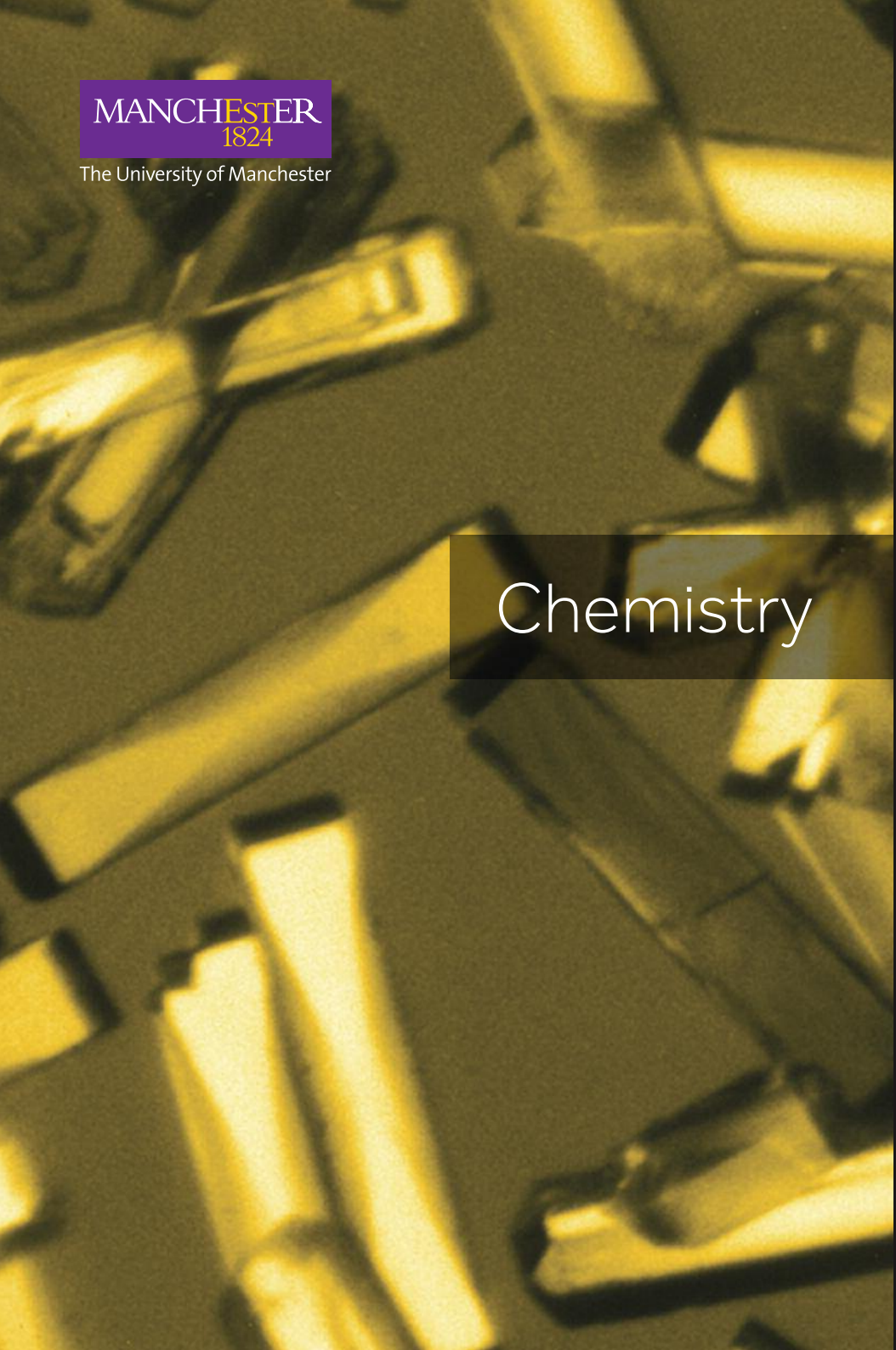


MANCHESTER 1824

The University of Manchester

Chemistry

UNDERGRADUATE BROCHURE 2014

www.manchester.ac.uk/chemistry

The facts

One of Britain's largest and most respected schools of Chemistry, with top ratings for both teaching and research

£35 million investment over the past five years to build dedicated, advanced facilities

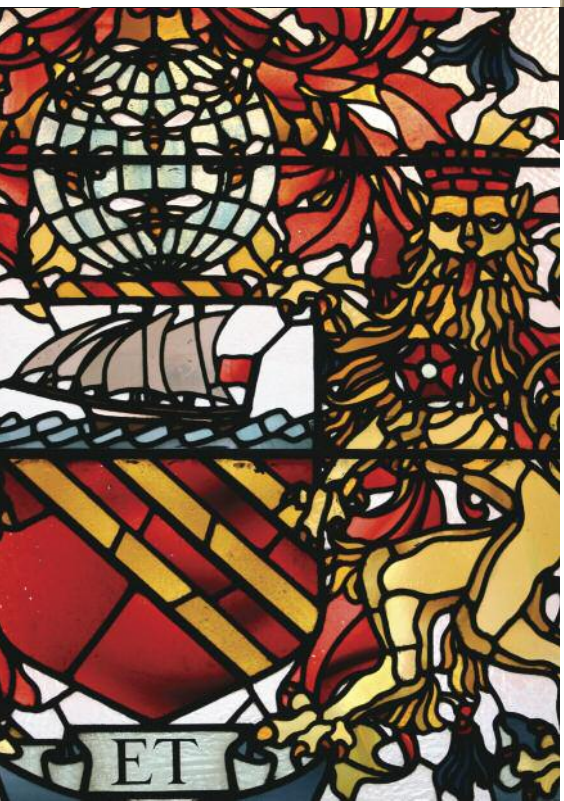
Satisfaction rating of 92% in the 2012 National Student Survey

Proud history since 1825, with seven chemistry Nobel prize winners

Rated in the top four in research power in the latest Research Assessment Exercise

> The School of Chemistry has excellent teaching staff and facilities, and is an outstanding research centre for my masters degree

Victoria Green
MChem Chemistry with Industrial Experience



Contents

Our University
Making things happen

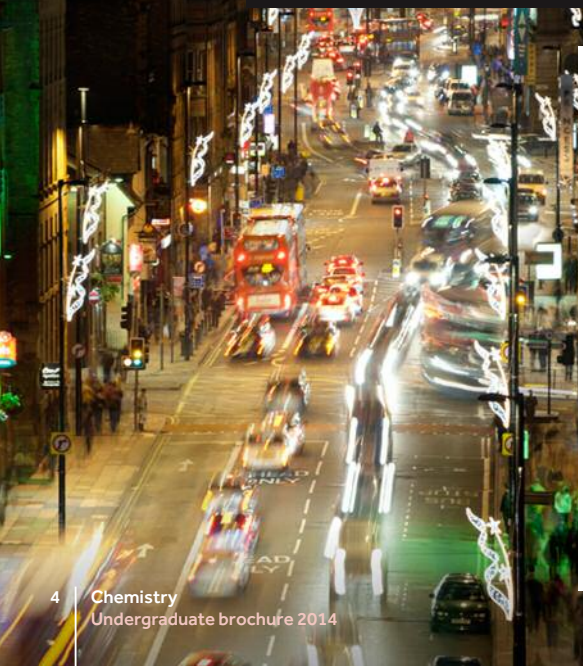
Influential, forward-thinking and down-to-earth, we'll give you an amazing university experience rooted in a rich academic heritage. We turn enthusiasm into achievement and groundbreaking theory into practice.

We accomplish feats of global significance, from splitting the atom to giving the world graphene – the two-dimensional wonder material that is one atom thick but 200 times stronger than steel. With more Nobel laureates on our staff than any other UK university, and strong links to industry and public services, we vitalise our undergraduate courses with pioneering research.

