules will be available on Cecil.

Green Chemistry
First Semester

Green chemistry is an important, recent concept that involves the development of new chemistry to eliminate the use or production of hazardous substances in the design, manufacture and application of chemical products. Sometimes the phrase "benign by design" is used to encapsulate the idea. The development of this new chemistry requires a multi-disciplinary approach that draws on all the traditional areas of chemistry (organic, inorganic, physical and analytical). This short course will establish the basic concepts of green chemistry and illustrate its application through a number of individual case studies.

Coordinator: Assoc Prof L. James Wright
Lectures: 12 lectures
Workshops: 12 hours by arrangement
Assessment: Test 60%; assignments 40%

Mass Spectrometry and Nuclear Magnetic Resonance
First Semester

Many different physical methods are used to determine chemical structure. Two techniques used routinely for structure determination are mass spectrometry and nuclear magnetic resonance. Although this module will cover the theory behind each technique, major emphasis will be placed upon the application of the methods to actual structure determination.

Coordinator: Assoc Prof Brent Copp
Lectures: 12 lectures
Laboratory: 12 hours by arrangement
Assessment: Test 80%; assignments 20%

X-ray Crystallography
First Semester

X-ray crystallography is the most accurate way of determining the positions of atoms and molecules in crystalline solids. The technique can be used to determine the three-dimensional structure of simple molecules, natural products, metal complexes, proteins and viruses. The course introduces crystallographic symmetry and space groups. The phase problem will be outlined along with the Patterson method for structure solution.

Coordinator: Assoc Prof Peter Boyd
Lectures: 12 lectures
Laboratory: 12 hours by arrangement
Assessment: Test 50%; assignment 20%; laboratories 30%

Biomolecular NMR spectroscopy
Second Semester

High-resolution nuclear magnetic resonance (NMR) spectroscopy is a powerful tool used to determine the three-dimensional structure of proteins and nucleic acids at atomic resolution. In addition to structure determination, NMR spectroscopy can be used to probe time-dependent phenomena, such as dynamic features of biological macromolecules, reaction kinetics, protein folding, and molecular recognition between biological macromolecules and other solution components, which may either be other macromolecules or low molecular weight ligands (e.g. drugs). This module focuses on these applications and will be complemented by basic NMR principles.

Coordinator: Dr Andrew Dingley
Lectures: 12 lectures
Laboratory: 12 hours by arrangement
Assessment: Test 50%; assignment 40%; quizzes 10%

Contemporary Polymer Science
Second Semester

This module will introduce students to areas of polymer science that are particularly relevant to new and developing materials technology. The topics covered are likely to vary from year to year and include a selection of the following: novel coatings and adhesives, innovative techniques for polymer synthesis, polymer-based controlled release systems, polymer gels, liquid crystalline and conducting polymers, polymer blends, composites and nanomaterials, new polymer materials from renewable resources.

The course will include a selection of practical exercises.

Coordinator: Mr Neil Edmonds
Lectures: 12 lectures
Laboratory: 12 hours by arrangement
Assessment: Test 35%; assignment 35%; laboratories 30%

Computational Chemistry
Second Semester

Computational chemistry involves the calculation of the properties of molecules and solids using computer methods. This subject is becoming increasingly important in the design of new molecules and in gaining an understanding how molecules react. It has applications in the design of pharmaceutical and new materials, as well as in the fundamental study of molecular structure and bonding. This course will cover the basic principles of theoretical and computational chemistry and illustrate the application of these methods in exercises that will familiarise students with modern computational chemistry software.

Coordinator: Dr Jóhannes Reynisson
Lectures: 12 lectures
Laboratory: 12 hours by arrangement
Assessment: Test 50%; assignment 30%, laboratories 20%

Environmental Contamination
Second Semester

This module will introduce the study of chemical contamination of the environment and explore how chemical processes in environmental systems respond to anthropogenic perturbation. The primary focus will be on trace metal contamination in aquatic systems. The module combines lectures, laboratory sessions and trace metal speciation modeling with the software Visual MINTEQ to help decipher some of the complex chemistry of trace metals in natural systems.

Coordinator: Dr Peter Swedlund
Lectures: 12 lectures
Laboratory: 12 hours by arrangement
Assessment: Tests 50%; laboratory assignment 50%

CHEM 380
Materials Chemistry
(15 Points)
Second Semester

Prerequisites: No formal prerequisite, but knowledge of materials chemistry and laboratory practice at the level covered in CHEM 210 or CHEM 201 will be assumed.

Synthesis, properties characterisation and applications of advanced materials. Includes a review of current trends in materials research. Important aspects of solid inorganic materials and organic polymers are covered.

Coordinator: Dr Tilo Söhnel
Textbooks: S Elliott, The Physics and Chemistry of Solids, Wiley; RJ Borg, GJ Dienes, The Physical Chemistry of Solids, Academic Press; PC Painter, MM Coleman, Fundamentals of Polymer Science: An Introductory Text, Technomic Publishing. Other reference books will be identified by lecturing staff
Laboratory: 36 hours
Assessment: Final exam 50 %; two tests 25%; laboratories 25%

CHEM 390
Medicinal Chemistry
(15 Points)
First Semester

Prerequisites: No formal prerequisites, but knowledge of organic chemistry and laboratory practice at the level covered in CHEM 230 or CHEM 203 will be assumed.

Nature of cellular targets for drug action - lipids, proteins, enzymes, DNA. Principles of molecular recognition. Enzymes and receptors as targets for drug action. DNA as a target for drug action. An overview of approaches to drug discovery and development. Structure-activity relationships, stereochemistry and drug action, prodrugs, drug metabolism and pharmacokinetics, physiochemical properties and drug action, drug resistance. Laboratories focus on the synthesis, and biological testing of drugs.

Coordinator: Dr Viji Sarojini
Textbook: GL Patrick, An Introduction to Medicinal Chemistry 2nd or 3rd ed, Oxford University Press
Laboratory: 6 laboratories (6x3 hours)
Assessment: Final examination 50%; test 20%; laboratories 30%

CHEM 392
Issues in Drug Design and Development
(15 Points)
Second Semester

Intellectual property and patent law in the pharmaceutical industry. An overview of the legal and regulatory framework for drug design and development. Clinical trials: formulation of a drug; phase I, phase II and phase III protocols and ethical considerations. An introduction to the principles involved in the Codes of Good Manufacturing Practice and Good Laboratory Practice (quality control and quality assurance procedures) as applied to the manufacture of drug products and the quantification of drugs and metabolites in biological fluids. Occupational health and safety issues. Examples of drug development. Case studies of selected drugs from design to release.

Coordinator: Dr Viji Sarojini
Recommended reading: Drug Discovery and Development: Technology in Transition, Edited by HP.Rang, Elsevier
Laboratory: There is no formal laboratory course, however visits to pharmaceutical companies will be arranged
Assessment: Final examination 50%; assignments and site visits 50%

BSc Specialisation in Medicinal Chemistry

What is Medicinal Chemistry?

The primary objective of Medicinal Chemistry is the design and discovery of new compounds that are suitable for use as new drugs. It is a multidisciplinary subject that relies on knowledge from a wide variety of fields including organic chemistry, biochemistry, pharmacology, physiology, and computing.

The discovery of a new drug not only requires its design and synthesis but also the development of testing methods and procedures which are needed to establish how a substance operates in the body and its suitability for use as a drug. Drug discovery also requires fundamental research into the biological and chemical nature of the diseased state.

The Medicinal Chemistry specialisation was first offered in 2002, and is the first programme of its kind to be offered in New Zealand. Students completing this specialisation will be trained in synthesis, reactivity and analysis of organic compounds as well as possessing valuable insight into the pharmacological, regulatory, and ethical aspects of bioactive molecules. The three-year BSc specialisation in Medicinal Chemistry followed by the one-year BSc(Hons) in Medicinal Chemistry (p37) is designed to produce high quality graduates equipped with the multidisciplinary knowledge and skills relevant to the rapidly expanding pharmaceutical industry.

Director: Professor Margaret Brimble
Level 7, Room 731B
Phone 373 7599 ext 88259
Email: m.brimble@auckland.ac.nz

Programme for BSc with Medicinal Chemistry Specialisation

Part I

The courses taken in Part I establish a solid framework in fundamental science and covers the basic concepts of chemistry, biology, biochemistry, computer science, statistics, and physics.

Core courses (90 points):

BIOSCI 101	Essential Biology: From Genomes to Organisms
BIOSCI 106	Foundations of Biochemistry
BIOSCI 107	Biology for Biomedical Science: Cellular Processes & Development
CHEM 110	Chemistry of the Living World
CHEM 120	Chemistry of the Material World
MEDSCI 142	Biology for Biomedical Science Organ Systems

Elective courses (at least 15 points)

COMPSCI 111	Introduction to Computing and the Internet
STATS 101	Introduction to Statistics
PHYSICS 120	Physics of Energy
PHYSICS 160	Physics for Life Science

Note: All students new to this programme in 2006 or subsequent years must also complete two General Education courses by the end of their undergraduate studies.

Part II

The second part consists of selected prescribed and elective courses in chemistry, biological sciences, pharmacology, physiology, pathology, and pharmacy.

Core courses (90 points):

BIOSCI 201 Cellular and Molecular Biology
BIOSCI 203 Biochemistry
CHEM 230 Molecules for Life: Synthesis and Reactivity
CHEM 240 Measurement and Analysis in Chemistry and Health Sciences
MEDSCI 204 Introduction to Pharmacology and Toxicology
MEDSCI 205 The Physiology of Human Organ Systems

Elective courses (at least 15 points):

BIOSCI 202 Genetics
BIOSCI 204 Applied and Environmental Microbiology
CHEM 210 Physical and Materials Chemistry
CHEM 220 Inorganic Compounds: Structure, Bonding and Reactivity
MEDSCI 202 Microbiology and Immunology
MEDSCI 203 Mechanisms of Disease
PHARMACY 202 Pharmaceutics I

Part III

A course in Medicinal Chemistry, selected advanced chemistry courses, and a course which considers issues such as intellectual property, good laboratory and manufacturing practice and regulatory affairs of relevance to the pharmaceutical sector comprise Part III. Additional elective courses chosen from biochemistry, pharmacology, and physiology are also taken.

Core courses (60 points):

CHEM 330 Contemporary Organic Chemistry
CHEM 390 Medicinal Chemistry
CHEM 392 Issues in Drug Design and Development
MEDSCI 303 Principles of Pharmacology

Elective courses (at least 30 points):

BIOSCI 349 Biomedical Microbiology
BIOSCI 350 Protein Structure and Function
BIOSCI 351 Molecular Genetics
BIOSCI 353 Molecular and Cellular Regulation
BIOSCI 354 Gene Expression and Gene Transfer
BIOSCI 356 Developmental Biology and Cancer
CHEM 320 Design and Reactivity of Inorganic Compounds
CHEM 340 Advanced Analytical Chemistry
CHEM 350 Topics in Chemistry
MEDSCI 206 Human Physiology: The Neural Machine
MEDSCI 305 Systematic Pharmacology
MEDSCI 306 Introduction to Toxicology.

Career opportunities

The students completing this multidisciplinary degree programme will have a unique combination of skills: they will be trained in synthesis, reactivity, and analysis of organic compounds as well as possessing valuable insight into the pharmacological, regulatory, and ethical aspects of bioactive molecules. Graduates can expect to be highly employable in a wide range of institutions such as hospitals, biomedical and pharmaceutical companies, private research institutions, local and national government authorities and agencies, and Crown Research Institutes.

Postgraduate Programmes

Postgraduate Programmes in Chemistry

Each year a proportion of Stage III students choose to move on to postgraduate studies. Students making this choice are often driven by the desire to participate in research and ultimately gain entry to a PhD. In our increasingly competitive job market the completion of a postgraduate programme is also a useful career move. BSc(Hons), PGDipSci and research MSc programmes are available.

The Postgraduate Diploma in Science is a one year programme and is the usual path for students intending to go on and complete a research MSc in chemistry. The research MSc is a one year programme consisting of a research project and thesis. It is possible to enter into a PhD on completion of a research MSc with sufficiently high grades. Postgraduate diplomas and/or MSc degrees are available in Chemistry, Food Science, Forensic Science, and Wine Science.

The BSc(Hons) degree takes one year and consists of course work and a research project and dissertation. It is possible to enter directly into a PhD on completion of BSc(Hons) and this programme is a popular choice for good students seeking a faster path to the PhD degree. The BSc(Hons) is available in Chemistry, Food Science, and Medicinal Chemistry. It is also a path for students intending to go on and complete an MSc in Chemistry.

The department is very active in a number of the frontier areas of chemical research, spanning the range from applied research to the fundamental and theoretical. Laboratory facilities, research equipment, major instruments, computer support, and the research journals in the Library are all of a high standard. Much of the "hands-on" investigation is carried out by graduate students, in the pursuit of MSc and PhD degrees. Facilities are available at both the City and the Tamaki Campuses for postgraduate research. The Department of Chemistry has strong research links with the School of Biological Sciences, the Faculty of Engineering, and the Faculty of Medical and Health Sciences.

Coordinators for Postgraduate Studies

Chemistry Programme

Assoc Prof Brent Copp
Phone +64 9 373 7599 ext 88284
Email: b.copp@auckland.ac.nz

Dr Tilo Söhnel
Phone +64 9 373 7599 ext 89722
Email: t.soehnel@auckland.ac.nz

Food Science Programme

Assoc Prof Yacine Hemar
Phone +64 9 373 7599 ext 89676
Email: y.hemar@auckland.ac.nz

Forensic Science Programme

Dr Douglas Elliot
Phone +64 9 373 7599 ext 85860
or 815 3936
Email: douglas.elliot@esr.cri.nz

Wine Science Programme

Assoc Prof Paul Kilmartin
Phone +64 9 373 7599 ext 88324
Email: p.kilmartin@auckland.ac.nz

Doctoral Coordinator

Dr Gordon Miskelly
Phone +64 9 373 7599 ext 88338
Email: g.miskelly@auckland.ac.nz

Selection of supervisor

Students need to select a research supervisor in parallel with the application to enrol for BSc(Hons) Chemistry, BSc(Hons) Medicinal Chemistry, MSc in Chemistry programmes. The handbook and the website have information about projects and research areas offered by staff within the department.

Please make arrangements to discuss with individual staff members the projects that are of interest to you. You should consult with at least three staff members. Fill out a supervisor selection form (available from the Chemistry department office or from the website http://www.che.auckland.ac.nz) and indicate, in order of preference, three supervisors with whom you would like to work. Submit this form to Min-Young Lee (min.lee@auckland.ac.nz) in the Chemistry Office by 8 December, 2010. The Department will endeavour to offer students their first choice and will confirm supervisor selection to students as soon as possible after this date.

BSc(Hons) in Chemistry

The one-year BSc(Hons) programme is an option for well prepared students wishing to study chemistry in greater depth than a BSc.

The BSc(Hons) can also provide a faster path to the PhD degree for students intending to perform advanced research.

The minimum requirement for entry into the BSc(Hons) in Chemistry is a BSc degree majoring in Chemistry with at least a B average in 90 points above Stage II, including at least 45 points in Chemistry. A student who is within one course of completing a BSc and has passed the entry requirements stated above may, with the approval of the Head of Department, enrol for BSc(Hons) provided that the remaining course is completed within 12 months of entry to this degree programme and is not a course required for the major. BSc(Hons) will only be awarded once the requirements for BSc have been completed.

BSc(Hons) is a one year full-time or two year part-time degree programme composed of four courses (60 points) and a research dissertation (60 points).

Your research project will be supervised by one of the academic staff and you will normally be allocated the supervisor of your choice. Your project work will be carried out throughout the year and the results reported in a written dissertation. Assessment of your project and dissertation will be based on your input of work and effort and the quality of your written dissertation rather than on the results alone.

The research topics available for the BSc(Hons) project arise from the research programmes of the academic staff. These research programmes are described in detail in the Research Supervisors and Research Topics part of this handbook.

Students are advised to consult the 2011 Calendar for detailed regulations for this degree.

Prerequisites

Attain at least a B average in 90 points above Stage II, and have completed a Chemistry major (refer to page 13 and the University Calendar).

Requirements

- 60 points CHEM 793 BSc(Hons) Dissertation in Chemistry
- 60 points from CHEM 710-780
  or
  45 points from CHEM 710-780 and a further 15 points, subject to approval by Head of Department, from 700 level courses in a related subject

A candidate for BSc(Hons) must achieve a GPA average of 3.5 (B-) or above to be awarded this degree. A student who completes the BSc(Hons) year but does not attain the minimum grade for honours may credit the 700 level courses towards a Postgraduate Diploma in Science.

Selection of supervisor

Students need to select a research supervisor in parallel with the application to enrol for this programme. Please make arrangements to discuss with individual staff members the projects that are of interest to you. You should consult with at least three staff members and fill out a supervisor selection form. Please see page 35 for the procedure.

For further information on the BSc(Hons) in Chemistry degree, please contact:

Assoc Prof Brent Copp
Phone 373 7599 ext 88284
Email: b.copp@auckland.ac.nz

Dr Tilo Söhnel
Phone 373 7599 ext 89676
Email: t.soehnel@auckland.ac.nz

BSc(Hons) in Medicinal Chemistry

The one-year BSc(Hons) in Medicinal Chemistry programme is an option for well-prepared students wishing to study medicinal chemistry in greater depth than a BSc. The BSc(Hons) can also provide a faster path to the PhD degree for students intending to perform advanced research.

The minimum requirement for entry into the BSc(Hons) in Medicinal Chemistry programme is a BSc degree with Medicinal Chemistry specialisation with at least a B average in 90 points above Stage II. A student who is within 15 points of completing a BSc and has passed the Stage III requirements stated above may, with the approval of the Head of Department, enrol for the BSc(Hons) in Medicinal Chemistry provided that the remaining course is completed within 12 months of entry to this degree programme. BSc(Hons) will only be awarded once the requirements for BSc have been completed.

The BSc(Hons) in Medicinal Chemistry is a one year full-time or two-year part-time degree programme composed of four courses (60 points) and a research dissertation (60 points).

Your research will be supervised by one of the academic staff and you will normally be allocated the supervisor of your choice. The project will introduce you to the nature and excitement of scientific research. Your project work will be carried out throughout the year and the results reported in a written dissertation. Assessment of your project and dissertation will be based on your input of work and effort and the quality of your written dissertation rather than on the results alone.

The research topics available for the BSc(Hons) project arise from the research programmes of the academic staff. These research programmes are described in detail in the Research Supervisors and Research Topics part of this handbook.

Students are advised to consult the 2011 Calendar for detailed regulations for this degree.

Prerequisites

Attain at least a B average in 90 points above Stage II, and have completed a BSc with a Medicinal Chemistry specialisation (refer to page 31 and the University Calendar)

Requirements

- 15 points from CHEM 735
- 45 points from CHEM 710 - 780, BIOSCI 756, 757, 759, MEDSCI 708, 715, 716, 721, 722
- 60 points CHEM 793 BSc(Hons) Dissertation in Chemistry

A candidate for BSc(Hons) must achieve a GPA of 3.5 (B-) or above to be awarded this degree. A student who completes the BSc(Hons) year but does not attain the minimum grade for honours may credit the 700 level courses towards a Postgraduate Diploma in Science in Chemistry.

Selection of supervisor

Students need to select a research supervisor in parallel with the application to enrol for this programme. You should consult with at least three staff members and fill out a supervisor selection form. Please see page 35 for the procedure.

For further information on the BSc(Hons) in Medicinal Chemistry degree please contact:

Prof Margaret Brimble, Level 7, Room 731B
Phone 373 7599 ext 88259
Email: m.brimble@auckland.ac.nz

Postgraduate Diploma in Science (PGDipSci)

The Postgraduate Diploma in Science takes one year and consists of 120 points (usually eight courses). This programme is one of the paths for students intending to go on and complete a research MSc in Chemistry. The requirement for entry into this programme is a BSc major in Chemistry. A student who is within 15 points of completing all the requirements for a BSc may, with the approval of the Head of Department, enrol for a PGDipSci provided that the remaining course is completed within 12 months of entry to PGDipSci and is not a course required for the major. The programme must be completed within one year of initial enrolment if enrolled full-time or within 4 years of enrolment if enrolled part-time.

Students should discuss their course selection with the Postgraduate Coordinator and may be recommended to include CHEM 701 and 702 Postgraduate Topics in Chemistry 1 and 2.

The course CHEM 750 is strongly recommended and students intending to proceed to a Research MSc in Chemistry should also take CHEM 795 Research Methods in Chemistry. Students may elect to do CHEM 691 the Postgraduate Diploma Dissertation - a 30 point research project carried out under the supervision of a member of the academic staff. The results of this project are reported in a dissertation and overall assessment of this course will be based on your input of work and effort and the quality of your written dissertation. The research topics available for the CHEM 691 project arise from the research programmes of the academic staff. These research programmes are described in detail in the Research Supervisors and Research Topics part of this handbook.

Applicants are advised that only a limited number of topics are available for CHEM 691 projects.

Students are advised to consult the 2011 Calendar for detailed regulations for this diploma.

Prerequisites

A BSc degree completed at The University of Auckland with a major in Chemistry OR an approved degree of equivalent standing completed at another university.

Requirements

- At least 90 points from CHEM 691, 710-780, 795
- Up to 30 points from 600 or 700 level courses in Chemistry or a related subject with approval of the Head of Department

CHEM 750, the Advanced Topics course is strongly recommended

CHEM 795 is strongly recommended to candidates intending to proceed to research MSc.

Students must apply for admission to the PGDipSci programme on-line using Student Services Online.

For further information on the PGDipSci in Chemistry Programme, please contact:

Assoc Prof Brent Copp
Phone 373 7599 ext 88284
Email: b.copp@auckland.ac.nz

Dr Tilo Söhnel
Phone 373 7599 ext 89676
Email: t.soehnel@auckland.ac.nz

Postgraduate Enrolment - where to from here?

Enquire

Visit www.auckland.ac.nz or contact our student advisers for any information you need.
Phone: 0800 61 62 63 | **Email:** studentinfo@auckland.ac.nz
Student Information Centre: Room 112, ClockTower, 22 Princes St, Auckland

↓

Apply for a place in a programme(s)

Do you have internet access, or can you come on to campus to our help labs?

↓

Yes

- Log on to www.auckland.ac.nz
- Click on Apply Now
- Complete the online Application for a place in your programme(s) of choice.
- New students will receive an acknowledgement email including Net ID and password details for accessing Student Services Online (the online enrolment system)
- Applications will require details of the courses you intend to study towards your postgraduate qualification. If these details are required by the programme you are applying for, you will be asked to complete those details.

No

Phone: 0800 61 62 63
(or +64 9 923 1969 if overseas)
Email: studentinfo@auckland.ac.nz

The ClockTower Call Centre will forward required information to you.

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Offer

Your programme(s) will be assessed by the relevant department and the Faculty of Science and if accepted, an offer email will be sent to you.

To see the status of your application(s), log on to www.auckland.ac.nz and click on Apply Now. Select "Apply for admission to the University", and log in to Student Services Online.

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Accept

- Accept or decline your offer of a place in a programme online. Remember – you still need to enrol in your courses!

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Enrol in your choice of courses

Enrol in courses via Student Services Online using your login and password.

For help with choosing courses you can:

- refer to www.science.auckland.ac.nz or to publications relating to your programme, or to The University of Auckland Calendar. For programme publications call 0800 61 62 63. The Calendar is for sale in bookshops or can be accessed from www.auckland.ac.nz Click on "Current Students" then "University Calendar" in the Quick Links box
- go online to check the timetable for your chosen courses
- for more information visit the Faculty of Science Student Centre, Ground Floor, Building 301, 23 Symonds Street
  Phone: 64 9 373 7599 ext 87020 | **Email:** scifac@auckland.ac.nz
- or call 0800 61 62 63.

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Pay your tuition fees.

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You are now a University of Auckland student. Congratulations!

Master of Science (MSc) in Chemistry

The research MSc in Chemistry takes one year and consists of a research thesis (120 points) completed under the supervision of one of the members of staff in the Department of Chemistry. The requirement for entering the MSc degree is either a BSc(Hons) degree or a Postgraduate Diploma in Science and at least a B- average in at least six 600 or 700 level science courses (90 points) of which at least 5 (75 points) must be at 700 level. A student who is within 15 points of completing all the requirements for BSc(Hons) or PGDipSci may, with the approval of the Head of Department, enrol for MSc provided that the remaining course is completed within 12 months of entry to MSc. The Head of Department's permission is formally required for assignment of a research supervisor.