Join us at the heart of Britain's most popular student city.

Learn more about us:
www.manchester.ac.uk

Introducing Manchester



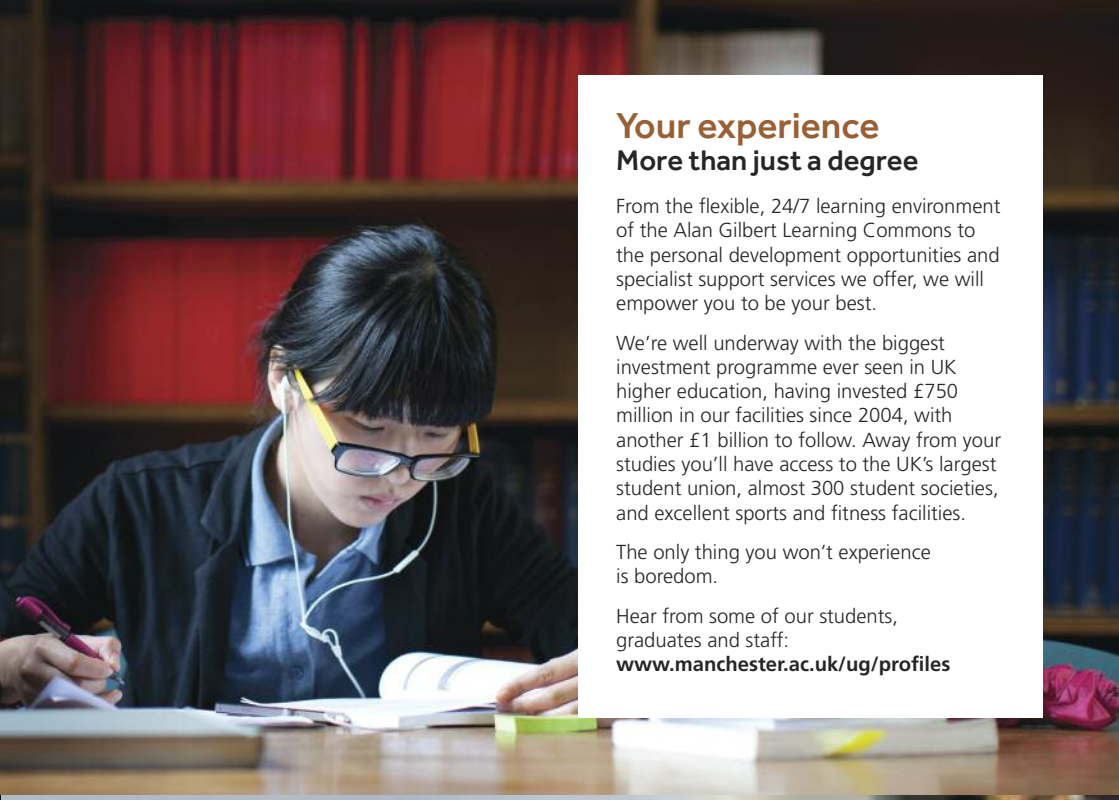
Our city
Always moving forward

Manchester lives on the edge of tomorrow, ever a step ahead in science, industry, media, sport and the arts. The Mancunian character, exemplified by the city's central role in the industrial revolution, strives for excellence in all walks of life.

This is a city of many accents, having become a cosmopolitan magnet for students and professionals eager to experience its can-do attitude, independent spirit and cultural wealth.

Never content to live on past glories, Manchester has a passion for progress.

Discover what makes Manchester unique:
www.manchester.ac.uk/cityofmanchester



Your experience
More than just a degree

From the flexible, 24/7 learning environment of the Alan Gilbert Learning Commons to the personal development opportunities and specialist support services we offer, we will empower you to be your best.

We're well underway with the biggest investment programme ever seen in UK higher education, having invested £750 million in our facilities since 2004, with another £1 billion to follow. Away from your studies you'll have access to the UK's largest student union, almost 300 student societies, and excellent sports and fitness facilities.

The only thing you won't experience is boredom.

Hear from some of our students, graduates and staff:
www.manchester.ac.uk/ug/profiles

Your career
On a course to success

We are one of the UK's most targeted universities by employers – 92% of our graduates go straight into employment or further study.

We design our courses with your employability in mind. Our problem-based approach to learning inspires you to think critically, creatively, and independently. You'll also be able to learn new skills through volunteering, personal development programmes and study abroad pathways.

We have the UK's best careers service, providing advice and mentoring services, and connecting you with employers who'll put you on a path to career success.

Take control of your career:
www.manchester.ac.uk/careers

Chemistry at Manchester

Study Chemistry at Manchester and you will meet, work with and be taught by internationally acclaimed chemists, in a facilities-rich building that was recently boosted by a £35 million refurbishment programme.

An extension dedicated to undergraduate teaching, costing £14.1 million, sits alongside our state-of-the- art research facilities. The laboratories are used for undergraduate teaching and projects, and also for outreach work, serving the community.

Manchester's Faculty of Engineering and Physical Sciences is one of the highest rated in the country, packed with top-flight Schools across the full range of disciplines. This means that if you would like to branch out from chemistry and take ancillary course units in other disciplines, you can be sure of the same high standard of education throughout your course.

Our University Library is one of the country's leading academic libraries, boasting an extensive collection of science books and periodicals both in print and online, and study facilities that are second-to-none. Opened in 2012, the Alan Gilbert Learning Commons is another exciting learning resource, open to students 24/7 and combining the latest IT facilities and personal and group study spaces to encourage you to take charge of your learning.

The expanding Manchester Science Park adjacent to the campus reflects the range and vitality of science in the University.

Why study Chemistry?

Chemistry can justly claim to be the foundation science of modern civilisation.

We could live a tolerable life without computers, television, fast transport, microwave cookers, or nuclear power ... but what about surgery or dentistry without anaesthetics, or medicine without drugs? It is chemists who design and synthesise the 'miracle' drugs that we now take for granted.

Modern chemistry takes you into all areas of modern science: from physics to biology, mathematics and materials science. Whether looking at fundamental reactions in living cells, the processes occurring in interstellar space, nanotechnology and quantum dots, or DNA and the human genome – chemistry is at the heart of it. Both practically (in the laboratory) and computationally, chemists probe the fundamental processes happening at a molecular level.

The ability of chemists to manipulate atoms and molecules into complex shapes gives chemistry an artistic aspect almost unique among the sciences. This is chemistry today: a cornerstone of modern science.

If you are looking for a varied and interesting career, a degree in chemistry is an excellent stepping-stone to a wide variety of opportunities.

Why Manchester?

- External links with industry and internal multidisciplinary links that inform and improve our undergraduate courses
- Internationally renowned research covering the full spectrum of chemical activity, ensuring taught courses based on the latest knowledge
- Wide portfolio of degrees, including options such as year-long industrial placements and study in a mainland European university (or equivalent establishment) or on a worldwide placement

Chemistry at Manchester

Welcome to our School

Chemistry is a broad and exciting science that underpins one of the largest industrial sectors in the UK. Our School of Chemistry at Manchester is continuing its long and illustrious contribution to the subject, and we are currently one of the largest and best in the UK, with more than 60 members of academic staff, about 700 undergraduate students, 250 postgraduates and 140 postdoctoral research staff. When you include support staff, there are well over 1,100 people involved in chemistry in the School.

Subdivision is the key to keeping our size manageable and our students happy. For discussions and problem solving, we have small-group teaching, and your personal tutor is there to check your progress and to provide sympathetic and practical support for any difficulties you may have.

We offer you great strengths in teaching and research, including: a comprehensive academic coverage; excellence in all the core sub-disciplines of chemistry; outstanding facilities; and a range of collaborations with life sciences, and with other physical and applied sciences.