The research project is undertaken in close cooperation with the supervisor and there is plenty of interaction with other researchers. All research students are assigned laboratory and desk space, as well as full access to the computer network. The thesis project provides a unique opportunity to develop experimental skills, creativity, and a flair for communicating results. For most research students, completing a thesis is an exciting accomplishment, which gives a much deeper insight into scientific thinking than is possible in an undergraduate programme. Research seminars are held regularly in the department, and each research student will present a seminar as part of their programme requirements. The results of many MSc thesis projects are presented at international conferences and published in scientific journals.

Students are advised to consult the 2011 Calendar for detailed regulations for this degree.

Prerequisites

A BSc(Hons) degree or PGDipSci completed at The University of Auckland OR an approved degree of equivalent standing completed at another university. B- grade average over 90 points of the qualifying programme, of which at least 75 points must be at 700 level.

Requirements

- A thesis (120 points) based on a research project
- A research seminar, normally presented during the second semester

Note that mid-year enrolment is possible for MSc. Consult the Coordinators for advice and read this handbook for information about research supervisors and research topics. An application to enter the MSc programme may be made at any time during the year, but the choice of supervisor may be restricted. Students must apply for admission to the MSc programme on-line using Student Services Online.

Selection of supervisor

Students need to select a research supervisor in parallel with the application to enrol for this programme. Please make arrangements to discuss with individual staff members the projects that are of interest to you. You should consult with at least three staff members and fill out a supervisor selection form. Please see page 35 for the procedure.

For further information on the MSc in Chemistry degree, please contact:

Assoc Prof Brent Copp
Phone 373 7599 ext 88284
Email: b.copp@auckland.ac.nz

Dr Tilo Söhnel
Phone 373 7599 ext 89676
Email: t.soehnel@auckland.ac.nz

Postgraduate Courses in Chemistry

CHEM 690 A & B
Graduate Diploma Dissertation (Chemistry)
(30 Points)

To complete this course students must enrol in CHEM 690 A and B

CHEM 691A & B
PG Diploma Dissertation (Chemistry)
(30 Points)

To complete this course students must enrol in CHEM 691 A and B

CHEM 701
PG Topics in Chemistry 1
(15 points)

CHEM 702
PG Topics in Chemistry 2
(15 points)

Prerequisites: No formal prerequisites.

Each course is a directed reading and individual study course to prepare students in the methodologies in a selected sub-discipline of chemistry. Enrolment in this course will be upon the recommendation of the Head of Department.

Coordinator: Prof Penny Brothers

CHEM 710
Structural and Computational Chemistry
(15 Points)
Second Semester

Prerequisites: No formal prerequisites, but knowledge of physical chemistry at the level covered in CHEM 310 and of basic calculus will be assumed.

Quantum mechanics, and the calculation of molecular structure at the fundamental level. Statistical thermodynamics: the relationship between molecular structure and balk properties of matter. The quantum mechanics of magnetic resonance: theory and applications of nuclear magnetic resonance (NMR) and electron paramagnetic resonance (EPR) spectroscopy in structural chemistry.

Coordinator: Dr Duncan McGillivray

CHEM 720
Advanced Inorganic Chemistry
(15 Points)
First Semester

Prerequisites: No formal prerequisites, but knowledge of inorganic chemistry at the level covered in CHEM 320 will be assumed.

The topics covered are chosen from areas of current research in inorganic chemistry, and will include functional supramolecular devices, organometallic and inorganometallic chemistry, and main group element multiple bonding.

Coordinator: Assoc Prof Peter Boyd

CHEM 730
Modern Methods for the Synthesis of Bioactive Molecules
(15 Points)
First Semester

Prerequisites: No formal prerequisites, but knowledge of organic chemistry at the level covered in CHEM 330 will be assumed.

The use of modern methods for the construction of complex molecules with an emphasis on carbon-carbon bond formation and control of stereochemistry. Principles and practice of synthesis design based on retrosynthetic analysis. Each student will present and discuss a recent synthesis of a complex bioactive organic compound.

Coordinator: Prof Margaret Brimble

CHEM 735
Advanced Medicinal Chemistry
(15 Points)
First Semester

Prerequisites: No formal prerequisites

This course will explore a selection of topics dealing with different aspects of medicinal chemistry. Current topics include anticancer agents, antibacterial and antiviral chemotherapy, the vasculature as a drug target and psychiatric chemotherapy.

Coordinator: Dr David Barker

CHEM 738
Biomolecular Chemistry
(15 points)
Second Semester

Prerequisites: No formal prerequisites

Discusses how techniques including NMR spectroscopy, calorimetry, neutron scattering and computational modeling, can characterise the molecular structure, dynamics, and interactions of biological macromolecules. The principles of each technique will be presented and complemented with examples of where these methods have made major advances in understanding important biochemical processes. Accessible to students with a background in chemistry, biology, bioengineering, or physics.

Coordinator: Dr Andrew Dingley

CHEM 740
Current Topics in Analytical Chemistry
(15 Points)
Second Semester

Prerequisites: No formal prerequisites, but knowledge of analytical chemistry at the level covered in CHEM 340 or CHEM 304 will be assumed.

Principles and applications of modern analytical chemistry. Emphasis will be on the solution of problems met by analytical chemists, including a study of the development of instrumentation, and a study of current trends in analytical research.

Coordinator: Dr Laura Nicolau

CHEM 750 (15 Points)
CHEM 750 A & B (7.5 Points each)
Advanced Topics in Chemistry 1
To complete this course students must enrol in either CHEM 750 A and B, or CHEM 750

CHEM 751 (15 Points)
CHEM 751A & B (7.5 Points each)
Advanced Topics in Chemistry 2

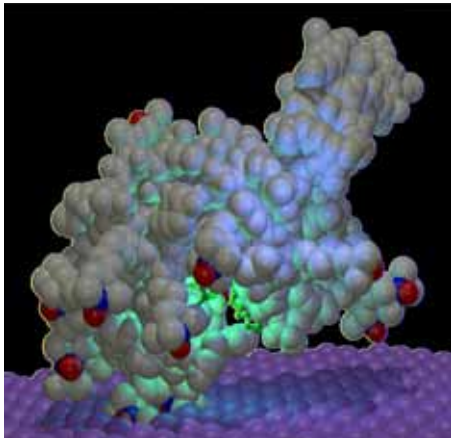
To complete this course students must enrol in either CHEM 751 A and B, or CHEM 751

A modular course comprising topics in physical, inorganic, organic and analytical chemistry related to departmental research interest, which will vary from year to year. Students satisfactorily completing three modules will be awarded CHEM 750. Students satisfactorily completing an additional three modules will be awarded CHEM 751.

Coordinator: Dr Jonathan Sperry

Modules offered for CHEM 750 and CHEM 751 in 2011

Note: This is a provisional list, updated information will be available at the beginning of each semester. Some modules may be withdrawn if there are insufficient enrolments.



First Semester

Solid-state NMR Spectroscopy

Since its discovery in the early 1950's, NMR spectroscopy has mainly been associated with the study of solutions. However, more recent developments have resulted in a situation where solid-state NMR spectra can now be obtained (almost) as easily as solution spectra. There are two main advantages of solid-state NMR: (a) There is more information in solid-state spectra than in solution spectra, and (b) The method is applicable (with some variations in technique) to all types of solids, so that it can be applied to a wide range of materials of practical importance. A particularly important aspect is that commercially important materials such as minerals (including zeolites, coal), wood, polymers, and foodstuffs can be investigated, as well as solid organic, inorganic and organometallic compounds. The lectures in this course will cover the background theory of the solid-state NMR of both spin ½ and quadrupolar (spin > ½) nuclei, and will illustrate the applications of the technique in the various areas mentioned above.

Coordinator: Dr Zoran Zujovic
Lectures: 8 lectures
Assessment: Assignment (20 %) and a one hour test (80 %).

Synthesis of peptidomimetics and proteins

Lectures will cover the following topics: Composition of peptides, structural features of peptides, the history of peptide synthesis (early work, peptide bond formation, synthetic strategies for peptide synthesis, solution phase peptide synthesis, solid phase peptide synthesis (SPPS), common side reactions in peptide chemistry), peptide ligation, different approaches for synthesis of peptidomimetics (click chemistry, metathesis, others), case study.

Coordinator: Prof Margaret Brimble
Lectures: 8 lectures
Assessment: Two assignments

Introduction to Nanoworld: Special case on Biosensors

The module introduces students to definition of nanoscience, top-down and bottom-up approaches in nanoscience, basic techniques and tools used currently in nanotechnology ('tool box' of nanoscience), Moore law. This is followed by defining the field of nanobiotechnology and bio-inspired electronics, and then principles of biosensors and examples of how nanoscience is used to create a new generation of biosensors.

Coordinator: Assoc Prof Jadranka Travas-Sejdic
Lectures: 8 lectures
Assessment: Assignment (20 %) and a one hour test (80 %).

Plant Cell Walls

Lectures cover several different aspects of plant cell walls including their biology and microscopy, the cytoskeleton, the composition of primary and secondary cell walls, biofuels, changes that occur during processing as well as changes that occur during fruit ripening.

Coordinator: Dr Bronwen Smith
Lectures: 8 Lectures
Assessment: Student seminars (15 %);
Take home assignment (85 %)

Using Lasers to Watch Chemical Reactions

The study of chemical reactivity was revolutionized by the invention of the LASER (Light Amplification by Stimulated Emission of Radiation) in 1960. Since that time, laser technology has progressed extremely rapidly on all fronts – from output wavelength to stability to power. The advent of pulsed lasers offered scientists even further insight into chemical dynamics, and transformed spectroscopic research. Powerful, pulsed lasers have now become a centrepiece of experimental chemistry in universities around the world. This module provides students with a working knowledge of this important research field. Students will be introduced to the basics of lasers, different laser types, the fundamentals of photochemistry, pulsed laser generation and time resolution, and the current state of laser spectroscopy. In the end, students will be able to understand the more important findings of laser spectroscopy papers in broad interest, high impact journal such as Science, Nature, or J. Am. Chem. Soc.

Coordinator: Dr Cather Simpson
Lectures: 7 hours + 1 hour of basic safety and training with the nanosecond and femtosecond lasers in the Photon Factory
Assessment: Participation and preparation (20%)
3 or 4 simple assignments (30 %),
Laser experiment, analysis and report (50%).

Second Semester

Polymer Electronics

An introduction to the application of intelligent polymeric materials in plastic electronics will be presented. The focus will be on conducting polymer based materials and devices, including fundamental studies related to synthesis procedures, conduction mechanisms and structural characterisation using spectroscopic techniques. The electrochemical properties of conducting polymers in the polypyrrole, polythiophene and polyaniline families will be outlined, along with the ability to produce nanostructured forms of these materials. A range of prospective applications will be considered, including energy conversion, biosensing, electroluminescence and microactuators.

Coordinator: Assoc Prof Paul A. Kilmartin
Lectures: 8 lectures
Assessment: Assignment (30 %) and a one hour test (70 %).

Heterocycles

Cyclic molecules in which one or more carbon atom is replaced by a heteroatom (commonly nitrogen, oxygen or sulfur) account for well over half of all known organic compounds. Many classes of natural products, as well as a large majority of commercially important drugs, agrochemicals, reprographic materials, dyes, etc., contain heterocyclic rings. The commercial relevance of heterocyclic compounds is amply demonstrated by a recent list of best selling pharmaceuticals. In the 12 months to 2009, seven of the top ten best sellers were nitrogen heterocycles. This module will discuss the synthesis, fundamental chemistry and applications of various heterocyclic rings.

Coordinator: Dr Jonathan Sperry
Lectures: 8 lectures
Assessment: assignment (25 %) and a one hour test (75 %).

Light Metal Production

The light metals industry is of increasing importance due to the favourable strength to weight characteristics of these materials. This growth is particularly apparent for Mg and Ti, but the major player is still Al. Although a dominant driver is the lightweighting of transport vehicles for improved energy efficiency, the metals are themselves very energy intensive to produce. A range of chemistry and materials challenges currently limit our ability to produce the metals efficiently.

Topics to be covered will include: The Light Metals Industry – Mg, Al and Ti; Physical chemistry of the metals and current production technologies; The Hall-Heroult process for Al smelting; Composition and chemistry of the Hall Heroult electrolyte; Inert anodes and new cell technologies for Al smelting; Current and developing Mg production technologies; The Kroll process and new FCC or Fray process for Ti manufacture; Summary and the future of the light metals industry.

Coordinator: Prof Jim Metson
Lectures: 8 lectures
Assessment: Assignment (50%) and a one hour test (50%)

Sustainability Chemistry

Important chemical issues relating to sustainability will be discussed. The concept and definition of "Green Chemistry" will be introduced and practical examples presented including polyester regeneration and the production of new, targeted insecticides. Chemists' contributions to energy issues including the development of electrode catalysts for fuel cells, photovoltaic cells for harnessing solar energy, and hydrogen generation, activation, and storage will be considered.

Coordinator: Assoc Prof L James Wright
Lectures: 8 lectures
Assessment: Two assignments (total 30 %) and a one hour test (70 %).

Microfabrication at the University of Auckland

Micron-scale devices and machined features can now be made using lasers like those present in the Photon Factory at The University of Auckland. Whether the goal is micromachined cardiac shunts made of soft, biomimetic materials for implantation in humans, the design and microfabrication of lab-on-a-chip units to evaluate cellular metabolism, or the micromanufacturing of photonic devices, pulsed lasers provide the most precise and effective performance.

This module introduces students to the basics of lasers, interactions of laser light with materials, and the latest laser research and technology. Students will also be required to use the microfabrication system to design and machine a simple device. This experiment will occur outside of regular class time, under direct supervision by the Photon Factory staff, and is estimated to take approximately 2 – 4 hours of hands-on time with the laser to complete.

Coordinator: Dr Cather Simpson
Lectures: 6 hours lecture + 2 hours of basic safety and training with the microfabrication systems in the Photon Factory

Assessment: Participation and preparation (20%) 3 or 4 simple assignments (30%); Laser experiment, analysis and report (50%)

CHEM 770
Advanced Environmental Chemistry
(15 Points)
Second Semester

Prerequisites:No formal prerequisites but an understanding of general chemical concepts will be assumed.

The focus of the course is the application of chemical principles to environmental systems. Topics covered include acid mine drainage, the role of iron oxides in aquatic systems, persistent organic contaminants and trace metal "finger printing" with ICP-MS.

The course includes a half-day field trip.

Coordinator: Dr Peter Swedlund

CHEM 780
Advanced Materials Chemistry
(15 Points)
Second Semester

Prerequisites: No formal prerequisites, but knowledge of materials chemistry at the level covered in CHEM 380 will be assumed

A selection of topics on the chemistry of advanced materials.

Topics covered typically include new technologies for light metals, polymers and multi-component materials.

Coordinator: Mr Neil Edmonds

CHEM 793
CHEM 793 A & B
BSc(Hons) Dissertation in Chemistry
(60 Points)

Restriction: CHEM 792

To complete this course students must enrol either in CHEM 793 A and B, or CHEM 793

Coordinator: Assoc Prof Brent Copp

CHEM 795
Research Methods in Chemistry
(15 Points)

A review of the literature and research methods associated with a selected chemistry research topic and an outline of the proposed research and its significance. Students will also be required to present an overview of the proposal in a seminar.

Coordinator: Assoc Prof Brent Copp

CHEM 796 A & B
MSc Thesis in Chemistry
(120 Points)

To complete this course students must enrol in CHEM 796 A and B

Food Science

Application Procedure

BSc(Hons) in Food Science or
PGDipSci in Food Science or
MSc in Food Science

Complete the Expression of Interest form in the Food Science Handbook and submit it to the Postgraduate Coordinator, Dr Yacine Hemar, as soon as possible. You will need to arrange an interview with the Postgraduate Coordinator. Bring your full CV, academic record/transcript and other relevant material to the interview.

The number of places available in these programmes is limited, and those accepted will be notified in early December or until the class is filled. Students must apply for admission to the BSc(Hons) or PGDipSci or MSc programme on-line using nDeva. Individual programmes of study for PGDipSci in Food Science and MSc in Food Science must be approved by the Posgraduate Coordinator.

Further information on the Food Science Programme may be found in the Food Science Handbook, available from the Department of Chemistry (Chemistry Reception, 5th Floor) or the Faculty of Science Student Centre (Science Centre, Building 301, 23 Symonds St).

Postgraduate Coordinator:
Assoc Prof Yacine Hemar
Level 4, Room 437
Phone 373 7599 ext 89676
Email: y.hemar@auckland.ac.nz

PG Programmes in Food Science

BSc(Hons) in Food Science

The one-year BSc(Hons) in Food Science programme is an option for well-prepared students wishing to study Food Science in greater depth than a BSc. The BSc(Hons) can also provide a faster path to the PhD degree for students intending to perform advanced research.

Prerequisite:

Attain at least a B average in 90 points above Stage II, and have completed a Food Science major.

Requirements:

- At least 30 points from FOODSCI 704, 706-710
- Up to 30 points from MEDSCI 709, 710, BIOSCI 741 or other courses approved by Programme Director
- 60 points FOODSCI 788 BSc(Hons) Dissertation in Food Science

PGDipSci in Food Science

The PGDipSci in Food Science is a one year programme. Taught coursework comprises core courses, and elective courses. A dissertation which is based on a short research project may be taken. Assessment for the taught component is by a combination of coursework, assignments and final examination.

Prerequisite:

A relevant Bachelor's degree in Science, Technology (or an approved equivalent) and evidence of a satisfactory level of competence in relevant subject areas.

Requirements:

- 60 points from FOODSCI 703, 704, 707-708
- 60 points from approved 600 and 700 level courses

Master of Science (MSc) in Food Science

This MSc degree follows from a BSc(Hons) or PGDipSci in Food Science and takes 1 year to complete. A thesis based on a research project is required. Assessment is by a combination of oral presentation, and thesis examination.

Prerequisite:

A PGDipSci or a BSc(Hons) in Food Science with a B grade over 90 points, of which at least 75 points must be at 700 level.

Requirements:

A thesis (120 points, FOODSCI 796), based on a research project on some aspect of food science.

Note:

Selection for the PGDipSci in Food Science and MSc in Food Science programmes will be based on academic merit, but a professional interest in food science or food technology will be taken into account.

Postgraduate Courses in Food Science

FOODSCI 610
Special Topic
(15 Points)
First Semester

Prerequisite: Permission of Programme Director

FOODSCI 691
FOODSCI 691A & B
PG Diploma Dissertation (Food Science)
(30 Points)
First and Second Semesters
Not available in 2010

To complete this course students must enrol in FOODSCI 691 A and B, or FOODSCI 691

FOODSCI 703
Food Processing
(15 Points)
First Semester

Prerequisite: Permission of Programme Director

Preservation of food by standard methods including freezing, dehydration and thermal processing. New developments in food preservation. Unit operations, mass and energy balance, and heat transfer are covered. Chemical and physical changes food undergoes during processing.

FOODSCI 704
Food Biotechnology
(15 Points)
Second Semester

Prerequisite: Permission of Programme Director

Bioprocess engineering fundamentals, fermentation processes, fermenter design and operation, bioseparations, food biotechnology.

FOODSCI 705
FOODSCI 705 A & B
Project in Food Science
(15 Points)
Second Semester

Prerequisite: Permission of Programme Director

To complete this course students must enrol in either FOODSCI 705 A and B, or FOODSCI 705

FOODSCI 706
Food Safety
(15 Points)
First Semester

Prerequisite: Permission of Programme Director

The understanding of the changing regulations that apply to the New Zealand food industry is of paramount importance. The Food Amendment Act of 1996 which allows the Australia New Zealand Joint Food Standards Agreement to come into force will be examined in detail. HACCP and risk management plans will be generated.

FOODSCI 707
Food Science
(15 Points)
First Semester

Prerequisite: Permission of Programme Director

Chemical, biological and physical aspects of foods. The decomposition of food due to lipid oxidation, enzymic and non-enzymic browning. Emulsions and foams. Integrated study of selected basic foods.

FOODSCI 708
Advanced Food Science
(15 Points)
Second Semester

Prerequisite: Permission of Programme Director

The functions and properties of food additives. Food attributes including colour, flavour and texture. Sensory science. Introduction to the Food Regulations. Interaction of macromolecules.

FOODSCI 709
FOODSCI 709 A & B
Selected Topics In Food Science and Technology
(15 Points)
First and Second Semester

Note: Consult the Director of Food Science

Modules will be organised by the staff and invited lecturers. Topics offered will usually be based on the specialist interests of the lecturers, although controversial issues may be included (for example, genetically modified food, irradiated food). Students may be required to participate actively by contributing seminars. Topics may vary from year to year.

To complete this course students must enrol in either FOODSCI 709 A and B, or FOODSCI 709

FOODSCI 710
Industrial Internship
(15 Points)
First, Second, or Summer Semester

Prerequisite: Permission of Programme Director

Note: Consult the Director of Food Science

The industrial internship is an opportunity for students to experience the food industry at first hand. While the placement would normally be in New Zealand, overseas internships are possible. The student will work in the food organisation on a defined project under the supervision of a suitably qualified person. A detailed written report on the assignment must be submitted.

FOODSCI 788
FOODSCI 788 A & B
BSc(Hons) Dissertation in Food Science
(60 Points)
First and Second Semesters

Restriction: FOODSCI 789

Note: Consult the Director of Food Science

A research proposal will be prepared on the dissertaton topic. Students will be required to present a overview of the proposal in a seminar. Students will participate in the critical analysis of scientific papers. The student will carry out an original piece of research. The results will be presented and discussed in a dissertation. A seminar on the research will be given

To complete this course students must enrol in FOODSCI 788 A and B

FOODSCI 796 A & B
MSc Thesis in Food Science
(120 Points)
First and Second Semesters

Prerequisite: Permission of Programme Director

To complete this course students must enrol in FOODSCI 796 A and B

Forensic Science

Forensic Science is the application of science to matters of law. As our knowledge and technical expertise in science increase, so does the complexity and importance of the science presented to the courts in the legal system.

ESR (the suppliers of forensic science to the New Zealand Police) and The University of Auckland jointly introduced in 1996 a set of postgraduate qualifications in forensic science. These are the Certificate of Proficiency, Postgraduate Diploma in Forensic Science (PGDipForensic) (a one year taught programme) and MSc (a one year research degree) in Forensic Science.

A PhD in Forensic Science is also available.

Postgraduate Programmes

Certificate of Proficiency

The Certificate of Proficiency provides a unique qualification in forensic science for professionals and graduates in all involved disciplines such as lawyers, justice persons, the police, scientists, health and medical professionals, and journalists. The PGDipForensic qualification normally requires candidates to have completed degrees in science, medicine, technology or related topics. A candidate's professional experience is also taken into account in the selection process.

Requirements:

- FORENSIC 701 and FORENSIC 702 (15 points each)

Postgraduate Diploma (Forensic Science)

Requirements:

- 105 points from FORENSIC 701-704, 706, 707
- 15 points from an approved 700 level course

Master of Science (Forensic Science)

The one year research MSc is available to students who complete the PGDipForensic with an average of B- or better, with the approval of the Director of the Programme. A thesis (FORENSIC 796, 120 points) based on a research project, normally completed within one year.

Application procedure

Consult the Forensic Science website at **www.che.auckland.ac.nz/forensic** or read the process below. There are limitations on the number of students in the PGDipForensic and MSc in Forensic Science programmes, and interviews will usually be conducted as part of the selection process. The criteria for selection will include academic merit, and weighting will be given for professional interest and experience in forensic matters.

Students applying for the PGDipForensic or MSc in Forensic Science must complete the **Registration of Interest form** on the website or in this handbook (page 55) and submit it to the Programme Director **by 01 November**.

Individual programmes of study for both PGDipForensic and MSc must be approved by the Director.

The programme has been designed for full time study; however, variations from this may be approved for both the Postgraduate Diploma and the Master's Degree. It may be possible to study FORENSIC 701, 702, 703 or 706 independently from the programme. The Director must approve of these course choices.

Note: Students must also apply for admission to the Certificate of Proficiency, PGDipForensic or MSc programme on-line using Student Services Online.