We scored 92% in the 2012 National Student Survey (NSS), putting us in the top three Russell Group chemistry departments for student satisfaction. The last Research Assessment Exercise (2008) placed us in the top four for 'research power', with Oxford, Cambridge and Bristol, and the most recent Higher Education Statistics Agency figures for income show Cambridge, Oxford, and Manchester as the top three earners.

We also have an impressive international standing: the 2012 Academic Ranking of World Universities, compiled by Shanghai Jiao Tong University, places Manchester as the top UK university outside 'Oxbridge' and London. It's a similar picture to the 2012 Times Higher Education World Rankings, where Manchester is again the top English university outside Oxbridge and the capital.

Our staff are actively engaged in world-leading research within chemistry and across many interdisciplinary areas. For instance, some staff work in the Manchester Institute of Biotechnology, the Photon Science Institute and the Dalton Cumbria Facility.

"Chemistry at Manchester has a distinguished history of achievement; a tradition maintained today by our wide-ranging research activities and by our excellent teaching."

Professor Christopher Whitehead
Head of the School of Chemistry

We have extensive links with industry, and facilities include the Knowledge Centre for Materials Chemistry, the Centre for Nanoporous Materials, the Centre for Radiochemistry Research, the Organic Materials Innovation Centre, the Dalton Nuclear Institute and the National Service for EPR Spectroscopy.

We administer our teaching through three sections: Inorganic, Organic and Physical, each led by a senior professor. However, research is organised in themes that overlap traditional boundaries: analytical and physical methods, chemical biology, computation, materials chemistry, nuclear and radiochemistry, and synthesis, enabling us to address current challenges in energy and environment, life and health, new technologies, and sustainibility.

Our recently refurbished synthetic chemistry laboratories now rival the best on offer anywhere in the UK, while our School's three lecture theatres have also been refurbished to the latest standards. With these, plus state-of-the-art teaching laboratories, and two computer clusters dedicated to Chemistry students that house more than 100 PCs for e-learning and general use, it's little wonder that we scored 92% for satisfaction with learning resources in the 2012 National Student Survey.

We also have a thriving undergraduate Chemistry Society (ChemSoc), which organises interesting seminars and a full social programme.

Since starting in September, I can't think of a single thing I would want to change. Manchester is a brilliant place to study chemistry as well as other subjects. The city is really lively and vibrant and there literally is something to do for everyone. Everything I have studied I have found genuinely interesting and the lecturers are all brilliant, funny and inspiring! Tutorials are also a great way of learning and really great if you're struggling and need help with anything. I think the industrial experience course is a great way of both earning money and getting the crucial experience needed after your degree and for starting work.

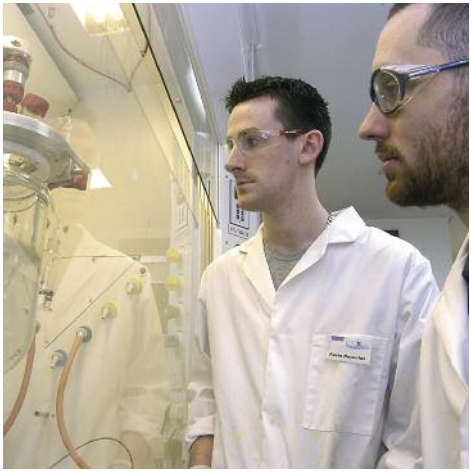
Alana Mcnulty, first-year student MChem (Hons) Chemistry with Industrial Experience

A history of innovation

Chemistry has a long and distinguished history in Manchester. John Dalton founded modern chemistry here in 1803 with his theory of atoms. Here, too, James Joule (yes, that unit is named after him) laid the foundations for the science of thermodynamics in the 1840s. The UK's first Professor of Organic Chemistry, Carl Schorlemmer, was appointed here in 1874.

Manchester has always been in the front line in chemistry, with seven chemistry Nobel Prize winners, including John Polanyi (1986) and Michael Smith (1993), both of whom studied for their BSc and PhD here. Add to this the many Royal Society of Chemistry medallists at present on the staff, and it forms an ongoing tradition of which we are justifiably proud.

Of course, Chemistry does not have all the 'firsts'; just to be fair, we should mention our sister discipline of Physics at Manchester, which has ten prize-winners. These include Lord Rutherford – who actually won the Nobel Prize for Chemistry, and who first split the atom at Manchester – and Professors Andre Geim and Konstantin Novoselov, who won the Prize for Physics in 2010 for the discovery of graphene – also an active area of research in our School of Chemistry.



Chemistry at Manchester

Library facilities

Our University Library is one of the best-resourced academic libraries in the UK, with more than 41,000 electronic journals and 500,000 electronic books. This includes many key chemistry journals, electronic collections of science and technology reference books, and specialist data collections. In the 2012 National Student Survey, our Chemistry undergraduates gave the library a 97% satisfaction rating.

As a fan of Manchester United, it was an automatic thing for me to put down The University of Manchester as one of my choices, even though I had never been to Manchester before. When I first came to the university on my visit day, the place blew me away, and I could straight away see myself spending the next four years of my life here. The teaching facilities and the laboratories are extensive, and the staff are always very friendly and helpful, even form the first day. On top of that, the lecturers are in the top class of their respective fields. With what the university has provided, there is nothing I could ask more for my experience and learning. The city of Manchester itself boasts so many different cultures and entertainment. I am from Indonesia, and I find Mancehster is a really friendly city for international students. With Rusholme and Chinatown within walking distance, the initial homesickness soon wore off.

Nadia Intan
third-year student
MChem (Hons) Chemistry with Industrial Experience

Visit days

Promising applicants will be invited to attend one of our visit days, which are held regularly between November and March. Starting with registration and a buffet lunch, these days give you the opportunity to see our School and campus at first hand, to ask questions, and to meet members of staff and current students. You will also have an informal 30-minute interview with a member of staff. The day is rounded off with a 40-minute 'flash bang' show. This will help us determine the most appropriate offer for you.

Your parents can also attend the visit day, and we arrange a separate programme for them.

International students

You will be sent an arrival guide prior to your journey to the UK. This provides comprehensive details about living and studying at Manchester and contains lots of practical information for use both before and after your arrival in Manchester.

Shortly before and during Welcome Week, the University offers you a free airport collection service from Manchester Airport to your accommodation. You will be greeted by the friendly faces of our International Advice Team (IAT) staff, who will help to ensure your arrival runs smoothly and without problems.

The University runs orientation activities throughout the year to help you make the most of the many facilities on offer. These sessions include both practical advice and social events. Orientation provides a friendly start to life at Manchester and forms a good foundation for your future studies.

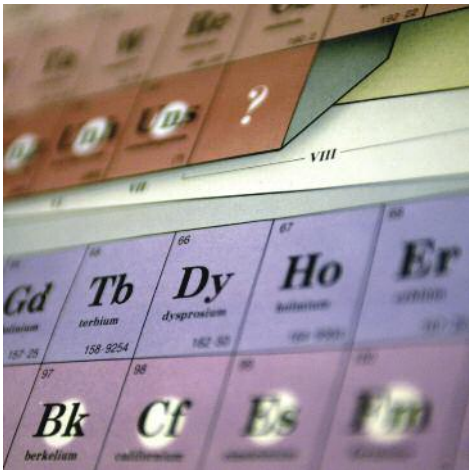
The IAT forms a part of the Student Services Centre and, following your enrolment, will be your central point of contact for administrative and support services, including immigration advice. This team can also help you with issues relating to work permits, finance and funding and academic or personal problems.

Funding

Entrance scholarship
We are offering entrance scholarships of £1,000 to applicants who achieve at least A*AA (or equivalent) from the A-levels making up our offer. The A* must be in Chemistry.

Industry-funded scholarships and bursaries
Our School offers some funding awards sponsored by industry. For example, for the past few years we have provided British Petroleum (BP) Scholarships for first and second-year students to the value of £2,000 each.

Find out more online:
www.manchester.ac.uk/undergraduate/studentfinance/home-eu-2013/university-scholarships-and-bursaries/subject-awards



International scholarships

International BSc and MChem students in the School of Chemistry who achieve a First Class performance in their first and second years will receive £3,000 at the start of Year 3. MChem students who obtain a First Class performance in Year 3 will receive another £3,000 in Year 4. These scholarships will be credited towards tuition fees in the relevant years.

International Excellence undergraduate scholarships

Our Faculty of Engineering and Physical Sciences offers up to ten scholarships of £2,000 per year for well-qualified international undergraduate students. These awards take the form of a scholarship against your tuition fees. All international students who are holding an offer of a place within the Faculty will be automatically considered for a scholarship.

Find out more online:
www.manchester.ac.uk/undergraduate/studentfinance/internationalstudentsstartingin2013/subject-specificawards/#eps

All other scholarships and bursaries

As one of the country's leading centres of research and learning, our University is committed to attracting and supporting the very best students. If you have the talent and ability, we want to make sure that you have the opportunity to study here regardless of your financial circumstances. More than one-third of our students will receive bursaries of up to £3,000 per year and many will be offered even more generous support.

www.manchester.ac.uk/undergraduate/studentfinance/home-eu-2013/university-scholarships-and-bursaries

Chemistry at Manchester

Your future career prospects

The final step in a successful undergraduate career is graduation, which takes place at a degree ceremony in the University's Whitworth Hall in July. However, your degree in chemistry is not an end, but a beginning.

It's a promising time to get a degree in chemistry. The British chemical industry, the sixth largest in the world, is the UK's number one export earner. It is the largest UK manufacturing sector, with a turnover exceeding £50 billion, employing around 200,000 people. Graduates in chemistry form the essential nucleus that will keep it at the forefront of industry. International career prospects are also excellent as the industry continues to grow.

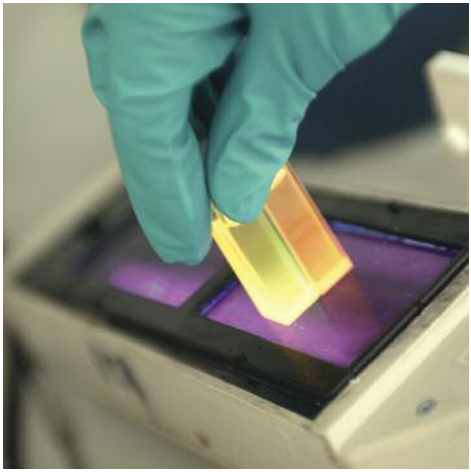
Because our chemistry graduates are skilled in scientific methodology and are numerate, versatile and creative, they also follow many alternative career paths. Around half of our graduates get a first job directly using their chemical knowledge; 25% go onto a further degree; and the remaining 25% opt for diverse careers in such areas as finance, management, computing and IT.

The University of Manchester currently tops the list of the annual poll of employers' preferred sources of graduates, outperforming all other UK universities. Our School works closely with the University's Careers Service to help you gain further skills to complement your degree, and to explore the job market.

If you are looking for a university with a world-class reputation for teaching and research, which is better respected by employers than any other, come and visit us to see that Manchester is the right choice for you.

"I absolutely enjoy the Chemistry course I am studying at Manchester. The course structure is so well suited to all students and the labs are very well equipped. The amount of support received through lecturers, tutors and PASS mentors is commendable. So far I am really liking my time here in Manchester."

Jaskirit Randhawa
first-year student
MChem (Hons) Chemistry with Industrial Experience



Postgraduate study

Those students who gain a First or Upper Second Class Honours degree can qualify for postgraduate studentships to pursue further study and research for the higher degrees of PhD and MPhil, whereas those who gain a Lower Second Class Honours degree are eligible for an MSc and MPhil course.

Professional accreditation

Whether you stay on at the University or not, our graduates are eligible for membership of The Royal Society of Chemistry (RSC) – the professional society for chemists in Britain.

At BSc level, bachelor accreditation gives you access to qualified membership of the RSC, and forms the basis for satisfying the academic requirements for achieving Chartered Chemist (CChem) through further study or continued professional development.

Graduation at the MChem level with First or Second Class Honours provides you with access to qualified membership of the RSC, and fully satisfies the academic requirements for award of Chartered Chemist (CChem) status.

Teaching and learning

The learning environment in secondary schools and colleges is very different to that in higher education; university teaching methods are often different from those adopted in schools. To make your transition as smooth as possible, our course gradually encourages you to take charge of your learning in your first year, so you can become a more independent, confident student.

Our first semester, running until Christmas, has a lighter lecturing load, allowing us to introduce you to methods of learning that might be new to you, such as computer-aided learning and group-working. In the four lectures you receive each week, you will begin to learn the trends observed in physical properties of elements that lead to quantum theory. From there, we will use the theory to derive models for bonding in simple compounds.

In two further time slots per week, we will use staff-supervised workshops and computer-aided learning material to cover topics where the underlying concepts are simple and where practice is the best learning method. You will have covered many of these topics at A-level, and our workshops will revise this material, bringing all students to the same level.

Topics will include:

- Organic and inorganic nomenclature
- Electron counting
- Recognising shapes and functional groups
- Drawing molecules
- Units

Two slots per week are dedicated to 'communicating chemistry', where skills such as data retrieval, report writing and making effective presentations will be strengthened in a chemical context. Much of this will involve group-working tasks, such as researching the literature in a current area of chemistry.

Chemistry is a physical science, so we will also build up your quantitative skills in mathematical manipulation and data analysis pertinent to chemistry. This makes use of extensive e-learning, online testing and drop-in clinics, allowing you to proceed at your own pace using our own computer cluster. Seven hours per week are dedicated to laboratory classes, where you will be taught the basic skills required for practical chemistry.

All first-year undergraduates are given a free introductory Chemistry textbook (Chemistry^3 by Burrows et al), a laboratory coat and a molecular model kit.

Chemistry at Manchester

Flexibility and choice

The course at Manchester follows a core structure for the first two years (and part of the third year for four-year courses), but also allows you considerable flexibility, especially in the third (and fourth) years, including a range of outside course units.

Your first semester includes a student-centred skills course unit covering basic mathematics, using printed and web-based material. The content is carefully targeted to the requirements of the core course and you may work through it at your own pace.

The course leaves room for a subsidiary subject selected from a range of subjects, such as Biochemistry, Earth Sciences, Materials, Mathematics, Physics, a European language, and the History of Science. You will also attend various skills course units, which teach a range of presentation, computer and information-retrieval, and report-writing skills.

We offer you the widest practicable choice of third-year course units. You will be required to take core Chemistry units, but will also have the opportunity to select from a range of other units normally available. These include advanced Inorganic, Organic and Physical Chemistry, as well as ones that cut across the traditional divisions, such as Nuclear Chemistry (fourth-year unit) and Environmental Chemistry.

As alternatives to the Chemistry course units, some units are available from other Schools, such as: History of Science, Technology and Medicine; and the Manchester Leadership Programme. Our 'Chemistry with' courses have specialist units provided by the partner School.

A common core

BSc/MChem Chemistry offers you the choice of either a three-year BSc (Hons) Chemistry course, or a four- year MChem (Hons) course. The first two years of both courses follow a common core structure, which allows you greater flexibility in the third and fourth years. In fact, the core course is common to all our courses to ensure that everyone has the same thorough grounding in basic chemistry.

In the first two years, you cover topics in all the major branches of chemistry and learn how they are interconnected. Laboratory classes in both years form an essential component of your training.

First-year topics include: Bonding in Molecules; Organic Reaction Mechanisms; Natural Product Chemistry; S, P, And D Block Chemistry; Thermodynamics; Kinetics; and Quantum Mechanics. You will also attend course units that cover a range of presentational skills, information-retrieval techniques and IT skills.