Director: Dr Douglas Elliot
Phone 373 7599 ext 85860 OR 815 3670
Email: douglas.elliot@esr.cri.nz

Deputy Director: Dr Gordon Miskelly
Level 6, Room 631A
Phone 373 7599 ext 88338
Email: g.miskelly@auckland.ac.nz

Postgraduate courses in Forensic Science

Prerequisite for all courses:
Permission of the Programme Director

FORENSIC 701
Fundamental Concepts in Forensic Science
(15 Points)
Second Semester

Ethics and quality assurance in forensic science. Principles of criminal law, principles of evidence and procedure, expert evidence, interpretation of scientific evidence, probability and statistics. Forensic pathology, psychology and psychiatry.

FORENSIC 702
Introduction to Forensic Science
(15 Points)
First Semester

Forensic biology, documents, fingerprints, physical evidence, toolmarks, fire examination, explosives, hairs and fibres, drugs, toxicology, alcohol (including blood and breath alcohol), crime scene examination, firearms identification.

FORENSIC 703
Statistics and Molecular Biology in Forensic Science
(15 Points)
First Semester

Statistics: data summarization and reduction, laws of probability, conditional probability, likelihood ratios and Bayes' Theorem. Interpretation of statistical results. Forensic biology: basic principles of population genetics, genomic structure, conventional blood grouping. DNA profiling: structure, enzymology and basic chemistry of nucleic acids, RFLP analysis, PCR and microsatellites, interpretation of DNA profiles.

FORENSIC 704
Techniques and Applications for Forensic Science
(15 Points)
Second Semester

Analytical techniques: GC, HPLC, GC-MS chromatography, IR and UV spectroscopy. Applications: toxicology, illicit drugs, sports drugs, racing chemistry. Physical and trace evidence.

FORENSIC 706
Environmental Forensic Science
(15 Points)
First Semester

Concepts of environmental science. Environmental monitoring and spill analysis, environmental legislation, criminal and environmental law. Case studies and practical work.

FORENSIC 707 A & B
Research Essay in Forensic Science
(30 Points)
First and Second Semesters

A research essay on an aspect of forensic science. Topics are selected from discussion with ESR and University staff. Students may be allowed to write on a subject of their choosing.

FORENSIC 796 A & B
MSc Thesis in Forensic Science
(120 Points)
First and Second Semesters

This comprises an advanced research project on some aspect of forensic science.

Elective Course
Candidates select an additional course at the 700 level to fulfil the Regulations for the Postgraduate Diploma in Forensic Science. Regulations are as specified in The University of Auckland Calendar. The Programme Director must approve the choice of elective.

FORENSIC SCIENCE PROGRAMME
Department of Chemistry
Faculty of Science

THE UNIVERSITY OF AUCKLAND
NEW ZEALAND

Chemistry Building
23 Symonds Street
email: chemistry@auckland.ac.nz
www.che.auckland.ac.nz/forensic

The University of Auckland
Private Bag 92019
Auckland, New Zealand

REGISTRATION OF INTEREST FOR LIMITED ENTRY PROGRAMMES

Print out this form and send it with your CV and academic transcript to the above address by November 1. (Note that you also need to apply separately for admission to the University)

Programme(s) applied for:
☐ . Postgraduate Diploma in Forensic Science
☐ . Master of Science (Forensic Science)

(Note: You do not have to apply separately for the Certificate of Proficiency - just enrol online. We will then contact you if we require more details prior to accepting you into these courses).

Family Name _____ Given Names _____

Permanent address _____

Address for correspondence (if different from above) _____

Phone ( ) _____ Fax ( ) _____

Email _____

First Degree / Qualification and Specialisation _____

Current Status / Employment _____

Current Course (if you are still studying) _____

References: The names and addresses, with email and facsimile details if available, of 3 people who are prepared to act as referees, at least one of whom can comment on your University work or relevant experience.

1. _____

2. _____

3. _____

Please turn over

STATEMENT OF INTEREST

Brief reasons for applying to the Forensic Science Programme

Declaration

I authorise The University of Auckland to collect, use, and disclose personal information about me i
with the Privacy Act 1993. I authorise any agency holding the source of any information I have pro
release that information to The University of Auckland upon request.

Signed _____ Date _____

Wine Science

The international success of the New Zealand wine industry has created demands for highly trained and skilled participants and for locally focused scientific research of the highest standards. The wine science postgraduate programme at the University of Auckland highlights the multiple dimensions and applications of wine science with courses that examine the science of grape production and winemaking, and analytical techniques in winemaking. Students also have the opportunity to learn about the organisation and operation of wine businesses and the industry as a whole.

Lecturers and researchers already working in wine-related fields are involved in teaching courses alongside wine science staff and leading New Zealand winemakers. The teaching programme has close associations with the newly established Wine Industry Research Institute of New Zealand. The programme also has strong links with leading international programmes of wine science research and aims to foster international scientific exchange and to offer opportunities for student exchanges. Based at the Tamaki Campus, the inaugural intake of students started the programme in February 2003 with new winemaking facilities and a related laboratory.

Postgraduate programmes

PGDipSci in Wine Science

The Postgraduate Diploma follows from a BSc and is a one-year full-time or two-year part-time diploma that teaches the processes of wine production. The course work comprises core courses in wine science and elective courses. Assessment for the courses is by a combination of coursework, assignments and final examination.

Prerequisite:

A relevant Bachelor's degree in Science, Technology, or in a related field.

Requirements:

Courses (120 points) including at least 75 points from WINESCI 701 – WINESCI 707, with up to 45 points from approved 600 and 700 level courses in biological sciences, chemistry, chemical and materials engineering, food science and geography.

ENTRY:

Selection for the course will be based on academic merit, but a professional interest in wine science will be taken into account.

MSc in Wine Science

The MSc in Wine Science follows on from a PGDipSci in Wine Science, and is a one-year full-time or two-year part-time degree. A thesis based on a research project is undertaken.

Application procedure

Students must apply for admission to the Postgraduate Diploma and MSc programmes online using Student Services Online. The number of places available in the programmes is limited. Prospective students should contact the Director of the Wine Science programme in advance of enrolment, and make available a full CV, academic record or transcript, and other relevant material. Individual programmes of study must be approved by the Director.

PhD studies in the area of wine science are also available through the Chemistry Department and School of Biological Sciences.

Director: Randy Weaver

Room 740.229a (Tāmaki Campus)
Phone 373 7599 ext 89969
Email: r.weaver@auckland.ac.nz

Postgraduate courses in Wine Science

Prerequisite for All Courses:
Permission of the Programme Director

WINESCI 701
Winemaking in a New Zealand Setting
(15 Points)
First Semester

The principles and practices of local winemaking are reviewed and compared with international counterparts to highlight the distinctive characteristics of winemaking in New Zealand. A microvinification project is undertaken in which students begin with an allotment of grapes, monitor the fermentation using a range of analytical techniques, and make decisions which affect the style of wine they produce.

WINESCI 702
The Science Behind Grape Production
(15 Points)
First Semester

Develops students understanding of the contemporary scientific knowledge and research that is of relevance to grape production for winemaking. The application of traditional and modern molecular methods in plant science and plant pathology will be discussed in relation to the selection, improvement and management of vines and grape attributes. Research issues of national and international relevance to viticulture will also be addressed.

WINESCI 703
The Science Behind Winemaking
(15 Points)
Second Semester

Follows on from 702 and focuses on the contemporary scientific knowledge and research that is of relevance to winemaking, commencing from the point of grape harvest. The application of traditional and modern methods in biochemistry and microbiology will be discussed. Research issues of national and international relevance to winemaking will also be addressed.

WINESCI 704
Sensory Evaluation and Statistical Methods
(15 Points)
First Semester

The principles of sensory science, sensory analysis of wine, differences among wine types, regional styles and grape types will be covered. Emphasis will be placed on those components which influence sensory appeal. The application of statistical methods to wine sampling and to the design of sensory panels will be overviewed.

WINESCI 705
WINESCI 705 A & B
Project in Wine Science
(15 Points)
First and Second Semesters

Students will gain a thorough understanding of the current knowledge on a selected topic associated with wine science and have experience in writing a research proposal and in giving a presentation to the peer group.

To complete this course students must enrol in either WINESCI 705 A and B, or WINESCI 705

WINESCI 706
The Business of Wine Production
(15 Points)
Second Semester

Students will be introduced to the economics of grape growing, winemaking, winery design and management. Distribution and marketing will be introduced. Special topics including wine law, use and negotiation of contracts small business development, stock valuation, issues of appellations, labelling and brand development will be taught. Environmental and resource management issues and health and safety regulations will be covered.

WINESCI 707
WINESCI 707 A & B
Topics in Wine Science
(15 Points)
First and Second Semesters

A number of advanced or special topics in wine science.

These will include topics such as winemaking equipment and winery systems, aroma in Sauvignon blanc wine, yeast science, and tannins and oxygen in red wine

To complete this course students must enrol in either WINESCI 707 A and B, or WINESCI 707

WINESCI 796 A & B
MSc Thesis in Wine Science
(120 Points)

Advanced research on an aspect of wine science. This may be undertaken with the Wine Industry, CRIs, and University staff.

To complete this course students must enrol in WINESCI 796 A and B

PhD study

The PhD degree comprises a programme of advanced study and research, the results of which are presented in a thesis. The thesis is a formal and systematic exposition of a coherent piece of research work carried out over the period of registration. It shall be an original contribution to the field of study and is required to meet internationally recognised standards for such work (PhD Statute). Enquiries relating to the administration of the PhD degree and the associated procedures should be directed to: Graduate Centre (Clock Tower, East Wing; telephone: 373 7599 ext 86899; postgraduate@auckland.ac.nz).

Entry to PhD

The normal requirement for admission to the PhD is an Honours degree with 2nd class honours division 1 or better, either MSc, BSc(Hons), or BTech. Candidates with overseas qualifications should consult the department for advice and assessment of their qualifications. Candidates may be required to enrol in one or more courses concurrent with research work to complement either their research work or their background in the subject.

Financial Assistance

This may be offered in the form of a PhD fellowship associated with a specific research project, or teaching duties within the department. Note that financial assistance available from the department is extremely limited, and all candidates are strongly encouraged to apply to all external sources of PhD funding for which they are eligible.

Application, Admission and Enrolment

The University of Auckland invites you to develop and submit your Expression of Interest (EOI) online. This process makes the submission of an EOI straightforward and provides you with a clear channel for enquiring about doctoral study and acquiring a supervisor. The online EOI allows for inclusion of sufficient information to enable us to assess you as a potential doctoral candidate and subsequently advise you appropriately. This process is outlined at www.science.auckland.ac.nz/uoa/science/for/pg/phd.cfm

If you are applying for the Doctoral programme, you will also need to supply:

- two academic references (if you have not studied at The University of Auckland before)
- a statement of research intent (approximately 500 words; this should be developed in conjunction with your proposed supervisor)
- the name/s of your proposed supervisor/s.

For further information, please contact:

PhD Coordinator

Dr Gordon Miskelly
Phone 373 7599 ext 88338
Email: g.miskelly@auckland.ac.nz

Research

Research in the Department of Chemistry

A wide range of research areas are represented by academic staff in the Department of Chemistry. Research students and postdoctoral fellows contribute to this research at all levels and publish their research in a wide range of well known international scientific journals.

Research in analytical, inorganic, organic and physical chemistry supported by structural and computational chemistry reflects our strength in the traditional core of the discipline. Food, wine and forensic science research links to the specialised degree programmes offered in those areas.

Research in emerging, multidisciplinary programmes is also strong, for example green chemistry, much of it carried out within research Centres and Institutes at the University.

Medicinal and biological chemistry research is carried out in collaboration with the Maurice Wilkins Centre for Molecular Biodiscovery.

Materials research has links to the Polymer Electronics Research Centre located within the Department, and also to the Plastics Centre of Excellence, the Materials Accelerator, the Light Metals Research Centre and the Centre for Advanced Composite Materials.

Two very new facilities within the Department, the Photon Factory and Microfabrication laboratory, have recently added new dimensions to our research activities.

Research areas are summarised under the following headings, and a list of staff engaged in each area can be found on the Department's website.

Analytical Chemistry and Forensic Science
Biological Chemistry
Food and Wine Science
Inorganic and Green Chemistry
Organic and Medicinal Chemistry
Physical and Materials Chemistry
Structural and Computational Chemistry

A summary of current research activities and research projects offered by individual members of staff can be found beginning on page 65.

Research Supervisors and research Topics

Nomination of preferred supervisor

Students need to select a research supervisor in parallel with the application to enrol for BSc(Hons) Chemistry, BSc(Hons) Medicinal Chemistry, MSc in Chemistry programmes. The handbook and the website have information about projects and research areas offered by staff within the Department.

Please make arrangements to discuss with individual staff members the projects that are of interest to you. You should consult with at least three staff members. Fill out a supervisor selection form (available from the Chemistry Department office or from the website http://www.che.auckland.ac.nz) and indicate, in order of preference, three supervisors with whom you would like to work. Submit this form to Min-Young Lee (min.lee@auckland.ac.nz) in the Chemistry Office by 8 December 2010. The Department will endeavour to offer students their first choice and will confirm supervisor selection to students as soon as possible after this date.

PhD candidates will select their supervisors as part of their EOI submission (see page 62).

Associate Professor Bob Anderson

RADICAL REACTIONS IN BIOLOGICAL CHEMISTRY

Mechanistic studies on the free radical chemistry of compounds related to health issues are the main focus of the research topics offered for BSc (Hons), MSc and PhD. Use is made of the department's fast reaction facility to generate radical species in aqueous solution on the short timescale (ns – μs) and to follow their subsequent reactions in real time by time-resolved spectrophotometry and conductivity.

Complementary product analysis and DNA damage studies are undertaken using steady state radiolysis with analytical and molecular biology techniques.

PROJECTS

RADICAL MECHANISMS IN ANTICANCER DRUG DESIGN

Research focus is on the fast reaction chemistry of compounds being developed, a) to enhance the killing of cancer cells in radiotherapy, and b) to release cytotoxins from bioreductive drugs. Both these approaches are aimed to attack drug-resistant hypoxic cells in tumours that are thought to cause treatment failure. Investigations include measurements of the controlling electronic parameters of the prodrugs, stabilities of the radical intermediates and other factors that influence the desired release of the cytotoxins. Free-radical activated drugs have an electron-affinic trigger moiety linked to a masked cytotoxin which can be released on one-electron reduction; while certain hypoxia-selective drugs, such as the clinical drug tirapazamine, can be activated upon one-electron reduction to form a cytotoxic radical, which damages DNA. These studies are carried out incollaboration with synthetic chemists of the Auckland Cancer Society Research Centre led by Professor Bill Denny.

Topics

I) New approaches to the radiolytic release of cytotoxins from prodrugs.
II) Radical parameters controlling the activity of new bioreductive drugs.

REACTIONS OF ANTIOXIDANTS WITH BIO-RADICALS.

Research is on mechanisms by which certain dietary compounds and endogenous compounds can act as antioxidants in undergoing fast electron transfer reactions, with DNA and proteins, resulting in chemical repair. Test compounds include vitamins, polyhydroxyphenols, nitroxyls and compounds normally found in the brain. These studies relate to the possible prevention of cancer, heart disease and neurological disorders. Also, DNA-targeted antioxidant compounds are studied as a novel approach to repair normal tissue damage through electron transfer to DNA radicals. Molecular biology techniques are used to assess DNA damage.

Topics

III) Antioxidants in the fast chemical repair of fatty acid radicals.
IV) Electron transfer from antioxidants in the fast chemical repair of DNA radicals.
V) Prevention of DNA strand breaks and base damage by antioxidants.

ELECTRON TRANSFER IN DNA AND REDOX PROTEINS

Research is on the mechanisms of electron and hole transfer in DNA and redox proteins. Pulse radiolysis is used to rapidly induce an electron onto DNA bases or metallo- or flavin-centers in proteins and electron migration to electron affinic DNA-binders or to other redox centers is followed using optical absorption spectrophotometry. These studies are related to radioprotection mechanisms of DNA minor-groove binders and fundamental studies on electron transfer chains.

Topics

VI) Intramolecular electron and hole transfer in DNA.
VII) Intramolecular electron transfer in redox proteins.

SELECTED PUBLICATIONS

Shinde, S.S., Maroz, A., Hay, M.P., Patterson, A.V., Denny, W.A. and Anderson, R.F. Characterization of radicals formed following enzymatic one-electron reduction of 3-substituted1,2,4 benzotriazine 1,4-dioxide anticancer compounds (tirapazamine), *J. Am. Chem. Soc.*, 2010, 132, 2591-2599.

Maroz, A., Shinde, S.S., Franzblau, S.G., Ma, Z., Denny, W.A., Palmer, B.C. and Anderson, R.F. Release of nitrite from the antitubercular nitroimidazole drug PA-824 and analogues upon one-electron reduction in protic, non-aqueous solvent. *Org. Biomol. Chem.*, 2010, 8, 413-418.

Shinde, S.S., Hay, M.P., Patterson, A.V., Denny, W.A. and Anderson, R.F.*Spin-trapping of radicals other than the .OH radical upon reduction of the anticancer agent tirapazamine by cytochrome P450 reductase. *J. Am. Chem. Soc.*, 2009, 131, 14220-14221.

Shinde, S.S., Maroz, A., Hay, M.P. and Anderson, R.F. One-electron reduction potential of the neutral guanyl radical in the GC base pair of duplex DNA. *J. Am. Chem. Soc.*, 2009, 131, 5203-5207.

Professor Ted Baker

PROTEIN STRUCTURE AND FUNCTION

Research in our group is concerned with determining the molecular basis of biological processes. We focus on the structure and function of proteins, using X-ray crystallography to determine their 3D structures, and various approaches to relate structure to function kinetics, binding studies, recombinant DNA methods, as appropriate). Some projects are directed towards the design of new therapeutic drugs. The research is likely to involve protein purification and crystallization, X-ray crystallography, computer modelling and bioinformatics. Students will also have the opportunity (in some projects) to learn the techniques of DNA manipulation and protein engineering.

CURRENT PROJECTS

STRUCTURE AND FUNCTION OF TB PROTEINS

We are studying the structure and function of proteins isolated from Mycobacterium tuberculosis, the cause of TB. Some of these proteins are essential biosynthetic enzymes, whose structures can be used for the design of new anti-TB drugs. Others will give new insights into the biology of TB (eg. how the organism persists in the lungs).The project will involve bioinformatics, molecular biology, protein chemistry and structure determination, and is carried out as part of an international collaboration.

BACTERIAL TOXINS

Common bacteria such as Staphylococcus aureus and Streptococcus pyogenes produce protein toxins that trigger a variety of human diseases. In some cases these toxins attack the immune system whereas in others they targets human tissues. We are studying the structure of these toxins in order to understand the molecular basis for their activities and their impact on human health.

ISOPEPTIDE BONDS IN PROTEINS

Three years ago we discovered a novel kind of covalent cross-link in proteins, formed between the side chains of the amino acids lysine and asparagine. We believe that if we can introduce such bonds into proteins using protein engineering we could generate super-stable proteins. First, however we have to find out how common these bonds are, how they form and what properties they give to proteins. This is a very exciting mixture of chemistry and biology.

SELECTED PUBLICATIONS

Brown PM, Caradoc-Davies TT, Dickson JM,Cooper GJS, Loomes KM and Baker EN. Crystal structure of a substrate complex of myo-inositol oxygenase, a novel di-iron oxygenase with a keyrole in inositol metabolism. Proc. Natl. Acad. Sci. USA. 2006. 103:15032-15037.

Koon N, Squire CJ, Baker EN. Crystal structure of LeuA from Mycobacterium tuberculosis, a key enzyme in leucine biosynthesis. Proc. Natl. Acad. Sci. USA. 2004. 101:8295-8300.

Kang HJ, Coulibaly F, Clow F, Proft T and Baker EN. Isopeptide bonds stabilize Gram-positive bacterial pilus structure and assembly. Science 2007. 318: 1625-1628.

Dr David Barker

SYNTHETIC ORGANIC AND MEDICINAL CHEMISTRY

Research in our group focuses on synthesizing and modifying naturally occurring bioactive compounds, whilst along the way developing new synthetic methodology These synthesise are designed to be flexible and allow for the creation of analogues of the natural compound which may lead to compounds that have greater bioactivity and may also give insight into how the naturally occurring compounds act. Listed below are just some of the research areas that we are currently investigating. Areas of current interest include:

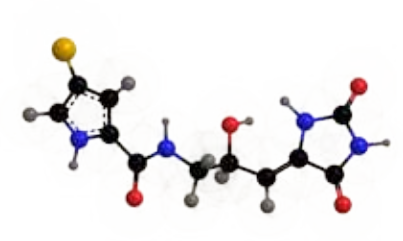
CURRENT PROJECTS

SYNTHESIS OF THE HYPOXIA INDUCIBLE FACTOR 1 (HIF-1) INHIBITOR MANASSANTIN B

Hypoxic cancer cells are a type of cancer cell that exist in very low oxygen conditions and are notoriously difficult to treat using standard therapies, often requiring larger doses of toxic chemotherapy. Manassantin B is a complex dineolignan extracted from saururus chinensis, a herb used in Chinese and Korean folk medicine. It has recently been found to inhibit the growth of these difficult hypoxic cancer cells. Unlike other compounds that attack hypoxic cancer cells manassantin B has very low toxicity, and as such, is a lead compound in the development of new non-toxic anti-cancer therapeutic agents. This research group is currently synthesizing manassantin B and its analogues. It is hoped these compounds will allow the development of this exciting new class of therapeutic agents and reduce the need to use highly toxic chemotherapeutic compounds.

SYNTHESIS OF BIOACTIVE 1,4-BENZODIOXANE LIGNANS

The Eusiderin family of neolignans have been isolated from the bark of
Licaria chrysophylla and other species. Many members of the eusiderins have been found to bebiological active and have a wide range of activites incldiuing cytotoxicity, hepatoprotective,



acting as a or β blocking agents useful in antidepression or antihypertension therapy. Others exhibit antihyperglycemic properties and act as inhibitors of 5-lipoxygenase. The compounds are unusal in the lignan family because they have a chiral 1,4-benzodioxane ring system. Our research is directed toward the synthesis of this family of natural products using a flexible but enantioselective approach.

SYNTHESIS OF COMPLEX PYRROLE-CONTAINING MARINE NATURAL PRODUCTS

Pyrrole-containg natural products are highly abundent with numerous highly bioactive pyrroles being isolated from a diverse range of sources including insects, sponges, plants, fungi and bacteria. Our research focuses on the synthesis of complex marine natural products that contain substituted pyrroles. Current molecules of interest are: Trikentramine, an unusual pyrrole containing natural product isolated from Trikentrion loeve, the structure of which was determined to be a unique tricyclic structure with a pyrrole linked to a highly substituted chiral indene; the Mukanadins, which are a family of brominated pyrroles which possess neuroprotective properties through their modulation of calcium receptors in the central nervous system; the Lamellarins, a family of highly compelx aryl-substituted pyrroles which show considerable potential for the treatment of various cancers and as anti-viral compounds.

SYNTHESIS OF NOVEL ORGANOCATALYSTS BASED ON AN ALPHA-SUBSTITUTED PROLINE SCAFFOLD (with Prof. Margaret Brimble)

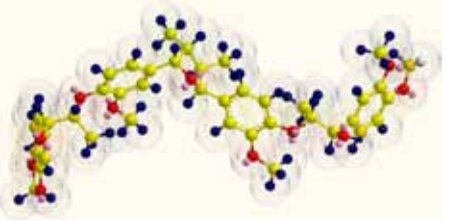
The natural amino acid proline has been the starting material for large number of different organocatalysts and the proline-based organocatalysts could be considered a super-family of organocatalysts capable of catalysing, in asymmetric fashion, a number of C-C bond forming reactions of fundamental importance in organic synthesis such as the aldol, Michael and Diels-Alder reaction. Fundamentally all proline-based organocatalysts act by conferring the chirality of the α carbon to an achiral reactant therefore leading to the formation of a single enantiomer as the major product. We have discovered the inclusion of an extra substituant at the α carbon significantly increases the enantioselectivity in a number of key chemical reactions. Our research revolves around synthesizing and evaluating a number of novel organocatalysts that have extra substitution at the key chiral α carbon and then using these new catalysts in the synthesis of complex natural products.

SYNTHESIS OF LIGANDS FOR ALPHA-7 NICOTINIC ACETYLCHOLINE RECEPTORs BASED ON THE DELPHINIUM ALKALOID METHYLLYCACONITINE (with Prof. Margaret Brimble)

Work on the toxic components of Delphinium brownii, a cattle-stock poison in Western Canada, led to the identification of methyllycaconitine as the principal insecticidal toxin. Both its toxicity and insecticidal activity have been attributed to its ability to act as a potent inhibitor of alphabungarotoxin nicotinic acetylcholine receptor (nAChR) binding in mammalian and insect neural membranes. At this subset of nAChR, methyllycaconitine is the most potent small molecule antagonist yet reported. Methyllycaconitine is therefore a valuable neurobiological tool for the study of the comparative pharmacology of nicotini acetylcholine receptors and is a lead compound for the treatment of Alzheimer's disease. Research is aimed at developing small analogues of methyllycaconitine that retain the binding efficiency and selectivity of the natural product but with far less toxicity. The synthesis of AE, EF and ABE bicyclic and tricyclic analogues of methyllycaconitine is currently being investigated.

SYNTHESIS OF DNA MINOR-GROOVE BINDING PEPTIDES

Poly-pyrrole antibiotics such as netropsin and distamycin represent typical examples of DNA minor groove binders endowed with a pronounced selectivity for AT-rich sequences and they are weakly cytotoxic. From synthetic analogues of these natural products several potent antitumor drugs have been obtained, such as the distamycin-nitrogen mustard conjugate tallimustine which has undergone clinical trials as an anticancer agent. These minor-groove binding ligands directly alter the natural interactions of the DNA and those enzymes which interact with DNA such as replicases and topoisomerases. Our aim is to design and synthesis DNA binding molecules that disrupt these proteins that interact naturally with DNA. Compounds of this type have potential as anti-cancer treatments and have also been known to be effective antibiotics.



SELECTED PUBLICATIONS

Chan, Y., Balle, J., Sparrow, J. K., Boyd, P. D. W., Brimble, M. A., Barker, D. A double Mannich approach to the synthesis of substituted piperidones: Application to the synthesis of substituted E-ring analogues of methyllycaconitine Tetrahedron, 2010, 66, 7179-7191.

Rye, C. E., Barker D. An Acyl-Claisen approach to tetrasubstituted tetrahydrofurans lignans: Synthesis of Fragransin A2, Talaumidin and lignan analogues. Synlett, 2009, 3315-3319.

Tong, S.-T., Brimble, M. A., Barker, D. Influence of alpha-methyl substitution of proline-based organocatalysts on the asymmetric alpha-oxidation of aldehydes. Tetrahedron, 2009, 65, 4801–4807.

Chan, Y., Guthmann, H., Brimble, M. A. and Barker, D. Diastereoselective Synthesis of Substituted 4-Piperidones and 4-Piperidols Using a Double Mannich Reaction. Synlett, 2008, 2601-2604.

Associate Professor Peter Boyd

INORGANIC, SUPRAMOLECULAR AND COMPUTATIONAL CHEMISTRY

My research interests are in the areas of synthetic, structural and physical properties of transition metal coordination complexes, the supramolecular and covalent chemistry of porphyrins and fullerenes and the application of computational chemistry in studies of the molecular shape, reactivity and spectroscopic properties of inorganic, organic, medicinal and organometallic systems.

CURRENT RESEARCH

SUPRAMOLECULAR FULLERENE-PORPHYRIN CHEMISTRY

C_{60} is one of the newly discovered allotropes of carbon called fullerenes. These cagelike molecules have a wide range of accessible oxidation states, a nearly spherical structure capable of 3D chemical functionalisation, a broad range of electronic absorption bands and large bonding surfaces for supramolecular interactions. The covalent attachment of fullerenes to porphyrins to form donor-acceptor conjugates is of great interest. C_{60} can act as an electron acceptor in photoinduced electron transfer processes from the donor porphyrin. We have been interested in the synthesis and properties of these covalently and supramolecularly linked chromophores. Fullerenes have small 3D reorganization energies after electron transfer. This feature shifts the charge recombination reaction into the so called "Marcus inverted region" slowing the back electron transfer rate and accelerating the forward rate when compared to traditional flat electron acceptors, as is found in the natural photosynthetic systems.

We have recently discovered a new supramolecular recognition element based on the observed attraction between the curved pi surface of the fullerene and the planar porphyrin pi surface. We are interested in the preparation of new molecular materials based on either the chemical derivatisation of C_{60}, the assembly of fullerenes with other host molecules in solution and crystal engineering in the solid state using this new recognition element. The motivation for these projects ranges from the aesthetic challenge of designing such systems to the practical aims of creating useful molecules and devices. Host-guest complexes and nanostructured frameworks can form functional materials with potential applications in the studies of light induced electron/energy transfer, the preparation of photovoltaic devices and as organic conductors.

DENSITY FUNCTIONAL and QM/MM STUDIES

Density functional methods have been used to:explore of the reaction path for the activation and scission of carbon dioxide in multimetallic dinitrogen bridged iron complexes, study the cleavage reaction of sulphur dioxide molecules using low valent molybdenum complexes, explore the reaction path of a catalytic cycle involving the formation of aryl nitriles from aroyl isocyanates via the formation of a metallocycle with tungsten oxychloride, calculate the molecular structure and bonding analyses of the redox states of bimetallic palladium hydride complexes and to study the dispersive interactions bewteen fullerenes and porphyrins

Projects available either for MSc or BSc(Hons) are:

- Synthesis of porphyrin based hosts for supramolecular binding of fullerenes
- Density functional studies of the interaction between transition metal ions in dimeric complexes
- Crystal engineering using fullerenes and coordination chemistry

SELECTED PUBLICATIONS

Sun D, Tham FS, Reed CA and Boyd PDW. *Extending Supramolecular Fullerene-Porphyrin Chemistry to Pillared Metal-Organic Frameworks.* Proceedings of the National Academy of Science. 2002. 99: 5088-5092.

Sun D, Tham FS, Reed CA, Chaker L and Boyd PDW. Supramolecular Fullerene-Porphyrin Chemistry. *Fullerene Complexation by Metallated "Jaws" Porphyrin Hosts.* J. American Chemical Society. 2002. 124: 6604-6612.

Boyd, P.D.W., Reed, C.A. Fullerene-Porphyrin Constructs. Accounts of Chemical Research, 2005, 38:235-242.

Hosseini, A., Hodgson, M.C., Tham, F.S., Reed, C.A. and Boyd, P.D.W. Tapes, Sheets and Prisms. *Identification of the Weak C-F Interactions that Steer Fullerene Porphyrin Cocrystallization.* Crystal Growth and Design, 2006, 6: 397-403.

Ariafard A, Brookes NJ, Stranger R, Boyd PDW and Yates BF *DFT Study of the Mechanism of the Reductive Cleavage of CO2 by a Bis-diketoiminatediiron Dinitrogen Complex.* Inorganic Chemistry 2010, 49: 7773-7782.

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Professor Margaret Brimble

FRSNZ, MNZM

SYNTHETIC ORGANIC CHEMISTRY, NATURAL PRODUCTS CHEMISTRY, MEDICINAL CHEMISTRY, CHEMISTRY BIOLOGY, PEPTIDE CHEMISTRY

Natural products have long been regarded as "nature's medicine chest" providing a rich source of lead compounds to synthesize for pharmaceutical development. Natural product synthesis has also been described as an 'enabling science' because it provides unlimited opportunity for discovery at the interface with biology and medicine. Our research in synthetic organic chemistry and medicinal chemistry focuses on making and modifying naturally occurring bioactive compounds that have been isolated from plants, animal tissue, microbes or marine and soil organisms, which are rare or hard to isolate in abundance. These compounds provide rich and diverse chemical structures that challenge the synthetic chemist to develop new synthetic methodology for the construction of the novel and diverse heterocyclic arrays which they contain.

Our research group focuses on the development of flexible synthetic approaches to several natural products which have important biological activity. The synthesis of the molecules described in detail below has also allowed the preparation of synthetic analogues of the natural compound which may lead to improvements in biological activity and an understanding of the way the naturally occurring compounds act. Our research group is also engaged in the synthesis of glycopeptides as components for cancer vaccines and the synthesis of neuroprotective peptidomimetics.

CURRENT RESEARCH

SYNTHESIS OF THE SPIROLIDE SHELLFISH TOXINS

During chemical investigations of polar bioactive molecules from microalgae and shellfish, two lipid-soluble macrocycles, spirolides B and D, were isolated from the digestive glands of both mussels (*Mytilus edulis*) and scallops (*Placopecten magellanicus*). These macrocycles contain a novel bis-spiroacetal ring system and an unusual seven-membered spiro-linked cyclic iminium moiety. They cause potent and characteristic symptoms in the mouse bioassay and were found to be weak activators of type L calcium channels. The spirolides are therefore useful lead compounds for the development of new

therapeutic agents to treat cardiovascular disorders such as hypertension.

SYNTHESIS OF THE ANTICANCER AGENT BERKELIC ACID – A MOLECULE FROM THE EXTREMES OF LIFE

Berkelic acid was recently isolated from a Penicillium species obtained from the surface water of Berkeley Pit Lake, an abandoned open-pit copper mine in Montana, USA. The acidic water (pH 2.5) is contaminated with metal sulfates at high concentrations so that only extremophiles, which may produce novel natural products, can survive. Berkelic acid inhibits MMP-3 in the micromolar range (GI_{50} = 1.87 μM) and caspase-1 in the millimolar range (GI_{50} = 0.098 mM). Compounds that block the activity of proteolytic enzymes (MMPs) used by tumour cells to promote metastatic spread provide a new approach for cancer treatment. Berkelic acid was tested in the National Cancer Institute antitumour screen against 60 human cell lines and showed selective activity toward ovarian cancer OVCAR-3 with a GI_{50} of 91 nM. Berkelic acid consists of a tetracyclic aromatic spiroketal and the aim of this project is to synthesize this novel heterocyclic motif thus providing methodology to access synthetic analogues. These novel analogues can then be used to probe structure-activity relationships and the mode of action of this important new class of anticancer agent.

SYNTHESIS OF THE ANTI-*HELICOBACTER PYLORI* AGENTS SPIROLAXINE METHYL ETHER AND ANTIBIOTICS CJ-12,954, CJ-13,014

Studies have shown a relationship between gastric and duodenal ulcers and infection by the microaerophilic spiral-shaped Gram negative bacterium *Helicobacter pylori* which is present in the mucus layer of the stomach. Antibiotics CJ-12,954 (produced by the basidiomycete *Phanerochaete velutina*) and spirolaxine methyl ether (produced by the white rot fungi *Sportrichum laxum*) exhibit potent activity against *Helicobacter pylori* and are lead compounds for the treatment of ulcers. Research is directed towards the synthesis of these compounds and analogues thereof in order to provide novel antiulcer agents.

SYNTHESIS OF THE TELOMERASE INHIBITORS, THE RUBROMYCINS

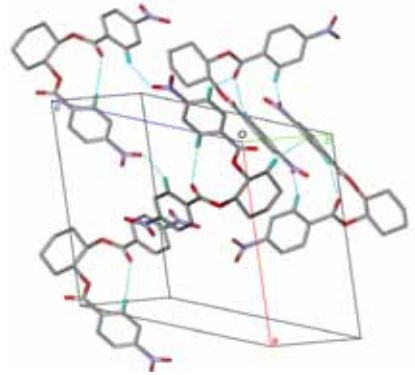
Telomeres are the natural ends of linear chromosomes, essential for maintenance of stable chromosomes and are important for maintenance of the cell cycle clock. Tumour cells typically have shortened telomeres that are maintained by the highly specialized telomerase enzyme. Elevated telomerase levels are found in almost all human cancers and levels frequently correlate with disease progression. The rubromycins are a unique class of antibiotics produced from a strain of streptomyces that inhibit human telomerase. Synthetic work is directed towards the assembly of the novel aryl spiroketal ring system present in γ–rubromycin that is the main structural feature responsible for the observed telomerase inhibition.

SYNTHESIS OF METHYLLYCACONITINE ANALOGUES AS SELECTIVE LIGANDS FOR α7 NICOTINIC ACETYLCHOLINE RECEPTORS (with Dr. David Barker)

Studies have indicated that neuronal nicotinic acetylcholine receptors (nAChRs) play a significant role in mediating the molecular events leading to cognitive enhancement, neuroprotection, analgesia and anxiolytic activity. The pentameric structure of the neuronal nAChR and the considerable molecular diversity in subunits provide the possibility of a large number of nAChR subtypes which may serve a variety of discrete functions within the CNS thus providing novel targets for therapeutic agents. Methyllycaconitine is the principal insecticidal toxin isolated from the cattle-stock poison *Delphinium brownii* and is a potent inhibitor of the α7 bungarotoxin sensitive nAChR in mammalian and insect neural membranes. At the α7 subtype of nAChR, methyllycaconitine is the most potent small molecule antagonist yet reported. Methyllycaconitine is therefore a valuable molecular probe for the study of the comparative pharmacology of nicotinic acetylcholine receptors and is a lead compound for the treatment of Alzheimer's disease and schizophrenia. The synthesis of simple analogues of methyllycaconitine is being undertaken in order to probe their pharmacological properties.

SYNTHESIS OF PYRANONAPHTHOQUINONE ANTIBIOTICS

The pyrananonaphthoquinone family of antibiotics exhibit inhibitory activity against a variety of pathogenic fungi, yeast and Gram-positive bacteria. Another property of these compounds is their ability to act as bioreductive DNA alkylating agents via quinone methide intermediates thereby resulting in cross-linking of DNA strands. These alkylated DNA adducts then interfere with the cell replication process. This concept of bioreductive alkylation offers an exciting mechanism of drug action for the development of new anticancer agents that target hypoxic cancer cells which exist in very low oxygen conditions and are difficult to treat using standard therapies. Current research is also focused on the synthesis of the dimeric pyranonaphthoquinone crisamycin A that exhibits potent antiviral activity.



SYNTHESIS OF PEPTIDES, GLYCOPEPTIDES and PEPTIDE MIMICS AS COMPONENTS FOR MELANOMA VACCINES (with Assoc. Prof. R. Dunbar, Maurice Wilkins Centre for Molecular Biodiscovery)

The immune system often recognizes tumour cells and infectious agents from the unique peptides on their surfaces hence synthetic peptides of similar structure can be used as vaccines to stimulate the immune system. This project focuses on the design and synthesis of peptides and glycopeptides as constructs to stimulate human T cells whilst being resistant to proteolytic degradation by common human proteases. Promising compounds are tested in an in vitro assay using human skin to model responses to vaccines for human injection, allowing the best compounds to proceed to clinical trials. This project represents a paradigm shift in our research from synthetic organic chemistry to the exciting field of chemical biology.

SYNTHESIS OF NEUROPROTECTIVE PEPTIDES and PEPTIDE MIMICS

The peptide synthesis platform within our research group also engages with the local biotech community to develop viable drug candidates based on peptide leads. An example is the development of NNZ2566 for Neuren Pharmaceuticals Ltd that is currently in phase 2b clinical trials for traumatic brain injury with funding of US$18 million from the US Army.

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Chen, J.L.-Y., Brimble ,M.A. Synthesis of the Bis-spiroacetal C25–C40 moiety of the Antimitotic Agent Spirastrellolide B using a Bis-dithiane Deprotection/Spiroacetalisation Sequence. Chemical Communications, 2010, 46: 3967–3969.

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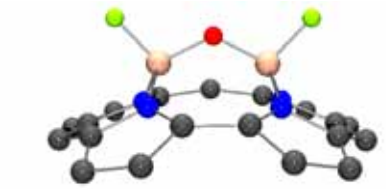
Wilson, Z.E., Brimble, M.A. Molecules from the Extremes of Life. Natural Product Reports, 2009, 26: 44–71.

Professor Penny Brothers

INORGANIC AND ORGANOMETALLIC CHEMISTRY

My primary research activities involve the syntheses of new coordination and organometallic complexes, and determining their structure and chemical properties. The focus of much of this work is on understanding new coordination and bonding modes for main group and transition metals. As well as advances in fundamental knowledge, there are potential applications in new materials and drug discovery. All projects will involve synthetic techniques from organic, coordination and organometallic chemistry, and physical techniques including multinuclear high field NMR spectrometry, X-ray crystallography and IR and UV-visible spectroscopy.



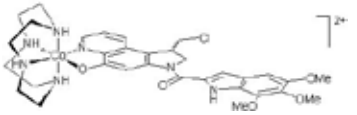
CURRENT RESEARCH

PORPHYRIN AND CORROLE COMPLEXES: DESIGNING NEW MATERIALS AND NEW CATALYSTS

Metalloporphyrin complexes occur naturally in hemoglobin, myoglobin and cytochromes. Synthetic porphyrin complexes are used widely as catalysts, in new materials, and as potential therapeutic agents. These applications are possible because the porphyrin ligand imparts interesting and unusual properties to the chemistry of the central atom. Corroles are relatives of porphyrins but have a slightly different framework, closely related to naturally occurring vitamin B12. Our research group is the first in the world to prepare complexes containing boron coordinated to the porphyrin ligand. They are very unusual in that they contain two boron atoms coordinated in the porphyrin cavity, in contrast to almost every other porphyrin complex which contains only one coordinated atom. We have achieved similar results with diboron corroles. The boron porphyrin and corrole complexes show unexpected types of chemical reactivity resulting from the proximity of two boron atoms within a tight cavity. We plan to investigate this further, looking at a spontaneous chemical reduction reaction which forms a B-B bond without any added reductant. This could be useful in preparing reagents for Suzuki coupling, and in hydrogen storage applications. Other potential applications of boron porphyrins and corroles are as sugar sensors and as fluorescence sensors, which will involve studying the photophysical properties of the boron porphyrins and corroles. This project will involve both fundamental studies directed at learning more about boron porphyrin complexes, and also specific experiments designed to test their feasibility for potential applications. One further project is to develop germanium corrole complexes as catalysts for living radical polymerisation. This project is in collaboration with Professor Xuefeng Fu of Peking University (Beijing, China).

METAL COMPLEXES AS POTENTIAL ANTI-CANCER DRUGS

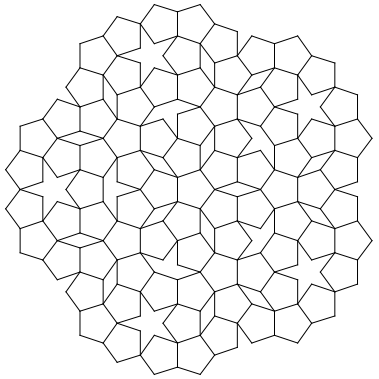
Inorganic medicinal chemistry is a rapidly developing field, spurred largely by the tremendous success of the Pt-based anti-cancer drugs like Cisplatin. The unique complexing and redox properties of metal centres can be exploited in the rational design and synthesis of new metal-based anti-cancer drugs. Hypoxia selective and radiation activated anti-cancer drugs, in which the drug is activated either in the oxygen-deficient, chemically reducing environment of solid tumour cells, or during radiation therapy, are a particular target in this project. The synthesis and chemistry of new complexes of cobalt and other transition metals containing small bioactive organic groups as ligands will be explored. Examples of these are hydroxamates and hydroximates which are known to inhibit matrix metalloproteinases, enzymes which are expressed on the surface of solid tumours and which promote metastasis. A further example synthesised in our group is the complex shown below in which the large organic ligand is a potent anticancer drug. This project is in collaboration with Dr David Ware.



NEW MATERIALS: MOLECULAR PENROSE TILING

Like a bathroom wall, a tiled plane is covered with no gaps or overlaps. This is easy to achieve using regular tiles like triangles, squares or hexagons but impossible using only shapes with 5-fold symmetry. In the 1960s Roger Penrose approached this intriguing mathematical problem by using tiles of more than one shape,

either rhombic or pentagonal, and the resulting patterns are called Penrose tilings. Similar tilings have been observed in ancient Islamic architecture. Penrose tiling on a surface has never been achieved using molecules and we are interested in pursuing this goal using 5-fold symmetric molecules as the pentagonal tiles and either metal coordination or supramolecular chemistry to control the interactions between the edges of the tiles. A range of possible "molecular tiles" have been identified based on cyclopentadienyl, expanded porphyrin, calixarene and curcurbituril motifs. This project will involve synthesis of the molecular tiles and their deposition on a surface in a controlled fashion so as to design molecular materials with particular properties such as the Penrose tiling pattern shown below. This project is in collaboration with Dr Geoff Waterhouse and Dr David Ware



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Professor Ralph Cooney

MATERIALS SCIENCE

Principal Investigator of the FRST/TRST Materials Accelerator (2009-2013) and the FRST Hybrid Plastics (2008-2014) programmes. Both of these are materials research contracts with extensive NZ industry partnerships and funding.

The Materials Accelerator: This research programme focuses on the development of commercially valuable multi-materials products. It involves c.100 researchers from The University of Auckland and three other Universities (AUT, VUW, Massey University) and three Crown Research Institutes (Scion, IRL, GNS). The companies involved are generally in the following high-technology sectors: Appliances & Devices, Aeronautical & Transport, Construction and High temperature Technologies. The programme encompasses plastics, composites, metals, conducting polymers, etc.

The Hybrid Plastics programme: This involves the investigation and commercialization of combinations of commercial polymers and specialized conducting polymers with applications as anti-microbials in hearing aids, packaging, construction, medical applications, etc.

RESEARCH TOPICS

Research projects will be focused on a range of applied materials and interfaces including combinations of the following:

Conducting polymers
Polymers
Surfactants
Colloids
Electrode surfaces
Zeolites
Catalysts

The materials combinations and the associated interfaces will be investigated using a range of spectroscopic and physical techniques to clarify the role of molecular structure in determining the actual performance of commercially valuable products.

PROJECTS

The development of transformational hearing technologies (ear-buds and hearing aids) using new polymeric materials in partnership with innovative NZ companies.

The development of new polymeric anti-microbial agents for application in a range of commercial uses including medical, construction, food and appliance applications.

RECENT PUBLICATIONS

1.Preparation and characterisation of composites of polyethylene with polypyrrole-coated wollastonite. C.K. Ong, S. Ray, R.P. Cooney, N.R. Edmonds and A.J. Easteal. J. Appl. Polymer Sci. 110, 632-640 (2008)

2.Cation driven actuation for free standing PEDOT films non-aqueous electrolytes containing TBACF3SO3. R. Kiefer, G.A. Bowmaker, R.P. Cooney, P.A. Kilmartin and J. Travas-Sejdic. Electrochimica Acta 53, 2592-2599 (2008)

3.Effect of deposition current density on the linear actuation behaviour of PPy(CF3SO3) films. S.Y. Chu, H. Peng, P.A. Kilmartin, A. Bowmaker, R.P. Cooney and J. Travas-Sejdic. Current Applied Physics 8, 324-327 (2008)

4.Actuation of polypyrrole films in propylene carbonate electrolytes. R. Kiefer, P.A. Kilmartin, G.A. Bowmaker, R.P. Cooney and J. Travas-Sejdic. Sensors and Actuators B 125, 628-634 (2007)

5.Mixed-ion linear actuation behaviour of polypyrrole. R. Kiefer, S.Y. Chu, P.A. Kilmartin, G. Bowmaker, R. Cooney and J. Travas-Sejdic. Electrochimica Acta 52, 2386-2391 (2007)

Assoc Prof Brent Copp

NATURAL PRODUCTS / MEDICINAL CHEMISTRY

Natural products continue to be the dominant inspiration for the development of new pharmaceuticals, with recent analysis showing that 60% of anticancer and anti-infective new drug registrations are of natural origin. My research group is interested in the discovery of new natural products with potential applications against human diseases including inflammation, cancer and neglected diseases such as tuberculosis, leishmania and malaria. We not only target the isolation of biologically active natural products but we also undertake their synthesis or the synthesis of related compounds to allow exploration of structure-activity relationships.

CURRENT PROJECTS

NATURAL PRODUCTS – NOVEL BIOACTIVES

Our search for new biologically active natural products is focused on New Zealand marine organisms. This project involves working with a variety of marine organism species to isolate small amounts of their secondary metabolites (natural products). We make extensive use of MS and high-resolution NMR to solve the structures of these compounds – it's an undeniable thrill to solve the structure of a molecule that is 'new' to chemistry. Purified natural products are then screened in a wide range of biological assays to determine their full pharmaceutical drug lead potential.