Finally, you have the opportunity to study a subsidiary subject from another School.

The second year continues developing the core and extends topics from your first year, introducing new areas such as molecular spectroscopy; bonding and reactivity; group theory and molecular symmetry; metal-ligand bonding; stereochemistry and heterocyclic chemistry; chromatography and separations; main-group chemistry; computational chemistry; and electrochemistry, plus additional option course units in Contemporary Themes in Chemistry (including materials, digital media and drug discovery), and Environmental and Green Chemistry. There is also an opportunity to take an optional course from outside chemistry, through the University College for Interdisciplinary Learning or the Manchester Leadership Programme.

Course details

Chemistry BSc 3yrs
UCAS Code F100

Chemistry with Medicinal Chemistry BSc 3yrs
UCAS Code F150

Chemistry MChem 4yrs
UCAS Code F109

Chemistry with Industrial Experience MChem 4yrs
UCAS Code F101

Chemistry with Medicinal Chemistry MChem 4yrs
UCAS Code F152

Chemistry with International Study MChem 4yrs
UCAS Code F104

Chemistry with Forensic and Analytical Chemistry MChem 4yrs
UCAS Code F1F4

Typical offer

A-level **AAA - ABB**
IB **36 - 34 points**

For full details of our entry requirements, visit: **www.chemistry.manchester.ac.uk/study/undergraduate/courses**

Honours Chemistry Courses

How you learn
We use a variety of teaching methods, providing you with a sound theoretical understanding of chemistry and a broad knowledge of chemical reactions through 10 to 12 hours of lectures per week.

Laboratory work develops your experimental skills and gives you fuller understanding of lecture material. In the first two years, you will work in the teaching laboratories for around 7 to 12 hours per week.

Finally, in addition to lectures and labs, you will have weekly tutorials rotating through the three main branches of chemistry.

Student support
While the size of our School is important for the enhanced facilities and opportunities it brings, we are also very aware of the need for the personal touch.

We take excellent care of our students and assign several tutors to oversee the process. As well as the Director of Undergraduate Studies in overall charge, all students have three academic tutors in Physical, Inorganic and Organic Chemistry. You will also have your own personal tutor to oversee your personal welfare; each member of staff has a small number of personal tutees per year.

We are also proud of our innovative PASS (Peer-Assisted Study Sessions) scheme. The PASS scheme has one voluntary session each week that provides additional support in the area of that week's tutorial. In the session, third and fourth-year students help first-years to tackle problems similar to those in the tutorial. The emphasis is on showing you how to think about the problems and develop problem-solving skills, and how to get the most from our educational resources.

I think that Manchester is a great place to study and have fun. The staff in the School of Chemistry are really helpful and approachable, which are important factors for student success. One thing I love about Manchester is that there is always something going on, so I'm never stuck in my room with nothing to do.

Andy Yang, third-year student
BSc (Hons) Chemistry

Facilities

To help you make the most of your time at the University, we have available for our students:

- Dedicated computer cluster, used as an integral part of teaching
- £14.1 million teaching laboratories
- Regular small-group teaching in tutorials
- State-of-the-art synthetic labs for project work
- Electronic online access to scientific journals for study and project work

Chemistry

BSc (Hons) Chemistry (F100)

MChem (Hons) Chemistry (F109)

Years 1 and 2
For information on the first two years, see 'A common core', page 11.

At the end of your second year, you can choose whether to study for a three-year BSc (Hons) Chemistry degree, or the four-year MChem (Hons) Chemistry course. Your eligibility for continuation on the MChem course is assessed at the end of each year and is at the discretion of the School of Chemistry. The assessment is based on your general performance and end-of-year mark. If you have not reached the minimum threshold required for MChem, then you will be transferred to the BSc (Hons) Chemistry course. However, most of our students are eligible to continue their training through the master's year.

Year 3: BSc Chemistry (final year)
You can choose from a wide range of course units made up of core, advanced Chemistry and subsidiary units. These include advanced course units in Inorganic Chemistry, Organic Chemistry and Physical Chemistry, as well as topics that cut across the traditional divisions (eg, Nuclear Chemistry, Environmental Chemistry and Forensic Analysis).

As alternatives to the Chemistry course units, some units are available from other courses/Schools, such as the History of Science, Technology and Medicine, and the Manchester Enterprise Centre. The 'Chemistry with' courses have specialist units provided by the partner School.

Practical work this year consists of four short projects covering synthetic chemistry, measurement, computational chemistry and literature analysis.

Year 3: MChem Chemistry
You study chemistry in greater depth and select a greater number of advanced Chemistry course units. You also undertake a group research project, which you will plan and design in collaboration with a member of academic staff.

Year 4: MChem Chemistry (final year)
You carry out an extended individual project associated with one of the research groups in our School of Chemistry. You will study course units related to the area of the project, take units from other areas of chemistry and attend specialist lectures chosen in consultation with your project supervisor.

"Now that I am in my final year, I can fully appreciate how this course has prepared me for a life after undergraduate study. Not only have the lecture courses given me a broad knowledge of the subject, sparking my interest to continue studying, but the lab work has let me work with new and exciting techniques. It's great to see many of my friends have already secured jobs or further study after graduation. Manchester itself is a vibrant city and there's always something to do. I can't wait to continue my life here with a PhD in September."

Melissa Keogh, fourth-year student MChem (Hons) Chemistry

BSc (Hons) Chemistry with Medical Chemistry F150)

MChem (Hons) Chemistry with Meidcal Chemistry (F152)

Medicinal chemists contribute to finding out what happens to drugs in the body and modifying drugs to make them more effective. Natural extracts have been employed as medicines over several millennia (herbal remedies dating back to over 3000 BC have been recorded in China).

In modern times, we are increasingly able to understand the causes of diseases at the molecular level. Modern medicinal chemistry is central to the discovery and development of new drugs. Drug discovery is one of the main contributors to the dramatic impact on health and wellbeing seen particularly in the developed world over relatively few generations.

Of course, there is still much to do. In the developed world, diseases of ageing are becoming key targets for study, along with other viral diseases, such as hepatitis C. In the developing world, malaria and HIV-1 remain all too prevalent. Perhaps more than in any other area, medicinal chemists are able to make a significant impact on the lives of the wider community.

Our Medicinal Chemistry course is delivered by lecturers from our School of Chemistry, the School of Pharmacy and Pharmaceutical Sciences, the Paterson Institute for Cancer Research, AstraZeneca and the NHS.

Year 1
You attend core chemistry lectures and course units on biochemistry and medicinal chemistry.

Year 2
You continue to develop the core chemistry; in addition, you take course units on the fundamentals of drug discovery and the 'big killer' diseases.

Year 3: BSc Chemistry with Medicinal Chemistry (final year)
Alongside core chemistry units, you take advanced Chemistry course units in various aspects of medicinal chemistry and bio-organic chemistry, and units on advanced drug discovery and synthesis for drug discovery and development. Practical work in the third-year consists of four short projects covering synthetic chemistry, measurement, computational chemistry and literature analysis.

Year 3: MChem Chemistry with Medicinal Chemistry
Alongside core Chemistry units, you will take advanced course units in various aspects of medicinal chemistry and bio-organic chemistry and units on advanced drug discovery and synthesis for drug discovery and development. Practical work in the third year consists of a group research project, which you will plan and design in collaboration with a member of academic staff.

Year 4: MChem Chemistry with Medicinal Chemistry (final year)
You carry out an extended project in Organic/Biological/Medicinal Chemistry (within the School/Manchester Interdisciplinary Biocentre, in the labs of the research group supervising the project).

You study course units from various areas of chemistry, biological chemistry and medicinal chemistry, including optional course units from the School of Pharmacy and Pharmaceutical Sciences, and may attend specialist lectures chosen in consultation with your project supervisor.