EXPLOITING THE POTENTIAL OF NATURAL PRODUCTS

Our pure compound screening projects have identified a number of New Zealand marine organism-sourced natural products that exhibit

activity towards inflammation, cancer and neglected diseases. In order to exploit these findings, we are currently preparing libraries of molecules designed around these bioactive lead compounds. The available projects include the synthesis of beta-carboline and polyamine alkaloids that exhibit potent antimalarial activity and pyrones that are active towards the neglected disease leishmaniasis.

BIOMIMETIC SYNTHESIS (WITH DR. DAVID BARKER)

Our studies of New Zealand marine organisms have led to the characterisation of a novel family of tri- and tetra-cyclic pigments. Retrosynthetic analysis of the pigment structures suggests that the marine organism biosynthesises them from more simple precursor polyprenylated hydroquinones. In order to explore this possible mechanism, we plan to undertake the synthesis of the precursor hydroquinones and to develop biomimetic ('nature-like') methods to convert them to the pigment natural products.

NATURAL PRODUCTS AS BIOLOGICAL TOOLS

Whilst it is possible to isolate potently bioactive natural products, very few of these compounds will ever be of use as pharmaceuticals themselves due to undesirable pharmacokinetic or toxicity problems. Such natural products can still be of use to further understand biological processes, acting as probes or tools for biological chemistry studies. We have identified two families of marine sponge natural products, discorhabdin C and halenaquinone that exhibit potent biological activities by forming irreversible complexes with cellular enzymes or receptors. We are interested in determining which members of the cellular proteome are targeted by these natural products – such studies can often identify new targets for drug discovery or uncover new biochemical pathways in cells. We aim to prepare probes which are azide-tagged analogues of the natural products and to use these in classical proteomic 'pull-down' experiments to identify cellular targets.

BIOSYNTHESIS

Molluscs of the class Gastropoda, subclass Opistobranchia are unusual in that they lack protective shells and so have evolved alternative defence mechanisms for their survival. These include the use of bright (warning) colouration, nematocysts (stinging cells) and/or the use of repugnant chemicals. Opistobranchs can obtain their protective chemicals by either accumulation from ingested dietary prey (sponges, ascidians, alga), bio-transformation of ingested prey metabolites or by de novo biosynthesis. As part of our studies on the chemistry and biology of New Zealand Opistobranch molluscs, we have established that the local species Onchidella nigricans, when provoked, exudes an oil that contains a high concentration of the terpene lipid onchidal. We now want to establish whether O. nigricans is capable of the de novo biosynthesis of onchidal. Specific experiments proposed include (i) establishing beyond doubt the role of the isoprenoid pathway in the biogenesis of onchidal by studying how 1-13C-, 2-13C- and doubly-labelled (1,2-13C-) acetate is incorporated into the structure of the natural product and (ii) establishing which of the mevalonate or non-mevalonate pathways are active via the use of 1-13C glucose in incorporation studies. In all cases, molluscs will be acclimated in the laboratory, injected with an aqueous solution of the appropriate labelled precursor and left for a week. The use of quantitative 13C NMR analysis will determine sites of 13C-isotope incorporation into onchidal, allowing determination of the biogenetic pathway.

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Longeon, A.; Copp, B. R.; Roué, M.; Dubois, J.; Valentin, A.; Petek, S.; Debitus, C.; Bourguet-Kondracki, M.-L. New Bioactive Halenaquinone Derivatives from South Pacific Marine Sponges of the Genus Xestospongia. *Bioorganic & Medicinal Chemistry*, 2010, 18, 6006-6011.

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Appleton, D. R.; Chuen, C. S.; Berridge, M. V.; Webb, V. L.; Copp, B. R. Rossinones A and B, Biologically Active Meroterpenoids from the Antarctic Ascidian, *Aplidium* species. *Journal of Organic Chemistry*, 2009, 74, 9195-9198.

Dr Andrew Dingley

PROTEIN STRUCTURE AND DYNAMICS

The primary focus of the Dingley group is to understand protein function at the atomic level, with particular interest in three areas:

(i) The role of protein dynamics in the assembly of cytokine signalling, and

(ii) Surface-immobilization of antimicrobial proteins to prevent bacterial biofilm formation, and

(iii) How antimicrobial proteins interact and disrupt microbial membranes.

Experimental approaches range from molecular biology and protein production using both cell-based and cell-free synthesis to biophysical methods including high-resolution nuclear magnetic resonance (NMR) spectroscopy

CURRENT PROJECTS

CYTOKINE SIGNALLING

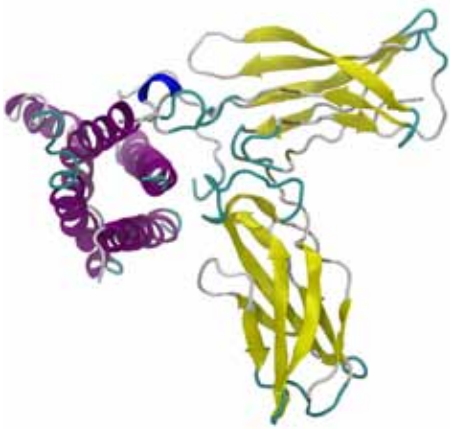
Cytokines play a central role in the regulation of various biological processes, including cell growth, survival, and defence against pathogens. Dysfunctional cytokine mediated signalling is linked to the pathology of several disease processes including rheumatoid arthritis, osteoporosis, multiple sclerosis, and various types of cancer. Many cytokines initiate intracellular signalling cascades through the formation of complexes with cell-surface receptors.

The formation of these protein assemblies at the membrane is guided by dynamic processes. NMR spectroscopy is an ideally suited technique to study protein dynamics because dynamics over a wide time-scale and at the atomic level can be probed. Using this technique, research focuses on understanding how dynamic changes in the cytokine interleukin-6 (IL-6) upon interaction with its cognate alpha-receptor (IL-6R) promote the IL-6-mediated cell signalling event.

ANTIMICROBIAL PROTEINS

Many bacteria have adapted rapidly to traditional antibiotics. As a result, there are a number of drug-resistant strains which pose as serious public health concerns. Antimicrobial proteins exist widely throughout nature and protect organisms from infection by destroying a broad range of pathogenic microbes (including multi-drug resistant bacterial strains) via disruption of the integrity of the microbial membrane. By understanding how these proteins function in molecular detail, potential new classes of antimicrobial compounds or preventive measures against biofilm formation may be discovered.

We have solved the three-dimensional structures of antimicrobial proteins from various organisms using solution-state NMR spectroscopy. The goal of this research programme is to extend these ongoing structural biology studies by:



A model showing the orientation of human IL-6 (purple) and the IL-6Ra (yellow) relative to each other. Both the D2 and D3 domains of the IL-6Ra are involved in the interaction with site I of IL-6.

(i) Investigating the mechanisms of interactions between antimicrobial proteins and membranes at the atomic level.

(ii) Develop protective coatings using antimicrobial proteins that prevent the formation of biofilms and are suitable for medical applications.

SELECTED PUBLICATIONS

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Xun, Y.; Tremouilhac, P.; Carraher, C.; Gelhaus, C.; Ozawa, K.; Otting, G.; Dixon, N. E.; Leippe, M.; Grötzinger, J.; Dingley, A. J.; Kralicek, A. V. (2009). Cell-free synthesis and combinatorial selective 15N-labeling of the cytotoxic protein *amoebapore A from Entamoeba histolytica. Protein Expr. Purif*. 68, 22—27.

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Associate Professor Allan Easteal

MATERIALS CHEMISTRY

Research projects are available in the areas listed below, but the list is not exclusive. Anyone considering research in this field is invited to discuss other topics that may be of particular interest to him/her. The research projects can be done for MSc. Funding may be available for a number of projects.

GELS AND NETWORKS

Mass transport processes in polyelectrolyte gels.
Injectable gels.
Environmentally responsive hydrogels.
Controlled-release systems.

BLENDS AND COMPOSITES

Functional bioactive conducting polymer composites.
Micofibril reinforced composites.

SUSTAINABLE POLYMERS

Utilisation of polymers from renewable resources.
Biopolymer-based packaging materials.
Biodegradable blends and composites.

ADHESIVES

High performance adhesives.
Natural rubber-modified emulsions.

COATINGS

Barrier coatings for paper.

SELECTED PUBLICATIONS

S Ray, RP Cooney, NR Edmonds and AJ Easteal, "Structure and properties of melt processed PVDF/PMMA/Polyaniline blends", Mat. Chem. Phys. 113, 829-838 (2009).

KL Leung, AJ Easteal and D Bhattacharyya, "In-situ formation of PEN microfibrils in polyethylene and polypropylene during extrusion", Composites A 39, 662-676 (2008).

Mr Neil Edmonds

POLYMERS AND COATINGS SCIENCE

Current Research

Formulation, characterization and performance measurements of thermoplastic and network polymers, composites, coatings, inks and adhesives.

- Biopolymers and biocomposites
- Conducting polymers and nanomaterials
- Development of antireflective coatings
- Geopolymers. Foamed concrete.
- Timber protection treatments to enhance environmental performance
- Development of novel binder systems for composite materials
- Specific research topics are listed below. Note that this list is not exhaustive and students are invited to discuss topics that are of particular interest but do not appear on the following list:

THERMOPLASTICS

Reactive processing of polymers. Compounding and alloys. Flame retardant additives. Novel packaging materials. Polymers from renewable resources. Biodegradation of polymers.

NETWORK POLYMERS, COATINGS, INKS AND ADHESIVES

The study of crosslinking reactions. Development of cross-linked water borne polymers for coatings, inks and adhesives. UV protection systems for coatings. Modification of coatings with nanomaterials. Self-healing coatings. Powder coatings. Antireflective coatings.

CONDUCTING POLYMERS

Responsive membranes. Novel colourants based on conducting polymers and nanoparticles..

COMPOSITES & NATURAL POLYMERS

Improvements to timber processes and products. Wood-fibre based composites. Fibre-matrix interface chemistry of composite materials. Enhancement of strength and stability of wood by chemical modification. Photoprotection of timber surfaces. Self-healing composites. Biopolymers: extraction, modification and characterization of natural resins and plant materials.

Dr Douglas Elliot

FORENSIC SCIENCE

The Forensic Science programme is closely linked with Environmental Science and Research Ltd (ESR) who supply the bulk of the NZ Police forensic services. Research work, depending on its exact nature, has therefore been carried out at ESR and at The University of Auckland with co-supervisors from both organisations. The majority of the students situated at the University have been supervised from the Department of Chemistry. However, when appropriate, supervision has been from other departments detection systems for semen, vaginal and buccal cells (with Ms Sue Vintiner, ESR) and different DNA analysis systems have been validated for forensic casework. The extraction of different quantities of DNA from difficult substrates, including fingerprints, has been studied (with Dr Elliot and Dr SallyAnn Harbison of ESR). The persistence of biological fluids with time, particularly in relation to new methods of DNA analysis, is an on-going field of study.

ILLICIT DRUGS

Research has been carried out on various aspects of cannabis; the possibility of sourcing it by rare earth analysis with ICPMS (with Dr Miskelly) and by DNA profiling (with Dr Harbison). The effects of storage and herbicide on THC levels have been studied (with Dr Anne Coxon, ESR). Dr Coxon has also investigated the breakdown pathways of heroin and its excipients and the uses of hash oil profiling in forensic science. Aspects of clandestine drug manufacture are being studied.

ENVIRONMENTAL FORENSIC SCIENCE

The development of fingerprinting reagent and the effects of blast-prevention chemicals is ongoing (with Dr Miskelly). Profiling of diesel and the persistence of clandestine laboratory by-products is also being studied (with Dr Miskelly).

Associate Professor Yacine Hemar

CURRENT PROJECTS

My research interests are related to the physical-chemical characterisation of food systems such as proteins and polysaccharides and their mixtures in solution, gel or emulsion states. Of specific interest the Structure-Function properties of biopolymer networks, and how these properties are affected by different stressors, such as shear, heat, pH etc... Some of the research activities are reported below:

MILK PROTEIN, POLYSACCHARIDES & MILK PROTEIN-POLYSACCHARIDE INTERACTIONS

The aim of this activity is to characterise the physico-chemical characterisation of proteins and polysaccharides and their mixtures, using a battery of analytical methods, including rheology and scattering techniques. The characterisation exercise is performed with the view of relating the microscopic properties to the macroscopic mechanical behaviour of these systems.

ENCAPSULATION, RELEASE, AND DIGESTION OF BIOACTIVES

We are currently investigating the use of different technologies for the encapsulation and the target release of food bioactives. The physical behaviour of the encapsulating system and the release kinetics of the bioactive during digestion are investigated in-vitro under simulated gastrointestinal conditions. This activity is part of a broader research area on the "rheo-physiology of structured foods".

NOVEL PROCESS TECHNOLOGIES

We are interested by the effect of Novel Process Technologies, such as High Hydrostatic Pressure, Pulsed Electric Field and Ultrasound on the physico-chemical properties of food systems. We are also currently developing methodologies to the real-time in-situ investigation of food-based systems when subjected to the stresses (electro-mechanical, pressure, cavitation effects etc...) resulting from the application of these Processes.

DEVELOPMENT OF LIGHT SCATTERING TECHNIQUES TO CHARACTERISE FOOD SYSTEMS

In the recent years we developed Diffusing Wave Spectroscopy (DWS) as a particle sizing method for concentrated dispersions. In addition, we have used DWS to measure the micro-rheological, high-frequency, behaviour of biopolymer systems, and to investigate the mechanical behaviour of fluids under shear. Currently we are extending this capability to Multiple Speckle Diffusing-Wave Spectroscopy (MSDWS), a CCD-Camera based technique, for the study of non-ergodic media.

SELECTED PUBLICATIONS

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Hemar, Y., Cheng, L. J., Oliver, C. M., Sanguansri, L., Augustin, M. A. (2010). Encapsulation of resveratroluUsing water-in-oil-in-water double emulsions . Food Biophysics, 5: 120-127.

Cucheval, A.S.B., Vincent, R. R., Hemar, Y., Otter, D.Williams, M.A.K. (2009). Multiple particle tracking investigations of acid milk gels using tracer particles with designed durface chemistries and comparison with diffusing wave spectroscopy studies. Langmuir, 25: 11827-11834.

Augustin, M.A., Hemar, Y. (2009). Nano- and micro-structured assemblies for encapsulation of food ingredients. Chemical Society Reviews, 38: 902-912.

Raudsepp, A., Callaghan, P., Hemar. Y. (2008). A study of the nonlinear rheology of complex fluids using diffusing wave spectroscopy. Journal of Rheology, 52:1113-1129.

Associate Professor Paul Kilmartin

ELECTROCHEMISTRY AND WINE SCIENCE

A research focus on organic electrochemistry extends into area of wine oxidation and nanostructured polymers. Research projects are offered in the following areas:

CURRENT RESEARCH

RED WINE MICRO-OXYGENATION

The use of micro-oxygenation of wines is being studied for its effects on the polyphenol content and sensory development of red wines. New methods for oxygen delivery involving dense polymer membranes and electrochemical micro-oxygenation at glassy carbon rods are being developed. The effects of micro-oxygenation upon reduced aromas in pinot noir wines is a further focus in conjunction with Pernod Ricard wines.

STABILITY OF SAUVIGNON BLANC AROMAS

The stability of sauvignon blanc aromas in relation to polyphenol oxidation is being examined, along with the effect of added antioxidants (glutathione, SO_2, ascorbic acid). In addition to model wine studies, a novel electrochemical technique is being applied to study the interaction of oxidised wine components with antioxidant and aroma compounds.

CONDUCTING POLYMERS AS ANTIOXIDANTS

This research is being undertaken in collaboration with members of The University of Auckland Polymer Electronics Research Centre (PERC). The ability of conducting polymers to act as antioxidants is being examined through the use of free radical scavenging tests applied in food science, and for their application as packaging materials.

CONDUCTING POLYMER CHEMICAL SENSING ELEMENTS

A further PERC project involves research into the use of conducting polymers as redox mediators for antioxidants in electrochemical sensors (e.g. for ascorbic acid and SO_2 in wines). The group at Auckland has recently developed nanostructured conducting polymers with excellent responses for ascorbic acid oxidation

SELECTED PUBLICATIONS

O. Makhotkina and P.A. Kilmartin, "Uncovering the influence of antioxidants on polyphenol oxidation in wines using an electrochemical method: cyclic voltammetry", Journal of Electroanalytical Chemistry 633 (2009) 165-174.

J. Sui, J. Travas-Sejdic, S.Y. Chu, K.C. Li and P.A. Kilmartin, "The actuation behaviour and stability of p-toluene sulfonate doped polypyrrole films formed at different deposition current densities", Journal of Applied Polymer Science 111 (2009) 876-882.

C.M. Lund, L. Nicolau, R.C. Gardner, P.A.Kilmartin, "Effect of polyphenols on the perception of key aroma compounds from Sauvignon blanc wine", Australian Journal of Grape and Wine Research 15 (2009) 18-26.

C.F. Hsu, J. Travas-Sejdic and P.A. Kilmartin, "Structural changes in polyaniline upon reaction with DPPH", Journal of Surface Science and Nanotechnology 7 (2009) 269-272.

Dr Duncan McGillivray

INTERFACE NEUTRON AND X-RAY SCATTERING FROM BIOLOGICAL SYSTEMS

My research involves looking at the surface structures of biological systems using surface sensitive methods, particularly neutron and X-ray scattering. The recent commissioning of the OPAL research nuclear reactor in Sydney, and the opening of the Australian Synchrotron X-ray source in Melbourne, provide world-class facilities within easy reach of Auckland. Through measurements performed at these facilities the behaviour of surfaces – and in particular biological membranes – can be studied in detail.

CURRENT RESEARCH

OXIDATIVE STRESS ON CELLULAR MEMBRANES

Cellular membranes act as both a support and a gateway for biological cells, and achieve their multiple purposes through their complex compositions including lipids, proteins and sugars. When these membranes are attacked by oxidative stresses (e.g., free radicals) their behaviour changes, and this has been linked to a number of diseases including heart disease, Alzheimer's and Parkinson's. By using a simpler model membrane the relationships between the membrane damage, cellular defences and disease pathologies can be investigated. This work is also related to a study on antioxidants in foods with Prof. Melton of Food Science.

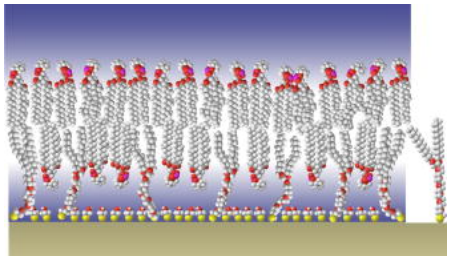
MEMBRANE-INCORPORATED MEMBRANE PROTEINS

Membrane proteins – those that function through interactions with cellular membranes – are some of the most significant functional proteins in biology, but are also some of the least well understood. The complex and highly asymmetric environment in which these proteins operate makes them challenging targets for study. Using the same model membrane system on a solid support, as above, functional membrane proteins can be incorporated and studied in situ. This approach has already been used in looking at the bacterial toxin α-hemolysin, and will be extended to other related membrane proteins (in collaboration with A/Prof. Mitra, SBS) and synthetic biological materials (with Prof. Middelberg, University of Queensland).

OTHER PROJECTS

Functional foods are those that provide a health benefit beyond simple nutrition – for example cholesterol-lowering margarines. Designing functional foods relies on an understanding of their physical properties and interactions with digestive systems, which can be determined in part from their structural characteristics. Study of emulsions on cholesterol-lowering food additives is underway with Dr Quek of Food Science.

The development of sensors for biological analytes, such as DNA, is an area of much research interest. In collaboration with A/Prof Travas-Sejdic and Prof. Williams the structural response of biosensor-type materials to analytes can be studied in response to environmental conditions.



Professor Laurence Melton

FOOD SCIENCE

Two major research interests are the interaction of food components and plant cell walls (dietary fibres).

How do different molecules interact and what are the consequences for food?

How do changes in plant cell walls alter the texture of fruit and vegetables on processing?

CURRENT PROJECTS

PROTEIN-POLYSACCHARIDE INTERACTIONS

There are four projects studying the interactions of the molecular level of an individual protein and a single polysaccharide. These projects are part of the Riddet Centre of Research Excellence in food science research programme.Techniques used include isothermal titration calorimetry,analytical ultra-centrifugation,surface plasmon resonance,MALDI-TOF-mass spectrometry following enzymatic degradation,X-ray crytallography, nuclear magnetic resonance(NMR),computer modelling.

INTERACTION OF FOOD COMPONENTS

The interaction of casein and liposomes containing various antioxidants is being studied in cojunction with scientists at the Plant and Food Research Institute. Antioxidant activity of the lipid- soluble material is measured and small angle neutron scattering is being done to understand how the molecules are arranged. Light scattering and rheology are also done.

PLANT CELL WALLS AND TEXTURE

The influence of plant cell wall on the texture of different apple varieties at different stages of fruit developement and ripening is being investigated.This is part of a Plant and Food Research Institute research programme.Three other student projects have been on vegetable cell wall, Solid-state NMR, electron microscopy, rheology, atomic force microscopy, sugar composition analysis are among the methods used.

SELECTED PUBLICATIONS

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ZHANG J, MELTON LD, ADAIM A and SKINNER MA. Cytoprotective effects of polyphenolics on H2O2-induced cell death in SH-SY5Y cells in relation to their antioxidant activities. *European Food Research and Technology* 228 123-131 (2008).

SUN-WATERHOUSE D, MELTON LD, O'CONNOR CJ, KILMARTIN PA and SMITH BG. Effect of apple cell walls and their extracts on the activity of dietary antioxidants. *Journal of Agricultural and Food Chemistry* 56 289-295 (2008).

Professor James Metson

MATERIALS SCIENCE

Research interests include the structure and chemistry of metal oxide and metal oxide surfaces, particularly those of magnesium, aluminium and titanium. Aluminium smelting

technology, especially impurity transport and gas emissions within and from reduction cells. Nitride and oxide semiconductor materials, especially ZnO, and sensors.

TIME-OF-FLIGHT SIMS OF OXIDE SURFACES

Light metals usage is increasing rapidly, however these highly reactive metals require coherent oxide film coverage for protection. This work will seek to use a new technique (TOF-SIMS) to examine the relationship between surface structure and secondary ions formed by desorption from these surfaces, after treatment with various labelling adsorbates. We have taken a leading role in elucidating unusual and very large fragments ejected from these surfaces and there is considerable theoretical interest in how such ions are formed.

NEW METHODS FOR THE DEPOSITION OF SEMICONDUCTING OXIDES

Polymer assisted deposition (PAD) and atomic layer deposition are potential methods for the deposition of very thin films of electronic oxides such as ZnO, TiO_2 etc. This project would seek to examine the introduction of dopants into such PAD films, deposited on porous oxide substrates. These high surface area materials provide a potential pathway to ultra-sensitive environmental sensors.

SEGREGATION EFFECTS IN NEW ALLOYS

These materials offer interesting substrates for metal based battery electrode and sensor applications. The challenge is to make and selectively etch such materials and then to examine the chemistry of their internal surfaces.

SELECTED PUBLICATIONS

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S. Verdier, J. B. Metson and H. M. Dunlop. Static SIMS studies of the oxides and hydroxides of aluminium. J. Mass Spectrom. 2007; 42: 11–19.

J.Lee, J. Metson, P.J.Evans, R.Kinsey and D. Bhattacharyya. Implanted ZnO Thin Films: Microstructure, Electrical and Electronic Properties. Applied Surface Science. 253, p.4317-4321 (2007).

J.B. Metson, B.J.Ruck, U.D.Lanke, F.Budde, H.J.Trodahl and A.Bittar. Characterisation of Amorphous GaN Films. Applied surface science 244, Issues 1-4, p. 264-268, (2005).

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Dr Gordon Miskelly

ANALYTICAL CHEMISTRY, FORENSIC SCIENCE

CURRENT RESEARCH

MODIFIED SEMICONDUCTOR SURFACES

This project looks at the effect of covalently attaching molecules to the surface of semiconductors. Research focuses on investigating the properties of both the attached molecules and the semiconductor surfaces. The ability to attach discrete molecular species to the surface allows us to alter the surface properties in a controlled fashion, and also allows us to engineer catalytic or sensor sites on the semiconductor surface. Currently we are examining these effects on porous silicon – a material obtained by the electrochemical oxidation of crystalline silicon, This material can be used as a sensor for analytes in the solution and gas phase.