Chemistry

MChem (Hons) Chemistry with Industrial Experience (F101)

Students on this course spend a 'sandwich' year in industry after their first two years of academic work. Sandwich students find significant advantages in the job market, where employers value their skills, experience and initiative. At least 60 companies, including most of the major chemical companies in the UK, employ our sandwich students. The work is for 12 months and is paid generously.

We have recently placed students with some of the largest firms in the country, including:	
3M Healthcare	Baker Petrolite
Amec	Brunner Mond
AstraZeneca	Bristol-Myers Squibb
Cadbury	Johnson Matthey
Chemtura	Kellogg's
Cognis	L'Oreal
Croda Chemicals	Lubrizol
Domino	Nalco
Eli Lilly	Novartis
Fuji Film	Pfizer
GlaxoSmithKline	Pilkington
Imerys	Reckitt Benckiser
Ineos	Sanofi Aventis
Infineum	Sun Chemical
Innovia Films	Syngenta
Intertek ASG	Unilever

We have a programme director, who acts as a facilitator between you and potential employers, and provides pastoral care during your placements. You will have frequent contact with the programme director while applying for jobs and you will be visited by him or by another member of academic staff at least twice during your year in industry, to gain advice, support and assessment.

Years 1 and 2
For information on the first two years, see 'A common core', page 11.

At the end of your second year, you can elect whether to study for a three-year BSc (Hons) Chemistry degree, the four-year MChem (Hons) degree, or the four-year MChem (Hons) Chemistry with Industrial Experience degree. However, eligibility for continuation on this MChem course is assessed at the end of each year and is at the discretion of our School of Chemistry. The assessment is based on your general performance and end-of-year mark.

Year 3
You spend this year in industry. Our programme director will maintain contact with you and will arrange for academic tutors to visit you during your placement year.

Core Chemistry material is taught by distributed learning units. You will also write a detailed report on the work that you have carried out during your placement year and you will give an oral presentation at the end of the year.

Year 4 (final year)
You will carry out an extended project associated with one of the research groups in our School. You will study course units related to the area of the project, take course units from other areas of chemistry and attend specialist lectures chosen in consultation with your project supervisor.

MChem (Hons) Chemistry with International Study (F104)

This Honours degree course was developed by our School of Chemistry in collaboration with the School of Languages, Linguistics and Cultures, responding to a growing need for science graduates who are fluent in more than one language and have exemplary interpersonal and communications skills.

It comprises four years of chemistry study combined with substantial study of a language, where appropriate (French, German, Spanish, or Italian), with your third academic year spent at either a mainland European university (or equivalent establishment) or on a worldwide placement.

Since the total Chemistry content will be at least equivalent to that of our existing courses, this degree satisfies the requirements for professional recognition by the RSC.

Manchester is a great city to live and learn in, and with so many things going on you will always have something to do. The School of Chemistry has excellent teaching staff and facilities and is an outstanding research centre for my masters degree. During my industrial placement year, I gained knowledge of specific laboratory techniques used in industry, as well as gaining excellent references and vital experience in my chosen career after university.

Victoria Green,
fourth-year student
MChem (Hons) Chemistry
with Industrial Experience

You will take the extramural year (around nine months in practice) after your second year at Manchester. You choose which of our partner universities to attend:

In Europe:

- Valencia, Spain
- Göttingen or Freiburg, Germany
- ENSCM, Montpellier or Strasbourg, France
- Florence, Italy

Worldwide:

- Arizona State University
- University of California
- University of Illinois, Urbana-Champaign
- University of Missouri, Columbia
- University of Tennessee, Knoxville
- University of Massachusetts, Amherst
- University of North Carolina, Chapel Hill
- Rutgers, New Jersey
- University of Vancouver, British Columbia
- Queens University, Ontario
- McGill University, Montreal
- Nanyang Technological University, Singapore

(Please note: these locations are subject to change).

For your year abroad, you are aided in the choice of the course units you take while there and will receive help in the arrangement of your accommodation, etc. Essentially, you become a local student for the time you are there. Both your programme director and our Study Abroad Unit will be in contact via email with you during your stay, providing help and support when necessary.

Chemistry

Years 1 and 2
For information on the first two years, see 'A common core', page 11.

At the end of your second year, you can choose whether to study for a three-year BSc (Hons) Chemistry degree, the four-year MChem (Hons) Chemistry degree, or the MChem (Hons) Chemistry with International Study degree. However, your eligibility for continuation on this MChem course is assessed at the end of each year and is at the discretion of our School of Chemistry. The assessment is based on your general performance, formal interview in your second year and end-of-year marks in both the first and second years.

Those students progressing onto European destinations in Year 3 must have demonstrated a proficiency in the language of the host university (minimum grade A at GCSE level at entry) and are required to attend a Language Experience for All Programme (LEAP) in Manchester during their first and second years.

Year 3
Your placement will be spent in a university outside of the UK. We link with a range of universities in Spain, Germany, France, Italy, North America and the Far East (via the ERASMUS and Worldwide Universities Schemes). Our host universities have been carefully selected on the basis of their track record of academic excellence and their support of cultural exchanges, and they share our own aspirations for the continued all-round development of the student. Your tutor/director keeps in touch with you, and you may be visited whenever possible. You are assessed entirely via the marks obtained from your host university.

Our Study Abroad Unit offers information about the financial aspects of your year abroad and links to partner universities' web pages.

Year 4 (final year)
You carry out an extended project associated with one of the research groups in our School of Chemistry. You will study course units related to the area of the project, take course units from other areas of chemistry and attend specialist lectures chosen in consultation with your project supervisor.

As an undergraduate at Manchester I have had the chance to develop my skills and knowledge through modules and laboratory courses in Chemistry. Each year has brought new and different challenges, but I think that students are continually supported by the staff but also given the opportunity to become more independent in their academic lives.

During my third year, I studied abroad in the United States at the University of Illinois, Urbana- Champaign. Studying at a different university gave me the chance to learn Chemistry in a different way through lectures and labs. I had many opportunities to travel, so was able to visit places I had only dreamed about seeing before then!

During my fourth year I undertook my Masters' research project in Inorganic Chemistry. Learning in detail about one particular field, has definitely been one of the highlights of the past four years and has inspired me to apply to research towards a PhD in the same field.

Priyanka Comar
fourth-year student
MChem (Hons) Chemistry with International Study

Chemistry with Forensic and Analytical Chemistry (F1F4)

Forensic science is exciting and challenging, and at the heart of this science is chemistry. This course is based around a core Chemistry course with a strong analytical component, because analytical methods are at the heart of modern forensic science. It is a four-year MChem course with components (such as Law) provided by the relevant University School, or by a practising specialist.

The Forensic Science Service recruits graduates with a good degree in a core science, and a range of personal and communication skills that would allow them to work in a team, learn new techniques and carry out experiments meticulously and reliably. Our course allows you to learn all of these skills.

The Forensic Science Service offers only a few new jobs each year, but this degree – coupled with our University's enviable graduate employment statistics – will certainly allow you to be a strong applicant.

However, since this course still covers all the core Chemistry material, it will open up many other possibilities too, such as developing medicines, or working with new materials. The special analytical flavour of the course would also equip you for the huge number of jobs in analytical chemistry, and strong communication skills should help you in almost any career that you might choose.

Years 1 and 2
You cover all the major branches of chemistry and learn how they are interconnected. Laboratory classes in both years form an essential component of your training and you conduct experiments in all branches of the subject.

You will study specialist course units in Law and Forensic/Analytical Science, which will be delivered by experts in their field, including practising forensic scientists.

However, eligibility for continuation on this MChem course is assessed at the end of each year and is at the discretion of the School of Chemistry. The assessment is based on your general performance and end-of-year mark.

Year 3
You develop advanced aspects of organic, inorganic and physical chemistry. You will also carry out specialist laboratory work involving advanced instrumental techniques and procedures.

Year 4 (final year)
You carry out an extended project in a forensic or analytical area, in association with one of our School's research groups, which will involve using advanced analytical techniques, ranging from NMR to mass spectrometry.

"Manchester is an exciting, vibrant city which was a welcome contrast to my quiet home town. Forensics is a fantastic area of study and, combined with chemistry, opens up many career paths thanks to its applications of analytical skills, covering a wide cariety of topics including drugs of abuse, DNA sequencing and even law. For my final year project I am conducting a computational study on charged amino acids. The role of the computational chemist is becoming greater each year and now is the perfect time to be learning the techniques. I enjoy the challenge of my project as it involves learning some PERL script and improves my computing skills. Although this may not sound particularly chemistry orientated, the underlying principles behind computational chemistry are important to chemical knowledge and will help expand what computational chemistry is capable of. Manchester is a great place in which to study and live and offers plenty of opportunity for whatever area of chemistry you are interested in."

Ben Ball
fourth-year student
MChem (Hons) Chemistry with Forensic and Analytical Chemistry

Our research

Manchester Chemistry has an international reputation for innovative, cutting-edge research. The School has world-class capabilities in synthesis, analytical and physical methods, chemical biology, materials chemistry, nuclear and radiochemistry, and computation. We develop innovative methods to help tackle major challenges related to life and health, energy and the environment, sustainability and new technologies. Information about staff undertaking research within these various themes is available through the School website.

We have a wide range of sophisticated research instruments, including state-of-the-art Nuclear Magnetic Resonance (NMR) and mass spectrometers and modern single-crystal X-ray diffractometers, and we are home to the UK National Electron Paramagnetic Resonance (EPR) Facility. We have specialised facilities for handling radioactive chemicals and for materials chemistry.

The School's research extends beyond the Chemistry Building, with staff involved in the work of three Research Institutes across the campus and in West Cumbria. Research at the interface between chemistry and biology is carried out in the Manchester Institute of Biotechnology (MIB), which brings together researchers from a range of disciplines addressing challenges in industrial biotechnology, healthcare and energy. Research into the chemistry of photon interactions is carried out in the Photon Science Institute (PSI). Research in Radiation chemistry, developing the skills to tackle issues such as radioactive waste management, is carried out at the Dalton Cumbrian Facility (DCF), which is part of the Dalton Nuclear Institute.

The School hosts several specialist research centres, including the Centre for Radiochemistry Research (CRR), the Centre for Nanoporous Materials (CNM), the Organic Materials Innovation Centre (OMIC), the Michael Barber Centre for Mass Spectrometry (MBCMS), The Centre of Excellence for Biocatalysis, Biotransformations and Biocatalytic Manufacture (CoEBio3), the Centre for Chemical Intervention in Biology and Medicine (CCIBM) and the Manchester Centre for Integrative Systems Biology (MCISB). The Knowledge Centre for Materials Chemistry (KCMC) provides a link between industry and academic researchers in applied materials chemistry.

As an undergraduate at Manchester, you will have the opportunity to experience research at the boundaries of knowledge, and to contribute to the development of an exciting and vibrant subject.

Recent Awards

Professor Paul O'Brien FRS was elected as a Fellow of the Royal Society in May 2013. This is a well-deserved honour for Paul and reflects his wide ranging achievements as a scientist. The School is very proud of this distinction.

Dr Richard Layfield has been awarded the 2013 Sir Edward Frankland Fellowship of the Royal Society of Chemistry "for contributions to organometallic chemistry, and in particular for pioneering work on magnetic studies of organo-lanthanide complexes" (May 2013).

Professor David Leigh FRS has been awarded the Royal Society Bakerian Prize Lecture for 2013 (July 2012).

Recent Grants

Professor Peter Budd has been successfully awarded an EPSRC Graphene Hub grant which involves researchers across the Faculty and **Dr Cinzia Casiraghi**: 'Graphene-based membranes' - £2,839,350 (April 2013)

Professor Rob Dryfe has been successfully awarded an EPSRC Graphene Engineering Grant: 'Electrochemical energy storage with graphene-enabled materials' - £2.1M (January 2013)

Professor Gareth Morris and **Professor Christopher Whitehead** have been successfully awarded an EPSRC Core Capabilities grant: 'Core Capability for Chemistry Research' - £1,005,120 (January 2013)

Professor Simon Pimblott has been successfully awarded a National Nuclear User Facility grant for equipment for the Dalton Cumbrian Facility - £1,666,667 (March 2013)

Professor Paul Popelier has been successfully awarded an EPSRC Fellowship: 'Reliable Computational Prediction of Molecular Assembly' - £1,615,691 (March 2013)

Professor Nicholas Turner, Professor Sabine Flitsch, Professor Jason Micklefield, Professor Roy Goodacre and **Professor Nigel Scrutton** have been successfully awarded a BBSRC sLoLa Grant: 'Rapid Evolution of Enzymes and Synthetic Microorganisms for the Development of Industrial Biocatalysts' - £4,489,481.00 (December 2012)

Research

Research in our School

Our School of Chemistry has an international reputation in innovative, cutting-edge research in all areas of chemistry. More than 400 people are engaged in research in our School.

Opposite are images from a tiny portion of the research currently undertaken in the School of Chemistry.

1 An array of nanoscale gold dots. Nanotechnology and the development of nanoscale materials is a very active area of research in the school, with applications in chemical analysis, solar cell technology, light-emitting structures and even inks that are impossible to forge.

2 A beam of hot Ba atoms reacts with a low background pressure of N2O gas creating electronically excited BaO, which emits light. Molecular beams are used to study gas phase reactions and the interactions of gases with surfaces.

3 One area of current interest is biomolecular recognition; for instance, recognition of nucleic acids (DNA and RNA). In particular, oligo nucleotidemimics, with improved affinity and specificity for native nucleic acids, have significant potential both as therapeutic or diagnostic agents.

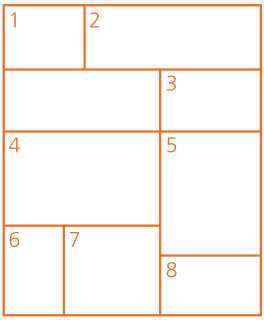
4 The new LAue DIffractometer LADI III at the neutron research reactor at the Institut Laue Langevin in Grenoble; on the right is Dr Matthew Blakeley who is the current person in charge of the instrument and is a past BSc and PhD student from the School. On the left is Mr Stu Fisher, a past MChem student and current PhD student in the School. Knowledge of the hydrogen and hydration details in proteins and nucleic acids is important to understand fully many chemical reactions and molecular recognition interactions in nature. Neutron macromolecular crystallography is used to determine these structural chemistry 3D details, and which often elude X-ray crystallography due to the small scattering cross section of hydrogen, as the lightest element, for X-rays. Neutrons, by contrast are strongly scattered by either of the isotopes hydrogen or deuterium, the latter often being preferred in such studies.

5 Novel bond descriptors, provided by Quantum Chemical Topology (QCT), are used in a Quantitative Structure Activity Relationship (QSAR) to predict the pKa values for carboxylic acids, anilines and phenols. Theoretical chemists use quantum theory and supercomputers to describe the behaviour of electrons in molecules.

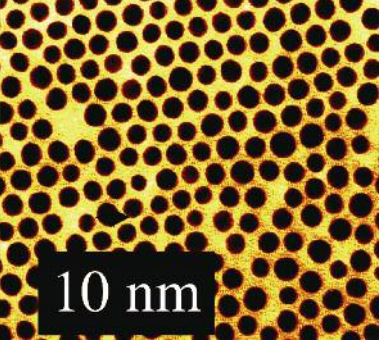
6 A key secondary structure of a 'Hammerhead' RNA motif of an encephalo myocarditis virus. Selective mutations to the motif cause the abolition of the activity of the RNA virus.