FORENSIC CHEMISTRY

Projects in this area include developing new compounds for the detection of latent fingermarks and shoemarks, increasing the selectivity of tests for blood, improving the capabilities of forensic imaging, multi-element provenancing of produce and materials, and characterising the contamination remaining at the sites of former clandestine laboratories

SELECTED PUBLICATIONS

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Swedlund, PJ; Miskelly, GM; McQuillan, AJ Silicic acid adsorption and oligomerization at the ferrihydrite – water interface: interpretation of ATR-IR spectra based on a model surface structure, Langmuir, 2010. 26: 3394-3401.

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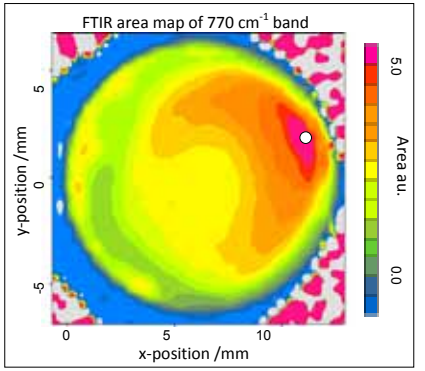
McDonald, D; Pope, H; Miskelly, GM Effect of chlorine and hydrogen chloride on latent fingermark evidence, Forensic Science International, 2008. 179: 70-77.



Dr Laura Nicolau

WINE SCIENCE

Wine is a very complex medium whose flavour is mainly due to volatile compounds. The origin of these compounds can be the grape variety, fermentations (alcoholic and malolactic fermentation) or the ageing of wine. The principal subject of my research is the characterisation of the important volatile components of New Zealand's wines, by gas chromatography and sensorial analysis. The aim is to understand the geographic, environmental, viticultural and winemaking factors that determine the aroma quality of New Zealand wines.

For this purpose we are using GC-MS, GC-FPD, GC-FID and GCO.

CURRENT PROJECTS

- Characterisation of New Zealand's Sauvignon Blanc aroma
- Determining the role of the yeast in the expression of the aromatic potential of Sauvignon Blanc wine
- Characterisation of New Zealand's Pinot Noir aroma
- Determining the influence of screw caps and cork closures on the oxidation and aromatic composition of red and white wines
- Determining the effect of micro-oxygenation on the aromatic composition of red wines

SELECTED PUBLICATIONS

2007. Fell, A.J.[4], Dykes, S.I.[4], Nicolau, L, Kilmartin, P.A.[1] The Electrochemical Micro-Oxidation of Red Wine. American Journal of Enology and Viticulture (2007) in press.

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2005. Brajkovich, M.[3], Tibbits, N.[3], Peron,G.[3], Lund, C.M.[3], Dykes, S.I.[1], Kilmartin, P.A.[1], and Nicolau, L. Effect of screwcap and cork closures on SO_2 levels and aromas in a Sauvignon blanc wine. Journal of Agricultural of Food and Chemistry, 53, 10006-10011.

2004. Pripis-Nicolau, L., De Revel, G. [3], Bertrand, A. [3], LONVAUD-FUNEL, A.[3]. Methionine Catabolism and Production of Volatile Sulfur Compounds by Œnococcus œni. Journal of Applied Microbiology, 96, (5), 1176 -1184.

Professor Conrad Perera

BSc (Cey); MSc (Mysore) PhD (Oregon St) FNZIFST

RESEARCH

Chemistry and technology of processing of food products, with special emphasis on functional foods. Transfer of technology to industry by way of national and international consultancies.

Minimal processing of fruit and vegetable products. Functional foods such as soy isoflavones and vitamin D and changes during processing. Development of novel methods of processing including energy efficient methods of drying.

CURRENT RESEARCH

DEHYDRATION

Edible coatings for dried fruit pieces

POSTHARVEST TECHNOLOGY

Study of the effect of 1-Methylcyclopropene on the quality of fresh-cut fruits and vegetables. Metabolic Stress Disinfestation and Disinfection as an alternative for Bromide in postharvest.

FOOD CHEMISTRY

Incorporation of functional ingredients into bread and their interactions during bread making Extraction and chemical modification of fish gelation

FUNCTIONAL FOODS

Effect of processing on soy isoflavones, and vitamin D2 from mushrooms and its bioavailability

SELECTED PUBLICATION

Perera*, C.O. and Owen, E. 2010. Processing of vanilla beans for maximum vanillin production. *Food & Biotechnology Processing* 3(1): 49-54

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Prabhakaran, M.P., Perera, C.O*. 2006. Effect of different coagulants on the isoflavone levels and physical properties of prepared firm tofu. Food Chemistry 99(3):492-499.

Tay S.L., Kasapis, S., Perera, C.O., Barlow, P.J. 2006. Functional and structural properties of 2s soy protein in relation to other molecular protein fractions J. Agric. Food Chem. 54(16): 6046-6053.

Hawlader, M.N.A., Perera, C.O., Tian Min. 2006. Comparison of the retention of 6-gingerol in drying of ginger under modified atmospher heat pump drying and other drying methods. Drying Technol 24(1):51-56

Dr Siew Young Quek

FOOD SCIENCE and FOOD PROCESSING

My primary research interests are in the areas of food science and processing with focus on fats and oils, fruits and seafood as listed below:

CURRENT RESEARCH

LIPID AND ANTIOXIDANT

Characterization of fat and oils from plant and marine sources, stability of fat and oils and their relations to antioxidant and processing methods; antioxidant in plant foods, emulsion properties and stability; roles of sterol and protein on the lipid bilayer of liposome; synthesis of omega 3 fatty acids.

FOOD PROCESSING

Soild-phase microextraction (SPME) and characterization of flavor compounds; quality of food during processing e.g. thermal treatment, high pressure processing and pulse electric field; post-harvest and minimally processing of fruit.

Extraction and separation of bioactives/ functional ingredients such as carotene, omega 3 fatty acids, vitamin E, phenolics and gelatine from food by-products (both seafood and plants); utilisation of food waste for water treatment; biodegradable food packaging/coating from whey protein.

MICROENCAPSULATION OF FUNCTIONAL INGREDIENTS

Microencapsulation of functional food ingredients e.g. phytosterols, omega-3 fatty acids, flavours, essential oils; interaction with food components and their release characteristics.

FUNCTIONAL FOOD PRODUCT DEVELOPMENT

Development of functional foods; sensory evaluation and shelf life of food products; interaction of ingredients and the relation to sensory and physical properties. .

SELECTED PUBLICATIONS

LARSEN, D., QUEK, S.Y.*, EYRES. L. Effect of heat treatment on the fatty acid profile and omega-3 fatty acid of New Zealand King Salmon (Oncorhynchus tshawytscha). Food Chemistry, 119: 785-790, 2010.

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Dr Jóhannes Reynisson

COMPUTER AIDED DRUG DESIGN

The concept of drug-like chemical space is of fundamental importance in drug development/discovery. The understanding of the properties of drug-like chemical space is still relatively weak. Marketed drugs – known drug space – are used as a metric to interrogate this phenomenon in conjunction with the development of improved molecular descriptors based on quantum mechanical methods for a better definition of this important region in chemical space.

CURRENT PROJECTS

- Design of a prediction module for the mutagenic potential of nitrenium ions
- Size estimation of drug-like chemical space based on marketed drug compounds
- Physiochemical properties of hERG K^+ ion channel binders in relation to cardiovascular function
- Number of natural products and their derivatives in known drug space

SELECTED PUBLICATIONS

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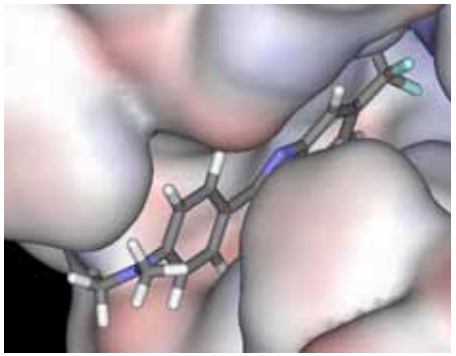
Reynisson J, Stiborová M, Martínek V, da Costa GG, Phillips DH, Artl VM. Mutagenic Potential of Nitrenium Ions of Nitrobenzanthrones: Correlation Between Theory and Experiment. Envi. Mol. Mut. 2008, 49, 659-667.

Reynisson J, Schuster, GB, Howerton, SB, Williams, LD, Barnett, RN, Cleveland, CL, Landman, U, Harrit N, Chaires, JB. The Intercalation of Trioxatriangulenium Ion ($TOTA^+$) in DNA: Binding, Electron Transfer, X-Ray Crystallography, and Electronic Structure. J. Am. Chem. Soc. 2003, 125, 2072-2083.



Professor Douglas Russell

LASERS IN CHEMISTRY: STRUCTURE AND REACTIVITY IN THE GAS PHASE

The invention and development of lasers has had a profound and far-reaching effect on chemistry. In our research, we exploit the unique characteristics of laser radiation in two interrelated areas: (a) mechanistic investigations of the pathways of pyrolysis of molecules in the gas phase using infrared laser homogeneous pyrolysis; (b) spectroscopic investigations of the structure and dynamics of small and short-lived molecules in the gas phase using tunable infrared diode laser spectroscopy. The Laser Laboratory houses an extensive range of instruments and apparatus in support of this work:

- High power (85 Watts) Electrox M80 continuous wave CO_2 IR laser
- Matrix isolation equipment for the study of IR and ESR spectra of short-lived species trapped at low temperatures
- High vacuum deposition chamber for the in-situ analysis of materials deposited during gas phase reactions
- Laser Photonics L5000 tunable diode laser IR spectrometer

We currently run a number of projects covering the research spectrum from the curiosity-driven "blue skies" end to the near-applied. These include:

- Mechanisms of pyrolysis of vapours of organometallic compounds used in industrial processes such as Chemical Vapour Deposition (CVD)
- Mechanisms of pyrolysis and reaction of small organic molecules, such as CFCs, hydrocarbons, carbenes and heterocycles
- Spectroscopy and kinetics of short-lived and other species produced in gas-phase pyrolysis systems
- Group theory and symmetry in high resolution spectroscopy

Much of the work involves collaboration with other scientists both in New Zealand and overseas.

SELECTED PUBLICATIONS

Russell DK. Lie-algebra contraction approach to problems of molecular symmetry: The double-potential-minimum problem. Phys. Rev. A. 2005, 71: 1-6.

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Dr David Salter

CHEMISTRY EDUCATION

Research interests are in the general area of learning and teaching chemistry. Research focuses on evaluating tasks that lead to more effective learning of chemical concepts.

Dr. Viji Sarojini

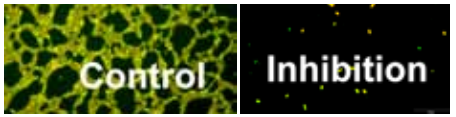
PEPTIDE CHEMISTRY WITH APPLICATIONS IN BIOLOGY AND MEDICINE, PLANT PATHOGEN INTERACTIONS

My research interests lie in the design, synthesis and structure-function analysis of novel peptide sequences with potential applications in biology, medicine and agriculture. Antimicrobial activity, biofilm and quorum sensing inhibition, DNA binding and biosensors are some of the applications currently being targeted.

CURRENT PROJECTS

INHIBITION OF INFECTIOUS BIOFILMS

Biofilms are matrix-embedded microorganisms that exhibit multiple drug resistance (MDR). We recently identified biologically active peptides that reduce biofilm formation in certain bacterial species. The ability to inhibit infectious biofilms has significant implications in the treatment of chronic infections such as those caused by *Pseudomonas aeruginosa* in cystic fibrosis (CF) patients. We are currently exploring the mechanism of action of these peptides to elucidate their Structure Activity Relationships and develop more potent analogs against CF infections.



QUORUM QUENCHING PEPTIDES

Microbial pathogens rely on cell to cell communication known as quorum sensing which is essential for their own survival as well as infection of the host. Quenching microbial quorum sensing is a promising disease control strategy. Our research in this area aims to develop antimicrobial peptides with quorum quenching ability.

BRANCHED PEPTIDE THERAPEUTICS

The use of Multiple Antigen Peptides (MAP; with

branched architecture) is one strategy that can be used to enhance the 'druggabiligy' of peptides. Branched peptides are not produced in nature, but can be synthesized in the laboratory. An ongoing project in this area takes advantage of orthogonal protecting groups and Native Chemical Ligation to synthesize a template assembled ion-channel protein based on the influenza viral protein for biosensor applications.

PLANT PATHOGEN INTERACTIONS

1) DNA BINDING PEPTIDES TARGETING THE FIRE BLIGHT PATHOGEN

Fire blight is a devastating bacterial disease of apple and pear trees caused by *Erwinia amylovora* with no efficient control measures so far. The development of novel fire blight control strategies is of particular interest to the New Zealand apple industry. We recently discovered anti fire blight activity in short peptides. We are now expanding our research in this area by targeting the Type III secretion system (virulence gene) of the pathogen. In this project I am interested in developing synthetic peptides with DNA binding ability that can be targeted to specific sites of the TTSS gene and inactivate it.

2) EXPLORING SURFACE FROST DAMAGE IN PLANTS

Our second project in Plant Pathogen Interactions is focused on chemical control measures for *Pseudomonas syringae* that infects a wide range of plant species including the kiwi fruit. We are particularly interested in inhibiting the'ice nucleating proteins' of *P.syringae* (known to cause surface frost damage) using analogs of naturally occurring anti freeze proteins.

PEPTIDE CHEMISTRY: NON-PROTEIN AMINO ACIDS IN SOLID PHASE PEPTIDE SYNTHESIS

Protease susceptibility and conformational flexibility are hurdles involved in the development of peptide based therapeutics. In our research we use side-chain as well as backbone modifications in synthetic peptides in order to overcome these hurdles. We are particularly interested in developing Solid Phase Peptide Synthesis methodology using non-protein amino acids which are known to enhance bioavailability and reduce conformational flexibility in peptides

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Dr Cather Simpson

BIOPHOTONICS AND ULTRAFAST PROCESSES IN THE PHOTON FACTORY

Several areas of research are currently of interest to our group. Studies of the femtosecond dynamics of large molecules in the condensed phase has both fundamental facets and more practical ones. One quite basic research goal is to understand and exploit the experimental manifestations of the coupling between nuclear and electronic motions on femtosecond timescales. These studies underpin a more applied biophotonics research thrust – the realization of nano-scale dragons as more effective light-driven anti-cancer agents. In our porphyrin-derived systems, the initial excitation energy is deposited in the ground state vibrational manifold by a sub-picosecond (10^{-12} s) internal conversion. From there, we control the molecular factors that direct the flow of this excess vibrational energy to focus it and kill target cells through highly localized temperature jumps.

A second project major explores the ultrafast photochemistry and photophysics of molecules that have –P=P– and –C=P– double bonds. Two objectives motivate this research: (1) to understand how the chemical intuition chemists have developed from thorough studies of the first long row of the periodic table – particularly C, N and O – extends to the rest of the main group, and (2) to help our synthetic collaborators tailor photoactive polymers to be more effective as photonic materials.

Through collaborative relationships with members of the Chemistry department, we have research projects that focus upon better harvesting solar energy and explore molecular systems as H_2 storage elements. We are developing spectroscopic methods to help A/Prof. Boyd's group optimize the ability of self-assembled molecular arrays to maintain a charge-separated state - to make more effective "molecular batteries" that can be re-charged by the sun. In another clean-energy project, lasers are used investigate the dynamical behaviour of molecules designed by A/Prof. Penny Brothers to provide the H_2-storage needed for practical implementation of fuel cells.

Our laboratory is the Photon Factory in the Dan Walls Centre for Pure and Applied Optics. It is equipped with the state-of-the-art pulsed lasers – from nanoseconds to femtoseconds – and the spectrometers, and detectors needed to make exciting new progress in these and other areas. The systems employ both fibre-based and free-space optics, and we have the only regeneratively amplified femtosecond pulses in New Zealand.

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Dr Bronwen Smith

FOOD SCIENCE

The microstructure of plant foods or any food is of special interest particularly the composition of plant cell walls since these comprise a large component of the food we eat and contribute to the texture and fibre component of the diet. The architecture of cell walls remains a challenge as does understanding the effects of its composition in terms of human health. Cell wall integrity is important during fruit ripening and in maintaining fruit and vegetable quality. Understanding the processes of cell wall control is therefore important in determining successful preservation and storage techniques. Food microstructure is also important in understanding the functionality of food components in human health and well-being.

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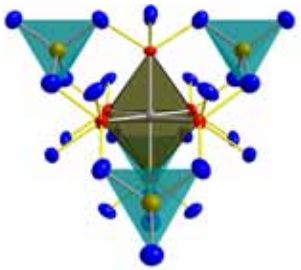
Dr Tilo Sōhnel

EXPERIMENTAL AND THEORETICAL SOLID STATE INORGANIC MATERIALS CHEMISTRY

The main focus of my research lies in the field of experimental and theoretical chemistry of solid state compounds and inorganic materials such as mixed main group metal / transition metal cluster compounds and complex transition metal oxides. This includes the preparation and characterisation of novel tin, antimony and lead cluster compounds with promising materials properties and the calculation of band structures of solid state compounds to investigate the crystal structure and the electronic structure. For the preparation of these compounds quite a number of different methods will be used, from classical high temperature sintering in evacuated quartz tubes for the synthesis of pure powder



materials, to the crystallisation from metal melt, or even gas phase reactions (chemical transport reactions) for the preparation of single crystals. For the identification of these compounds we use X-ray single crystal or powder diffraction, Mōssbauer spectroscopy, electron spin resonance, energy dispersive X-ray spectrometry (EDX), high resolution electron microscopy (HREM), transmission electron microscopy (TEM), measurements of temperature dependence of the magnetic susceptibility and the electrical resistance.

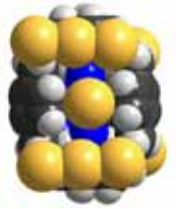
CURRENT RESEARCH

CRYSTAL AND ELECTRONIC STRUCTURES OF MAIN GROUP METAL CLUSTER COMPOUNDS

The search for novel inorganic compounds with interesting electrical and magnetic properties is one of the most exciting areas of current solid-state materials chemistry. For example, the discovery of new high-temperature superconductors has lead to immense activity in solid state chemistry and physics. In this context, the mixed main group metal - transition metal cluster compounds, which have not been studied extensively in the past, seem to be especially promising. This group of compounds form novel clusters with a wide variety of different combinations of metals and resulting architectures. The goal of this project is to discover new compounds by replacing the Sn-matrix of the known cluster compounds partially or completely by a Sb or Pb matrix, and to prepare new pure and mixed Sn / Sb and Pb cluster compounds. The aim is to succeed in the formation of original condensed cluster compounds with a higher coordination number than six as it has been found only in the case of the Bi-cluster compounds. Here coordination numbers are realised up to the number of 12. Furthermore, we expect to synthesize new Sb-compounds in the unusual +2 similarly to the +1 oxidation state for Sn. Mōssbauer spectroscopy is an excellent probe for the investigation of local phenomena such as oxidation states and the coordination sphere and has been proven as an extraordinary tool for the characterisation of Sn cluster compounds. Our research group is collaborating intensively with the Mōssbauer group at the Technical University in Munich, one of the world leading groups in this field.

CHEMICAL TRANSPORT OF TERNARY AND QUATERNARY CU-SB-OXIDES AND HALIDES WITH MIXED OXIDATION STATES AS POTENTIAL SUPERCONDUCTING MATERIALS

This project is in the field of solid-state materials and deals with the preparation and characterization of copper compounds with mixed



Cu oxidation states. We were able to isolate the first compound in this series of new structure types, a new ternary Cu/Sb/Si - oxide containing a mixture of five Cu^{2+} atoms in different coordination spheres in one compound. This is a unique and very promising compound and could potentially be used for partial oxidation and reduction of copper similar to Cu-containing high temperature superconductors. One of the most promising methods to produce such materials is by chemical transport, which is particularly useful for materials in reduced oxidation states. The goal is to prepare novel compounds with different compositions in order to study the influence of doping on electric and magnetic properties.

INFLUENCE OF RELATIVISTIC EFFECTS ON THE CRYSTAL STRUCTURE OF BINARY OXIDES AND HALIDES

Another research area is the investigation of the electronic properties of inorganic materials of transition group metals with unusual properties and structures. Relativistic effects have a significant influence on the properties of compounds containing heavy elements. They also have an enormous influence on the symmetry in the solid state. It was shown for the first time that group 11 halides exhibit large relativistic effects responsible for the formation of certain crystal structures. The chain like structures which are realized in gold(I)-halides, can be found in groups 11 and 12 oxides as well. To obtain a deeper insight into the electronic properties including the identification of the different oxidation states we like to carry out computer simulations of the electronic structure and chemical bonding in real space (ELF) using the solid-state density-functional programs.

DESIGNING OF POLYHALIDE NETWORKS WITH AZACRYPTANDS AS BACKBONES

The formation of polyiodides has been known since the beginning of the last century. Only very recently these compounds received interest because of their particular and diverse structural properties and their unusual electronic behaviour. Especially higher polyiodides are of extensive interest because of their electrical conductivity. For example when polymers are doped with iodide, charge transfer takes place and we obtain a conducting polymer.

We therefore want to investigate the formation of these polyiodides and especially polyiodide networks with azacryptands. In contrast to previous investigations which were concerned with complexes of neutral ligands in combination with metal ions, the remarkable and unique advantage of these azacryptand ligand systems is the possibility of acting as a large cation by either protonation or by selective formation of a positive charged metal complex with with up to three metal ions inside. In preliminary investigations we have demonstrated that these ligand systems are

very favourable for the formation of triiodides and resulting networks. These azacryptands will be used as templates for the controlled self-assembly of polyiodide networks.

We hope that we obtain a much wider variability in the size of the cationic species with a defined charge which will be achieved by the experimental conditions. It can be expected that with these ligand systems, one shoud be able to obtain defined information about the formation and stability of higher polyiodides and polyiodide networks, and the interactions between the polyanions and the cationic species.

SOME FURTHER PROJECTS

Of further interest are electric field gradients of heavy transition metals like Ru, Ir and Au, which are of particular interest for Mōssbauer investigations. Density functional theory calculations of the isomer shifts and electric field gradients of Ru, Ir, Sn, Sb and Au in solid state compounds will help to interpret the experimental results.

Calculations of main group and transition metal oxides and halides in the gas phase and the gas phase-solid state interactions are another point I am focusing on. That is, of course, an important factor in heterogeneous catalyses and in surface chemistry as well as in the simulation of chemical transport reactions.

This work involves a large number of national and international co-operations with research groups on the different topics in inorganic materials and theoretical chemistry.

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Dr Jonathan Sperry

SYNTHETIC ORGANIC CHEMISTRY/ MEDICINAL CHEMISTRY

Research in the group focuses on the studies of fundamental organic chemistry through the auspices of natural product synthesis. Research projects are focused towards the synthesis of natural products that possess an unprecedented molecular architecture and in doing so, discovering novel reactions en route. We also have a strong interest in biomimetic chemistry and medicinal chemistry, the latter focusing on anti-viral and anti-cancer chemotherapy in particular.

CURRENT RESEARCH
TOTAL SYNTHESIS OF THE ANTI-CANCER NATURAL PRODUCT ASPIDOPHYLLINE A

Cancer affects people of all ages and accounts for 13% of all human deaths worldwide. There is an obvious demand for new anti-cancer agents due to multiple drug resistance (MDR) which can quickly render current treatments useless. MDR is considered to be the major obstacle to successful cancer chemotherapy. Aspidophylline A is a structurally unique pentacyclic alkaloid that has been recently isolated from the Malayan Kopsia singapurensis. Importantly, aspidophylline was found to reverse resistance in drug-resistant KB cells, making it a promising lead compound for the treatment of cancers displaying MDR. The miniscule amounts available from the natural source means a chemical synthesis of aspidophylline A is essential for further biological evaluation. We have a vested interest in the total synthesis of aspidophylline A, with particular attention aimed at developing an efficient route to novel bridged furoindoline moiety.

TOTAL SYNTHESIS OF BISINDOLE ALKALOIDS

The indole nucleus is represented in a vast range of pharmaceuticals and is one of the most important structural subunits for the discovery of new drug candidates, placing it among the few heterocycles classified as a privileged scaffold. It is therefore unsurprising that a plethora of indole syntheses exist in the literature. Despite this, the synthesis of natural products possessing a bisindole skeleton are relatively sparse. Using a novel synthetic approach, we are aiming to complete the total synthesis of a variety of bisindole alkaloids including hyrtiosin B, montamine A and the dictazolines.

BIOMIMETIC SYNTHESIS

The 1917 synthesis of tropinone by Sir Robert Robinson saw the birth of biomimetic chemistry. In a single step, Robinson mixed three cheap, readily available compounds together in water to provide tropinone – the precursor to atropine, a scarce commodity during World War I. This pioneering synthesis demonstrated that complex molecular targets can be built up in few steps from simple starting materials. Biomimetic chemistry has since grown to become an integral part of organic chemistry, particularly in the field of chemical synthesis, addressing the inherent challenges of organic synthesis by drawing on inspiration gained from Nature's processes such as known (or proposed) biosynthetic steps. By using this knowledge, biomimetic chemistry can be used to construct highly complex, medicinally important natural products in significantly fewer steps than a more traditional, stepwise pathway. We are currently exploring the biomimetic synthesis of several complex alkaloids using a Nature inspired biomimetic approach.

STRUCTURE AIDED DESIGN OF BROAD RANGE INHIBITORS OF HRV 3C PROTEASE (In collaboration with Prof. M. A Brimble, Prof. J. Fraser and the Scripps Research Institute, USA)

Human rhinoviruses (HRVs) are the major cause of the common cold in the Western world and currently only symptomatic treatment is available to medicate rhinoviral infections. In addition to being attributed to the common cold, HRV infections are associated with acute and chronic bronchitis. It is estimated the total economic impact of cold-related work loss exceeds $20 billion annually in the United States alone and the quest to discover efficacious therapeutic agents of HRV infections continues to be of major pharmaceutical interest. The enzymatic activity of HRV 3C protease is required to produce mature viral proteins and functional viral enzymes essential for completion of viral replication. We have an ongoing interest in the design and synthesis of inhibitors of 3C-protease that are subsequently tested for bioactivity at the Faculty of Medical and Health Sciences at the University of Auckland. Particularly promising analogues will be sent to the Scripps Research Institute, USA for crystallisation studies with purified 3C-protease enzyme in order to gauge the exact site of binding to aid in our understanding of 3C-protease inhibition.

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Associate Professor Jadranka Travas-Sejdic

ADVANCED POLYMERIC MATERIALS

Current research interests are in the area of advanced polymer materials for biomedical applications (biosensors) and polymer electronics. In these areas macromolecular science overlaps with areas of nanotechnology and biotechnology and presents unprecedented opportunities for technological advancements and multidisciplinary research.

CURRENT RESEARCH

NANOSTRUCTURED CONDUCTING POLYMERS

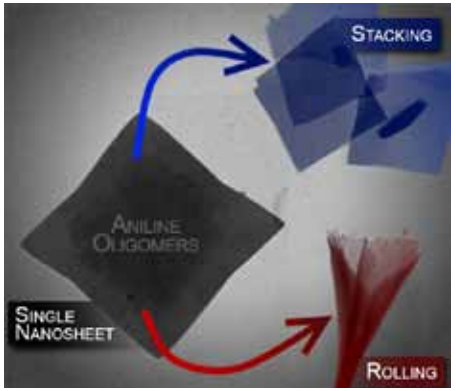
The aim of this project is development of novel self-assembled multifunctional conducting polymer nanostructures, such as nanotubes and nanospheres, for applications in ultra-sensitive nanosensors and nanoelectronics. Current focus is on fundamental studies on the relationship between incorporated functionalities, the morphology and opto-electrical properties of these nanostructures, to be followed by construction of biosensors based on the synthesised structures.

CONDUCTING POLYMER ACTUATORS

This programme aims to develop a new generation of conducting polymer-based micropump technologies designed to move micro-and nano-litre quantities of fluids with precision for use in implantable drug-delivery systems. Within this programme we are synthesizing and characterizing novel polymer materials for actuating elements of the micropump and collaborate with colleagues from other departments in order to integrate these materials into functional devices (within Polymer Electronics Research Centre).

BIOSENSORS

Conducting polymers, functionalized with oligonucleotides (ODN), on their own and in combination with nanocrystals (also called Quantum Dots), can act as simple sensors for gene fragments that allow the quantitative and



direct electrical detection of unlabeled fragments with high specificity, sensitivity and speed. These gene sensors are expected to have a number of advantages over conventional detection methods, including ease of miniaturization and the versatility of monomer/polymer functionalisation. We also investigate a range of photoluminescent polymers for biosensing applications.

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Dr David Ware

COORDINATION AND INORGANIC MEDICINAL CHEMISTRY

Research interests include the design and synthesis of metal complexes for use as pharmaceuticals, especially as anti-cancer agents, reactions of coordinated ligands, synthesis and reactivity of macrocyclic metal complexes and Co(III) and Cr(III) coordination chemistry.

CURRENT RESEARCH

METAL COMPLEXES AS POTENTIAL ANTI-CANCER DRUGS

Inorganic medicinal chemistry is a rapidly developing field, spurred largely by the tremendous success of the Pt-based anti-cancer drugs like Cisplatin. The unique coordination and redox properties of metal centres can be exploited in the rational design and synthesis of new metal-based anti-cancer drugs. Hypoxia and radiation activated anti-cancer drugs, in which the prodrug form is selectively activated either in the oxygen-deficient, chemically reducing environment of solid tumour cells, or during radiation therapy, are the particular targets in this project. The synthesis and chemistry of new complexes of cobalt and chromium, containing small bioactive organic molecules as ligands, will be explored. This project is in collaboration with staff at the Auckland Cancer Society Research Centre (ACSRC, Faculty of Health & Medical Science), and new complexes will be screened for anti-cancer activity in collaboration with the ACSRC.

New reactions of coordinated macrocyclic ligands

As part of the process of developing potential new drugs based on metal complexes, there is a parallel need to design and develop new ligands that will advantageously influence the properties of the complexes. This project involves the preparation of cobalt complexes containing macrocyclic and bicyclic amine and amide ligands. Reactions of these coordinated ligands which lead to new macrocyclic complexes with unusual ligand architectures and properties will be investigated. For example intramolecular alkylation, decarboxylation and condensation reactions have been successfully used to make novel ligands coordinated to cobalt(III) unobtainable through standard organic transformations.

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Professor David Williams

CURRENT AREAS OF RESEARCH

- Surface chemistry of oxides and semiconducting oxides as gas sensors
- New, low-cost instruments for air quality measurement
- New medical diagnostic tools
- Immunoassay theory
- Electrochemical sensors for gaseous and solution species
- Electrochemistry of modified liquid-liquid interfaces
- Imaging electrochemical reactions
- Corrosion science: stochastic models for localised corrosion work at Auckland currently focuses on gas sensors and instruments using semiconducting oxides, and their application in air quality measurement. This effort is in close collaboration with a local company : Aeroqual Ltd - http://www.aeroqual.com - and involves development of fabrication methods, surface science, theory, instrument development and characterisation. Work towards new medical diagnostic methods - on microfluidic tools, surface chemistry and detection methods - is in collaboration with the Polymer Electronics Research Centre, the MacDiarmid Institute, and Dublin City University (Biomedical Diagnostics Institute).

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Associate Professor James Wright

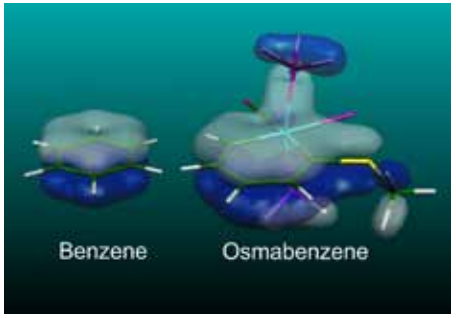
ORGANOMETALLICS, CATALYSIS, GREEN CHEMISTRY, MACROCYCLES, COORDINATION CHEMISTRY

Research interests lie in the general areas of organometallic chemistry, catalysis, inorganometallic chemistry, green and sustainability chemistry and coordination chemistry. A wide selection of projects is available for BSc(Hons), MSc and PhD students in these areas, and these will be discussed in full with interested students. All projects are designed to provide students with valuable experience in diverse areas of chemistry. Physical techniques frequently used include FTIR, multinuclear NMR, UV-vis and mass spectroscopy as well as X-ray crystallography.

CURRENT RESEARCH

ORGANOMETALLIC CHEMISTRY

Metallabenzenes are compounds in which one of the CH groups of benzene has been replaced by a transition metal. The first example of a metallabenzene, an osmabenzene, was synthesised at The University of Auckland. Our studies have provided valuable fundamental information about the aromatic character and reactivity patterns of these fascinating compounds and our current research is aimed at



synthesising and studying larger, fused ring analogues such as metallanaphthalenes, metallaanthracenes and metallaphenanthrenes. Although these compounds are interesting in their own right, information gained about them may also have relevance to new materials such as metal-substituted carbon nano-tubes. Other projects include: (i) The synthesis and study of mono- and di-metallated thiophenes and oligothiophenes. Important properties of these species, such as the nature of the electronic communication between the two metal centres in the di-metallated derivatives, and the conductivity of polymers that could be formed by condensing the di-metallated monomer units, will be investigated. (ii) selective functionalization of aryl groups that are sigma-bound to transition metals.

GREEN AND SUSTAINABILITY CHEMISTRY

(i) Catalytic oxidation chemistry. Studies involving the development and investigation of new, metal-containing catalysts for the hydrogen peroxide bleaching of wood pulp for paper production and the bleaching of highly coloured effluent streams from the pulp and paper industry has been underway in our labs for some time. Bleaching with hydrogen peroxide is particularly advantageous since it has a greatly reduced environmental impact compared to the chlorine based bleaching processes currently used. In an extension of this work, new hydrogen peroxide oxidation catalysts are now being developed and studied. These materials will be designed to catalyse the selective oxidation of low-value, commercially available substrates to give high-value products.

(ii) Metal catalysts for chiral syntheses. In another research project, new metal catalysts are being designed for the synthesis of chiral organic molecules through reactions such as asymmetric hydrogenation of prochiral alkenes, olefin metathesis reactions and other related processes. A key step in the design of these catalysts is the synthesis of suitable chiral ligands.

DESIGN AND SYNTHESIS OF NEW LIGAND SYSTEMS

Several projects come under this title. One involves the synthesis and study of new, multifunctional, acyclic or macrocyclic ligands that are capable of coordinating and holding in close proximity two or more metal atoms. Such species are of interest as potential enzyme models or catalysts, and for the study of host/guest chemistry. Other projects in this area involve the design and synthesis of new pyridine-based tripodal ligands. It has recently been shown that one of these systems has enabled the first example of a Cu(II)-C(sp^3) bond to be synthesised.

D. INORGANOMETALLIC CHEMISTRY: COMPOUNDS WITH TRANSITION METAL-Si, -B, AND -Sn BONDS

Transition metal complexes with bonds to these elements form an important class of compounds. Our research centres on the synthesis of derivatives that display new bonding modes and/or unique reactivity. We are particularly interested in compounds that have some multiple bond character between the main group element and the transition metal. Our studies include transformations that are of relevance to transition metal catalysed reactions of industrial importance, such as the metal catalysed hydrosilylation and hydroboration of alkenes, polysilane formation and hydrocarbon activation.

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A. F. Dalebrook, L. J. Wright, "Annulation of an Iridabenzene Through Formal Cycloaddition Reactions with Organonitriles," Organometallics, 2009, 28(18), 5536-5540.

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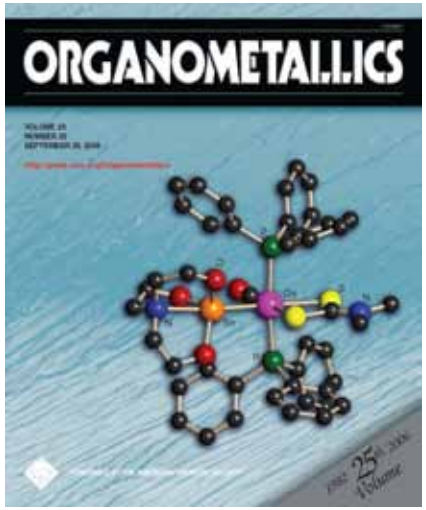


General information

Academic honesty, cheating and plagiarism

Cheating is viewed as a serious academic offence by The University of Auckland. The University will not tolerate cheating, or assisting others to cheat. Penalties are set by the Discipline Committee of the Senate and may include suspension or expulsion from the University.

What is cheating?

Cheating, in the context of University coursework and examinations, is the act of attempting to gain an unfair advantage by violating the principle that lies behind all University work – that of intellectual and scholarly integrity.

Work students submit for grading – in coursework and examinations – must ultimately be their own work, reflecting each student's learning and performance. To cheat is to be intellectually dishonest by passing off as your own, work that has been done by someone else. It is also unjust in that it devalues the grades and qualifications gained legitimately by other students.

All staff and students have a responsibility to prevent, discourage and report cheating.

Examples of forms of cheating

- Copying from another student during a test or examination, whether or not there is collusion between the students involved;
- Using the work of other scholars or students when preparing coursework and pretending it is your own by not acknowledging where it came from. This is called plagiarism. Course coordinators, lecturers or tutors are the appropriate people with whom you should discuss how to use and acknowledge the work of others appropriately;
- Making up or fabricating data in research assignments, or the writing up of laboratory reports;
- Impersonating someone else in a test or examination, or arranging such impersonation;
- Submitting the same, or a substantially similar, assignment that you have done, for assessment in more than one course;
- Misrepresenting disability, temporary illness/injury or exceptional circumstances beyond one's control, then claiming special conditions;
- Using Material obtained from commercial essay or assignment services, including web-based sources.

Group work

On the whole, the University requires assessment of the work of individual students. On those rare occasions where the work of a group of students is assessed, group members need to make sure that the workload is shared equally. Course coordinators will determine their own procedures for dealing with cases where the final piece of work reflects unequal participation and effort.

Student support

Typically students cheat because they are having difficulty managing workloads, feel that the course content is too difficult or experience difficulties with the language of the course. None of these reasons are justification for cheating. There are many people and services at the University to assist students. Options of people to approach include:

- the course convenor/coordinator, lecturer, tutorial head, lab demonstrator
- Head of Department
- faculty-level official
- Student Learning Centre or Library staff
- AUSA or other students' association representatives
- health and counselling services staff.

Students should also consult the University's major academic referencing resource: www.cite.auckland.ac.nz

The following website provides further information about the key principles and practices underlying academic honesty, and related resources: www.auckland.ac.nz/honesty

General information for students in the department

Assessment of courses in Chemistry

Courses in Chemistry normally include practical work, course work (usually tests and problems), and a final examination. The award of the final grade for each course is based on an assessment of the practical work, and the marks for the course work and final examination. Practical work is compulsory, and it is necessary to pass both the theory and the practical in order to pass these courses as a whole.

The component of assessed course work may consist of tests, written assignments, and problems. In all courses, course work is compulsory, whether assessed or not, as it is regarded as an essential part of your learning programme. Unassessed written assignments and problem papers may be crucial in assessing aegrotat cases or borderline cases in the final examination.

In all cases, if you are unable to complete the assessed course work for medical or other valid reasons you should inform the course coordinator. Any student unable to attend a test for medical or other valid reasons should inform the coordinator of the course. If you miss a test through illness or other similar circumstance, you must apply through examinations for a formal "consideration for a written test" with a medical certificate, indicating your impairment or inability to sit a test on that day. Remember that you need a medical certificate obtained, if possible, on the day of the test. If you miss a compulsory laboratory through illness or other similar circumstance, you should also provide the course coordinator with a medical certificate, indicating your impairment or inability to attend the laboratory on that day.

Learning resources

The sheer size of the University and the Department can be intimidating; this can make it difficult to know where to look when you require assistance and advice. The staff of the Department are remarkably approachable, and in addition to the usual teacher/student interaction in lectures, laboratories and tutorials, there are specific additional routes to obtain help.

Computer aided learning packages with programs relating to Stage I courses are available for self-tuition. No prior knowledge of computer operation is required to use these programs.

Provision has been made for tutorials for CHEM 110, CHEM 120, and CHEM 150, and many of the Stage 2 and 3 CHEM courses. Arrangements for these will be announced early in each course.

Student Learning Centre

This centre runs tutorials for students in many subjects. Details of chemistry tutorials for students with limited background in chemistry should be available from the centre.
Find out more on: **www.auckland.ac.nz/slc**.

Study groups

Experience has shown that students, especially those who particularly wish to improve their background in chemistry, achieve better results when working cooperatively in small groups. If you and some friends do form a study group, staff members will be pleased to meet with you to provide additional assistance if it is needed.

Health and safety rules and regulations

All people, including students, in the Chemistry Department are protected by the Health and Safety in Employment Act 1992 and related legislation. As well as giving you protection, the Act also gives you responsibilities.

To work safely with chemicals you need to be informed of the hazards you are likely to meet. For first-year students you will be informed of these hazards by the staff and by warnings in the laboratory manuals. Thus it is essential to read all of the experimental instructions before coming to the laboratory. For many of the advanced laboratories you are required to collect safety information from the available sources as part of your training as a chemist. Each laboratory has its own safety rules, with the Chemistry Department having the following general rules.

- Students are required to wear laboratory coats in all laboratories.
- Safety glasses or goggles are to be worn in all laboratories at all times. (Suitable safety glasses may be purchased from the from the Chemistry teaching laboratory). Standard prescription glasses are unacceptable.
- Suitable closed-in footwear must be worn in laboratories (no open toe sandals, bare feet or jandals).
- All students must behave in a responsible manner in laboratories.
- Chemicals may not be removed from the laboratories.
- No 'Personal Music Device' may be used in laboratories.
- All accidents and incidents must be reported to the person in charge. (This is a legal requirement.)
- The department's complete health and safety guidelines can be found on the departmental website. See www.che.auckland.ac.nz

Information for research and postgraduate students

Orientation

All new postgraduate students should collect an induction pack from Chemistry Reception (Level 5). This pack contains important forms and information for new students. Each year the department holds several functions designed to help new research workers and postgraduate students to get to know each other and the Chemistry Department.

Attendance at a half-day safety seminar is required for all new research workers and students. An orientation to the department will explain the structure of the Chemistry Department and useful people and resources. A seminar on research resources in the Library may be presented by one of the librarians. Later in the semester, a special "Seminar on Seminars" programme run by the Student Learning Centre may be organised for all research students in the department.

Seminars

In addition to the formal programme of lectures and research, as a research student you will be taking part in the daily life of the department. You are required to attend on a regular basis all seminars given in the section in which you work and you are welcome, and in fact encouraged, to attend any seminars from other sections. You will be required to contribute to your section's seminar series. Occasionally seminars are given by visiting speakers. It is important to take advantage of these as one of the exciting aspects of research in chemistry is meeting with other scientists. Our relative geographical isolation in New Zealand means that we must maximise our opportunities for discussion with visiting chemists.

Teaching opportunities

There may be opportunities for you to assist with laboratory teaching of undergraduates as either a limited term tutor or teaching assistant. Forms to apply to those positions are available from the department (Chemistry Reception). Closing date for applications are usually in January.

Chemistry Department services and facilities

Services:

- Glassblowers
- Electronics Workshop
- Chemistry Stores
- Mechanical Workshop

You should check with your supervisor before discussing a job with a service section. Orders to these services require a requisition form - signed by your supervisor.

Major departmental facilities:

- NMR spectrometers
- Raman/Far IR spectrometer
- X-ray diffractometer
- Thermal analysis
- GC-MS, LC-MS
- XPS-Auger(Engineering)
- Mass spectrometer (Mt Albert)
- Pulse/steady state radiolysis
- Thermal Analysis
- Microfabrication pulsed laser facilities

Users of these instruments require specialised training, and you must be checked out as an operator prior to use. Other facilities belong to a section or an individual staff member, and you must see the technician or staff member in charge before using.

Photocopying

Departmental photocopiers are available on the 5th floor. A swipe card is required for operation, please check with your supervisor regarding access. Note that staff and teaching jobs have priority on department copiers.

Computers

For computer access, please consult with your supervisor. Email access is permitted for research students, however, full Internet access must be authorised by a supervisor.

Research costs

Your supervisor will pay for all approved research-related costs. You do not have to pay for broken glassware, etc., although proper care is expected. PhD students are provided with PRESS accounts to support research and for conference travel. If you present a paper at a national or international conference, the department may be approached for a small contribution towards conference expenses. This usually applies to PhD students only.

Security

With your supervisor's permission, you may be issued with a swipe card for after-hours' access. It is very important that you do not let others into the building on your card. Unisafe officers can be reached 24 hours a day by calling 85000 on the internal phone line. Tell a staff member if you observe if you observe suspicious behaviour in or around the building. Be careful with personal belongings in the building, even in locked labs.

Common room

Postgraduate Chemistry students have access to both the common rooms located on the 5th and 6th Floor (Room 606) within the department. Tea, coffee, filtered water and a microwave oven are provided, but you need to bring your own mug, and take responsibility for cleaning up after yourself.

Mail

Pigeon holes for graduate students' mail are on the 5th floor, just past Reception, sorted by alphabetical order. Please check the pigeon holes regularly.

Telephones

Most research lab telephones are for internal calls only (they can receive but not make outside calls).

Entropy

Entropy is the weekly department newsletter. It contains information on the coming week's seminars, visitors, etc. Entropy is the weekly department newsletter circulated by email, containing information on the coming week's seminars, visitors, etc. Important information that is relevant to the whole deparmtent is included in the newsletter.

Staff Student Consultative Committee

The committee meets four times per year, and comprises staff and student representatives. You are encouraged to raise any issues with your representative or a staff member on the committee.

Advice and support for students

Improve your English language skills

All first-year students are required to undertake an assessment that enables us to identify your level of academic English. This free assessment is available via DELNA.

Diagnostic English Language Needs Assessment (DELNA)

DELNA is only available to students who have accepted a place and enrolled at The University of Auckland. It cannot be used to exclude you from a particular programme and the results do not appear on your academic record.

The screening is a 30 minute compulsory assessment that includes a vocabulary task and a text editing task. It enables us to quickly identify whether or not you need assistance with the demands of academic English. If you do require assistance, you will undertake the second part of the assessment.

You should book your screening assessment during Orientation Week or the first week of semester by going online to: www.delna.auckland.ac.nz/booking

The diagnosis is only necessary if your screening results suggest you need assistance with academic English language skills. This two-hour assessment includes a listening, reading and writing task. It enables us to recommend appropriate English language enrichment options.

If you do need to improve your skills, you will be invited to discuss your needs with the DELNA Language Adviser and guided to sources of effective English language enrichment within the University.

For more information visit
www.delna.auckland.ac.nz

English Language Self Access Centre (ELSAC)

ELSAC is the place where you can:

- Get advice about your particular English language needs for university study
- Use a huge variety of English language resources
- Come any time for as long as you like, Monday to Friday between 9am and 5pm. Visit the ELSAC space, real and virtual, and chat to Siew, Rebecca or Penny – we're all experienced English language teachers.

ELSAC services are free for as long as you are enrolled at The University of Auckland.

ELSAC

Level 1, Kate Edger Information Commons
Phone: +64 9 373 7599 ext 82134
Email: elsac@auckland.ac.nz
For more information visit
www.elsac.auckland.ac.nz

WAVE student support service

The W.A.V.E Department exists to provide a support network, a voice and services to improve the quality of student life at The University of Auckland. W.A.V.E is an acronym to describe the four major areas that the department works in: Student Welfare, Student Advocacy, Student Voice and Student Education.

If a student is unhappy about something at the University or needs help sorting out a problem, the dedicated W.A.V.E. team is there to help.

Welfare

Hardship Grants

If a student need help with food, accommodation, travel or medical costs they can apply for an AUSA Hardship Financial Assistance Grant. The Welfare Officer also provides emergency food parcels for students in need.

Contact: welfare@ausa.or.nz

Parents Space

There is a dedicated kitchen and study area for students to use, with or without your children, at AUSA House on 4 Alfred Street. The resources that are available include; port-a-cot, high chair, change table, TV/Stereo, computer & printer, children's toys & books, kitchen facilities, study spaces and lounge chairs.