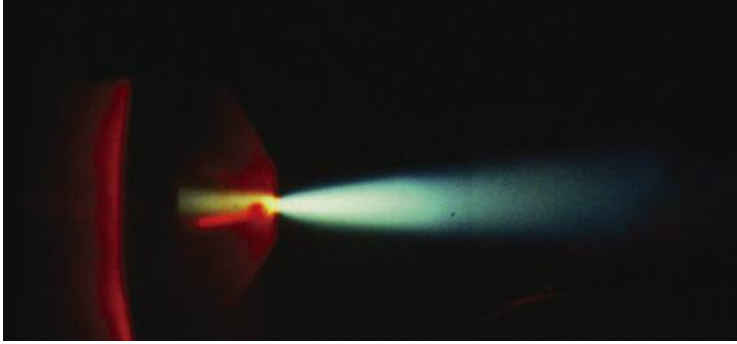
7 With more than 200 postgraduate students, our state-of-the-art synthetic laboratories mean that our School is fully prepared for the challenges of the 21st century.

8 Atmospheric pressure plasma discharge. Plasma technology has applications in the treatment of waste gas streams, such as diesel exhausts and solvents, for the purification of indoor air and the destruction of odours.

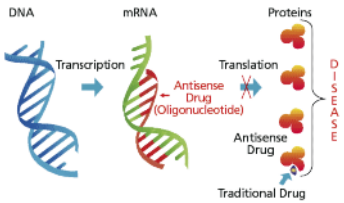


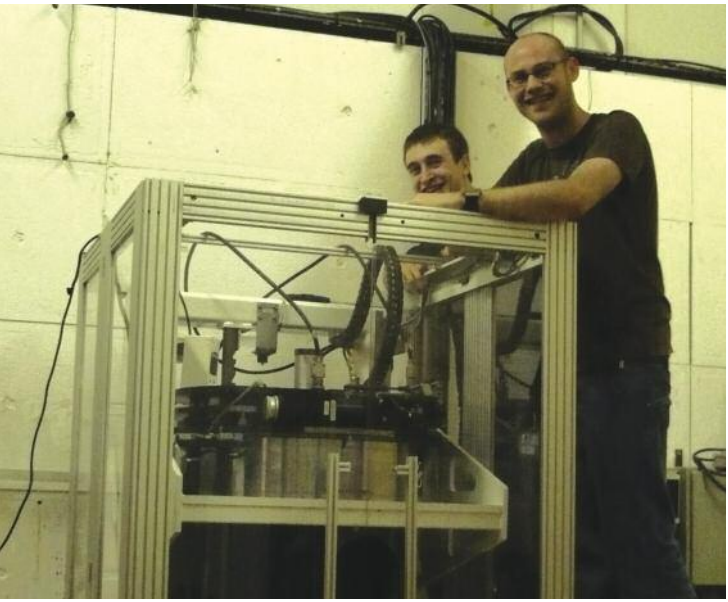
In addition, front cover image: Optical micrograph of nanoporous zeolite crystals. Image courtesy of Prof MW Anderson and Dr JR Agger, School of Chemistry

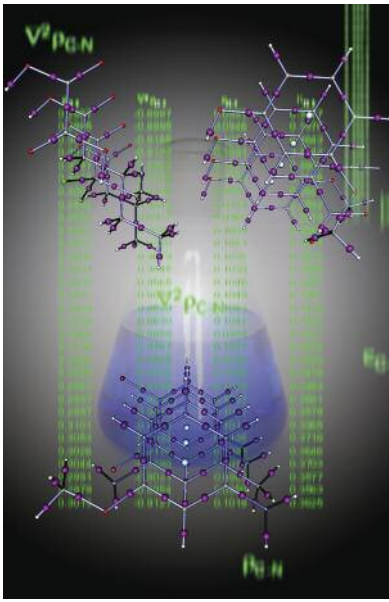


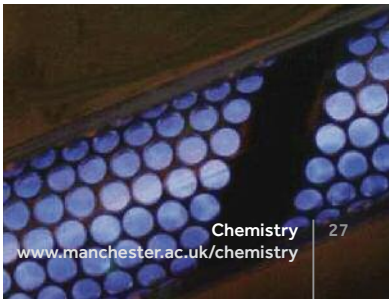


“The School of Chemistry has an international reputation in innovative, cutting-edge research in all areas of chemistry. There are more than 400 people engaged in research in our School.”









Research

Having finished my undergraduate studies in "MChem Chemistry" in Manchester, I was familiar with the university and the department and I knew that I would have access to first class facilities to undertake a PhD in organic chemistry. The academic staff are excellent and the administrative members of staff very friendly and helpful. Another reason why I decided to stay here is the life that the vibrant city of Manchester has to offer. My career aspiration is to, after having finished my PhD, carry out postdoctoral studies and eventually become an academic member of staff, which is the reason why I do a PhD. Through my research, I would like to provide synthetic tools for other academics and researchers around the world, which may help them and which they could use in natural product and drug syntheses.In order to become a successful undergraduate student, my advice would be to attend as many workshops, tutorials and PASS sessions as possible. Do not be shy to ask questions and get help when you are stuck. The lecturers in our department are very helpful and willing to answer questions when someone is struggling. Apart from having the University of Manchester as a world-class institution of higher education, I think Manchester as a city is also a great place to do your undergraduate degree as it offers you a whole variety of things to do and enjoy!

Irem Yalavac
PhD student

If you cannot measure it – if you cannot express it in quantitative terms – then your knowledge is of a meagre and insignificant kind.

Lord Kelvin


NH2

Find out more online

Accommodation
Discover your new home:
www.manchester.ac.uk/accommodation

Admissions and applications
Everything you need to apply:
www.manchester.ac.uk/ug/howtoapply

Alan Gilbert Learning Commons
Take a look around our 24/7, independent learning space
www.manchester.ac.uk/library/learningcommons

Careers
Take control of your career:
www.manchester.ac.uk/careers

Childcare
Balancing your studies with your caring responsibilities:
www.manchester.ac.uk/childcare

Disability support
Talk to us about any support you need:
www.manchester.ac.uk/dso

Funding and finance
Get to grips with fees, loans, scholarships and more:
www.manchester.ac.uk/studentfinance

International students
Let us help you prepare for your time here:
www.manchester.ac.uk/international

IT Services
Online learning, computer access, IT support and more:
www.manchester.ac.uk/itservices

Library
We have one of the UK's largest and best-resourced university libraries:
www.manchester.ac.uk/library

Maps
Find your way around our campus, city and accommodation:
www.manchester.ac.uk/aboutus/travel/maps

Prospectus
Download or order a copy of our prospectus:
www.manchester.ac.uk/ug/courses/prospectus

Sport
Get active with our clubs, leagues, classes and facilities:
www.manchester.ac.uk/sport

Support
Let us help with any academic, personal, financial and administrative issues:
my.manchester.ac.uk/guest

Students' Union
Immerse yourself in societies, events, campaigns and more:
manchesterstudentsunion.com

Videos
Learn more about us on our YouTube channel:
www.youtube.com/user/universitymanchester

Contact details

Disclaimer

This brochure is prepared well in advance of the academic year to which it relates. Consequently, details of courses may vary with staff changes. The University therefore reserves the right to make such alterations to courses as are found to be necessary. If the University makes an offer of a place, it is essential that you are aware of the current terms on which the offer is based. If you are in any doubt, please feel free to ask for confirmation of the precise position for the year in question, before you accept the offer.

For further information about the courses, or about qualifications, please contact:

Undergraduate Admissions Office
School of Chemistry
The University of Manchester
Brunswick Street
Manchester
M13 9PL
United Kingdom

tel +44 (0)161 306 9271

email ug.chem@manchester.ac.uk

For the most up-to-date course information, please visit our website:
www.manchester.ac.uk/chemistry

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Manchester
M13 9PL
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