Contact: spro@ausa.org.nz

Advocacy

The Student Advocacy team have the skills and dedication to ensure that students are treated fairly and with respect while you study at The University of Auckland. The Student Advocates offer prompt, confidential and quality support to any student who has an academic grievance or any other concern about the University services. We also provide general legal advice on issues within the wider community, such as tenancy and employment.

Contact: wave.manager@ausa.org.nz

Voice

Voice is another term for Student Representation. Student representation exists at all levels throughout the University and is coordinated through the W.A.V.E department. This ensures that students are represented at every level possible at the University. A Class Rep is a student who volunteers at the start of each semester to represent the interests of the students in their courses to the lecturers.

Contact: classreps@ausa.org.nz

Education

The Education Vice Presidents role is to bring your concerns about education matters to the wider community.

Contact: evp@ausa.org.nz

Other WAVE Services

Tâmaki Student Association

The TSA office is based at the Tâmaki Campus and is open from Monday – Friday between 10am-2pm. The services offered include a dedicated Parents Space for students, sports equipment, free lockers, lost property, emergency food parcels, AUSA Hardship Grant applications, Class Party applications, photocopying and free phone for local calls.

Contact: tsa.admin@ausa.org.nz

Epsom Tai Tokerau Student Association

The ETTSA office is located at the Epsom Campus to support students studying there. Students can organise the catering for a class party, loan sport equipment, buy a locker to store books, apply for a hardship grants, and be issued with an access card for the fitness centre and pool, and obtain stickers for MAXX bus discounts from the Office Administrator.

Contact: ettsa.admin@ausa.org.nz

Location:
Auckland University Students' Association,
2nd floor Kate Edgar Building.

Text or phone: 021 272 7026 or
309 0789 ext 202.

www.ausa.org.nz

Information Commons

Designed as information hubs, the Information Commons give you computer access and learning support, as well as proving group and individual study areas. You'll find these facilities at our City, Grafton and Epsom campuses.

Use one of the Information Commons computers or laptops to access your coursework through Cecil (the University's e-learning system), send email and browse the Internet, and to complete coursework using MS Office, Adobe Master Collectionand other software. You can retrieve information from the library databases, e-journals, e-books and electronic course materials - including recommended readings. You also have access to printers, scanners and photocopiers. Wireless networking technology is available.

At the Kate Edger Information Commons on the City Campus you will find computer training rooms, the Student Learning Centre, a Disabilities Resource room, the Library's Short Loan service and the English Language Self-Access Centre (ELSAC).

The IC Helpdesks provide walk-in, roaming, email and telephone support with all aspects of student computing resources and services. If you want to develop your IT and information literacy you can attend a training course, use electronic resources on the Library and Information Commons web sites or ask a staff member for help.

Information Commons
Phone: 373 7599 ext 82333
Email: ichelpdesk@auckland.ac.nz
www.information-commons.auckland.ac.nz

Student Learning Centre

The Student Learning Centre facilitates the development of effective academic learning and performance skills for all students enrolled at the University. Qualified tutors of the Centre provide learning instruction, advice and support through workshops, individual consultations, and online resources.

Skills areas covered include:

- Learning skills, eg, reading, note-taking, learning styles
- Writing skills, eg, question analysis, planning and structuring, summarizing and paraphrasing, referencing, editing.

  - Thinking Skills, eg, critical thinking, constructing arguments

  - Test and exam skills, eg, multi-choice and short answer questions, exam essays, exam sitting strategies
- Self-management skills, eg, time/workload management, motivation, academic assertiveness
- Computer skills, eg, MS Word/Excel/ PowerPoint; SPSS; EndNote
- Mathematics and Statistics support for specific credit courses
- Support for students with English as an Additional Language (EAL), eg, sentence structure, paragraph writing, academic style

The Centre caters for the academic needs of Māori students through its Te Puni Wananga programme, and for the needs of Pacific students through the Fale Pasifika programme. In addition, the SLC has specialist tutors who can provide assessment, instruction, and support for students with specific learning disabilities.

It is necessary to register with the SLC to utilise its services; this costs $10 for the calendar year.

Sci-Space

Sci-Space is a friendly, casual drop in centre for students where you will find the Student Resource Centre, Mathematics and Statistics tutorial assistance and a spacious, informal area where you can study or catch up with friends to chat or have a snack.

The Student Resource Centre distributes and sells course books.

Located behind the Student Resource Centre, you will find the Tutorial Assistance Area, a teaching and learning environment for mathematics and statistics students where tutors, identified by their coloured sashes, are available to assist with any difficulties you may have with assignments or understanding lectures. Tutors are usually available between 10.00am and 4.00pm on weekdays during term time. The space, furnished with round tables, is peer based, promotes student-initiated learning and fosters information sharing.

On the other side of the Student Resource Centre is a large, comfortable area equipped with tables, chairs and a microwave, providing a friendly environment in which to relax between lectures.

You will find Sci-Space in Room G16, Ground Floor Science Centre, Building 303.

Careers

Careers advice

A science degree from The University of Auckland will give you a foundation of knowledge and skills that can lead to a wide range of career opportunities. Our graduates begin their careers in research organisations, local government, central government, universities, commerce and industry, international and community organisations. You may begin your career in a science position, or in a position that is not directly science related but where your science knowledge and skills are of benefit.

University Careers Services can assist you with your career planning and job search throughout the course of your studies. Their website - www.auckland.ac.nz/careers - contains a wealth of invaluable career resources. University Careers Services provides assistance to science students through careers information and advice, job search and career research workshops in the Careers Service, plus seminars and a drop-in service at a variety of times and locations in the Science faculty.

For job vacancies, career events, information on internships and current graduate career opportunities, as well as information about employer presentations on campus, visit www.auckland.ac.nz/careerhub.

University Careers Services is located in The ClockTower, 22 Princes Street, and at Tāmaki Campus. For information about opening hours, please see www.auckland.ac.nz/careers.

Student support services

Service	Location	Phone
Accommodation and Conference Services	O'Rorke Hall, 16 Mount Street	+64 9 373 7599 accom@auckland.ac.nz www.auckland.ac.nz/accommodation
Careers Centre	Room 001, The ClockTower	+64 9 373 7599 ext 88727 careers@auckland.ac.nz www.auckland.ac.nz/careers
Early Childcare Services	28 Park Avenue, Grafton	+64 9 373 7599 ext 85894
Chaplain's Office	18 Princes Street	+64 9 373 7599 ext 87732 chapelsec@auckland.ac.nz
Disability Services	Room 036, The ClockTower (south wing)	+64 9 373 7599 ext 82936 disabilities@auckland.ac.nz
Mediator's Office		+64 9 373 7599 ext 88905 mediation@auckland.ac.nz www.auckland.ac.nz/mediation
Equity Office	Level 1, The ClockTower (East Wing)	+64 9 373 7599 ext 84923 www.eo.auckland.ac.nz
Student Finance	Room 108, The ClockTower	+64 9 373 7599 ext 84422
Health Services (including counselling)	Level 3, Student Commons	+ 64 9 373 7599 ext 87681
Dental Services	Level 3, Student Commons	+64 9 373 7599 ext 83860
International Students' Information Centre	Auckland International Old Choral Hall	+64 9 373 7513 int-questions@auckland.ac.nz www.auckland.ac.nz/international
Recreation Centre	Building 314, 17 Symonds Street	+64 9 373 7599 ext 84788 www.auckland.ac.nz/recreation
Scholarships Office	Room 012, The ClockTower	+64 9 373 7599 ext 87494 scholarships@auckland.ac.nz www.auckland.ac.nz/scholarships
Student Advocacy Network	AUSA House 3 Alfred Street	+64 9 309 0789 ext advocate@auckland.ac.nz www.auckland.ac.nz/wave
Student Information Centre	Room 112, The ClockTower	0800 61 62 63 +64 9 373 7599 ext 88199 studentinfo@auckland.ac.nz
Student Learning Centre	Level 3 Information Commons	+64 9 373 7599 ext 88850 slc@auckland.ac.nz www.slc.auckland.ac.nz
Student loans and allowances	StudyLink	0800 88 99 00 www.studylink.govt.nz
SciSpace	G16, Ground Floor, Building 303	+64 9 373 7599 ext 85510 www.science.auckland.ac.nz/scispace
Students' Association	AUSA, 4 Alfred Street	+64 9 309 0789 ausa@auckland.ac.nz www.ausa.auckland.ac.nz
University Book Shop (UBS)	Kate Edger Building	+64 9 306 2700 www.ubsbooks.co.nz

University Library
Te Tumu Herenga

The University Library consists of the General Library and 12 subject-specific libraries with over 2.2 million volumes, a world-class digital library collection, 4700 study spaces with 1100 of those providing access to computer.

General Library

Most science serials are now available electronically. The majority of the science book collection is shelved on Level M where you will also find printed serial collections for biology, marine science, chemistry, computer science, food science, geology, physics, mathematics and statistics. Geography, computer science and psychology serials are shelved with the book collection.

Tāmaki Library has resources in computer science, physics, psychology and sport and exercise science.

Leigh Marine Research Laboratory Library has marine science resources.

Courses, tours and training

Tours and hands-on courses will give you the confidence to use the University Library, its Information Commons service and all its resources. If you are a new student, the following courses are recommended:

- Library and Resources Overview: an introduction to the University Library resources and services.
- Database Searching: how to choose and use databases.
- Uni IT Essentials: covers University IT facilities, Netaccount and NetID, Cecil, Webmail, wireless and other electronic resources.

To book a Library course visit
www.library.auckland.ac.nz/booking

Services

Visit the subject librarians in Science Information Services on level M. Consultation sessions are available during visits made by the Subject Librarian to the Departments.

Other Library services include Ask a Librarian Service, Enquiry Desk, Information Commons Help Desk, Inter-Campus Library Delivery Service, Interlibrary Loan and Document Delivery and the Short Loan Collection.

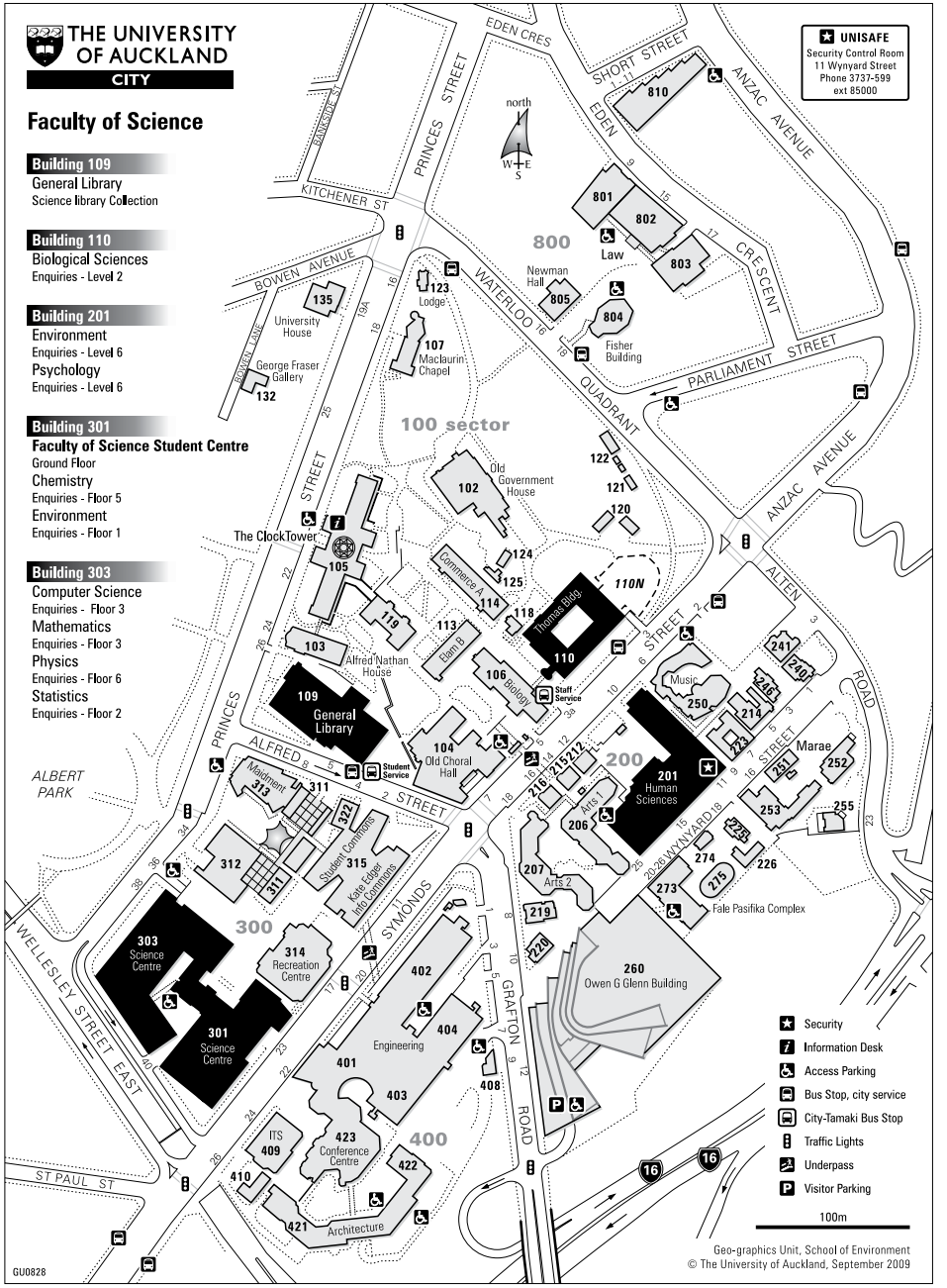
Subject Librarians

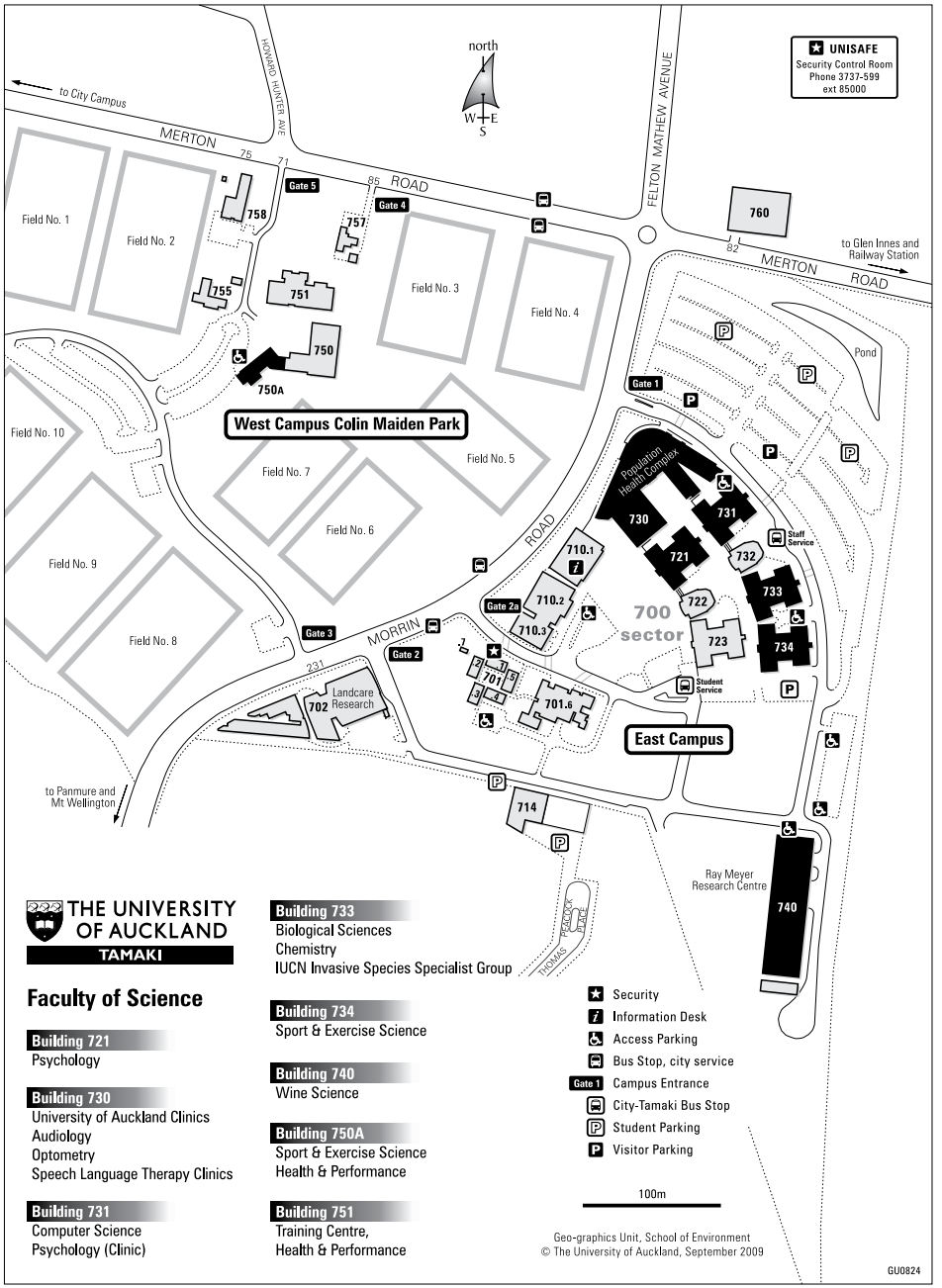
Visit the subject librarians in Science Information Services on Level M. Consultation sessions are available during visits made by the Subject Librarian to the Departments.

Borrowing and accessing resources

Your student ID card is your Library card. Use it to access the photocopiers, printers and to borrow items. You also have 24-hour access via the Library website.

General Library
5 Alfred Street, City Campus
Phone: 373 7599 ext 88044
www.library.auckland.ac.nz




north
to City Campus
MERTON ROAD
HOWARD HUNTER AVE
FELTON MATHEW AVENUE
UNISAFE
Security Control Room
Phone 3737-599
ext 85000
to Glen Innes and Railway Station
Field No. 1
Field No. 2
Field No. 3
Field No. 4
Field No. 5
Field No. 6
Field No. 7
Field No. 8
Field No. 9
Field No. 10
Gate 5
Gate 4
Gate 1
Gate 2
Gate 2a
Gate 3
758
757
755
751
750
750A
760
West Campus Colin Maiden Park
Pond
Population Health Complex
730
731
721
732
733
722
723
734
710.1
710.2
710.3
700 sector
Staff Service
Student Service
MORRIN ROAD
231
701
701.6
Landcare Research
702
East Campus
714
740
Ray Meyer Research Centre
THOMAS BLOCK PLACE
to Panmure and Mt Wellington
THE UNIVERSITY OF AUCKLAND
TAMAKI
Faculty of Science
Building 721
Psychology
Building 730
University of Auckland Clinics
Audiology
Optometry
Speech Language Therapy Clinics
Building 731
Computer Science
Psychology (Clinic)
Building 733
Biological Sciences
Chemistry
IUCN Invasive Species Specialist Group
Building 734
Sport & Exercise Science
Building 740
Wine Science
Building 750A
Sport & Exercise Science
Health & Performance
Building 751
Training Centre,
Health & Performance
Security
Information Desk
Access Parking
Bus Stop, city service
Gate 1 Campus Entrance
City-Tamaki Bus Stop
Student Parking
Visitor Parking
100m
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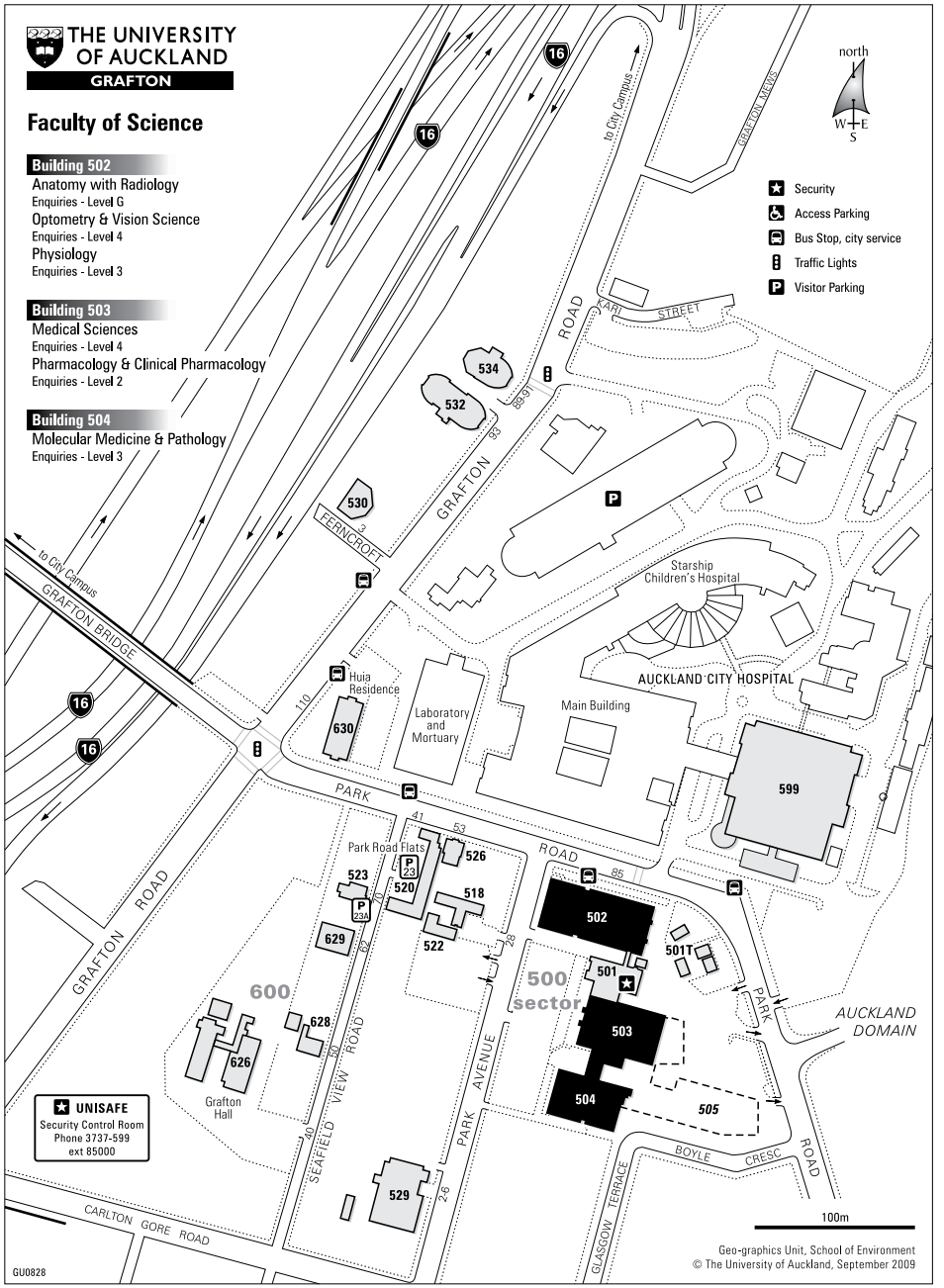
THE UNIVERSITY OF AUCKLAND
GRAFTON
Faculty of Science
Building 502
Anatomy with Radiology
Enquiries - Level G
Optometry & Vision Science
Enquiries - Level 4
Physiology
Enquiries - Level 3
Building 503
Medical Sciences
Enquiries - Level 4
Pharmacology & Clinical Pharmacology
Enquiries - Level 2
Building 504
Molecular Medicine & Pathology
Enquiries - Level 3
north
to City Campus
GRAFTON ROAD
GRAFTON BRIDGE
PARK ROAD
FERNCROFT
KARL STREET
GRAFTON MEWS
Security
Access Parking
Bus Stop, city service
Traffic Lights
Visitor Parking
534
532
530
Starship Children's Hospital
AUCKLAND CITY HOSPITAL
Huia Residence
630
Laboratory and Mortuary
Main Building
599
Park Road Flats
523
520
526
518
522
629
502
501T
501
503
504
505
500 sector
600
628
626
Grafton Hall
SEAFIELD VIEW ROAD
PARK AVENUE
AUCKLAND DOMAIN
529
CARLTON GORE ROAD
BOYLE CRESC
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Notes