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the first decade

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ROYAL SOCIETY OF CHEMISTRY

Most employers in the chemical and related industries will have noted that recent graduates from UK universities possess in increasing numbers first degrees entitled Master of Chemistry (MChem) or Master of Science (MSci)¹ rather than the traditional Bachelors qualification. So, when and why did this happen, what are the differences and where does the future lie?

It is 10 years since the Higher Education Chemistry Conference (HECC), which is the collective body of heads of university chemistry departments in the UK, first proposed the introduction of extended undergraduate chemistry programmes in England, Wales and Northern Ireland (EWNI). Similar developments had already occurred in physics and engineering.

The rationale behind the HECC's proposal was that with the theoretical basis of the subject, the technologies relevant to it and the range of its applications ever advancing, coupled with the broader range of transferable skills being required, courses had become of insufficient duration for graduates wishing to become career chemists. The Chemical Industries Association (CIA) had similarly commented that to maintain the quality of graduates who wish to pursue careers as professional chemists, an extended degree course would be required. The RSC was party to these discussions and, in 1993, RSC Council agreed to support the introduction of extended degree courses in EWNI. All parties were in agreement that extended programmes were required to complement and not replace the existing range of Bachelor degree courses.

While not put forward explicitly at that time, the award bestowed on such chemistry programmes was to become a Masters degree (MChem/MSci) and collectively they became referred to as 'enhanced degrees'. Notably Scotland was not included in these initial proposals since 4-year full time degree programmes in chemistry were already offered there. However, once MChem/MSci were introduced in EWNI many Scottish universities followed suit.

In practice the creation of MChem/MSci programmes was very much an evolution rather than a revolution. University departments developed different models, which was not itself necessarily a cause for concern. It did however reflect an uncertainty amongst universities about the rationale, structure and curricula of MChem/MSci degrees. A meeting for course directors was convened by the RSC in 1996 and 66 delegates attended. The outcome of this was a guidance document entitled *Enhanced first degree courses in chemistry*, which was published later that year.

Key recommendations in this document were that, in comparison to the standard of BSc courses, the enhancement in MChem/MSci courses should facilitate:

- confidence in application of fundamental principles to the solution of problems in chemistry;
- study of some additional advanced work in chemistry which is adequately underpinned;
- competence in practical chemistry and fundamentals of research methods; and
- further development of professional skills. Many universities developed and refined their courses on the basis of these recommendations as well as in light of their own experiences and feedback.

Today, there is a wide range of 'M degrees' on offer in most scientific and engineering disciplines with titles such as MChem, MSci, MBiol, MEng, MMath, MNatSc, MOptom, MPharm and MPhys.

The RSC accredits for satisfying the academic requirements for the award of Chartered Chemist (CChem) in excess of 200 MChem/MSci courses from more than 40 different universities.

¹The status of MChem and MSci degrees is the same. Each university has chosen how it wishes to designate its courses.

In general, RSC accredited MChem/MSci courses can be divided into three main types. Those which involve four years of full time study at a UK university (usually five years in Scotland), those which offer the opportunity to study abroad for one year, and those which allow the student to spend a year of the course in industry. The first set can have a variety of course titles. There are the traditional single honours 'Chemistry' degrees, the 'Chemistry with X' (where X is another subject or a specialised area of chemistry - eg Chemistry with Analytical Chemistry, Chemistry with Patent Law, Chemistry with Management), and the specialist titles (eg Materials Chemistry, Pharmaceutical Chemistry, Analytical Chemistry). The industrial and study abroad variants have titles which reflect these features (eg Chemistry with Industrial Experience, Chemistry with a Year in Europe). There have been two recent developments in higher education that are likely to impact significantly upon future provision of MChem/MSci courses; the *Bologna Declaration* and the *Frameworks for Higher Education Qualifications*.

In June 1999 the education ministers of 29 European countries meeting in Bologna, Italy signed a declaration committing their country to adopt 'a common framework of readable and comparable degrees' and thus create a European space for higher education' by 2010. A framework of comparable degrees is to be developed which takes in undergraduate ('first cycle') and postgraduate ('second cycle') qualifications. The latter of these is viewed as providing the level of educational attainment for future professional practitioners.

The challenge for universities offering MChem/MSci degree courses is to ensure that the level of outcome from their courses is equivalent to that of second cycle degrees awarded in any one of the other 28 signatory countries and are thus correctly presented as postgraduate. MChem/MSci degree providers are challenged further by the *Bologna Declaration* in that it states that 'access to the

second cycle shall require successful completion of first cycle studies'. Many countries have interpreted this as meaning that a student needs to be awarded a first cycle qualification before starting a second cycle course. Extended undergraduate programmes leading to M degrees are exceptional in that there is no formal exit qualification at the end of the first cycle. It is a situation that the UK will need to flag consistently to many of its European partners.

The second development is The Quality Assurance Agency (QAA) for Higher Education in the UK's *Frameworks for Higher Education Qualifications*. There were two such published in January 2001; one for EwNI and another for Scotland. Their primary objective is to facilitate a greater public understanding of the achievement represented by higher education qualifications. Thus the frameworks seek to ensure that the level of learning outcomes from all UK higher education courses is equivalent irrespective of whether it is awarded from university X or university Y.

Descriptors for a qualification at Masters (M) level are set out in both publications. The descriptors are valid equally to the MChem/MSci degree and the more customary postgraduate Masters qualifications (eg MSc, MRes). There is specific reference to the MChem/MSci format of degree in the frameworks. In the EwNI version it refers to 'extended undergraduate programmes' while the Scottish version refers to them as 'integrated programmes'.

The published frameworks have caused all UK universities to review their programmes and apply the learning descriptors to course outcomes at each stage. While this has not generally caused significant revisions to MChem/MSci degree courses, it has served to provide clarity to external parties (eg students, parents, employers, professional bodies) regarding the level of attainment.

In August 2001 the RSC implemented a new membership structure. Part of this was the separation of the award of Chartered Chemist (CChem) from admission to a category of membership. The rigour and level of demand for the award of CChem was also to be raised. The RSC considers it essential that CChem gets professional standing alongside the Bologna second cycle academic qualifications awarded elsewhere in Europe. The emphasis of the new accreditation criteria is therefore on the students' ability to apply their knowledge of chemistry and solve problems, reflecting the RSC's view of the level required of a future high level practitioner. The standard required for accreditation can be equated broadly to that presented in QAA's level M descriptors.

It is worth noting that, while the provision of MChem/MSci degrees has expanded, most traditional Bachelors qualifications remain available. Some universities have chosen not to develop M degrees in chemistry instead deciding to target their expertise at a wide range of undergraduate courses in the chemical sciences. Graduates from such courses are able to become members of the RSC and can achieve the award of CChem by means of a subsequent postgraduate qualification and/or professional development.

There are many factors that will decide where MChem/MSci degrees go in the next decade. Statistics indicate that from a standing start the proportion of students deciding to take MChem/MSci degrees rather than BSc has reached about 43% within 10 years. It is worth noting that, when the HECC first discussed the development of extended programmes in the early 1990s, it envisaged a situation whereby about 40% of the chemistry student population would choose an MChem/MSci.

The RSC as the Chartered Professional Body in the UK will continue to promote the chemical science profession while fulfilling its obligation

to uphold and advance the standards of qualifications, competence and conduct of those who practice chemistry. It is committed to enhancing the value of the CChem designation and also recognises that many chemical scientists who choose to become members of the RSC, take advantage of a range of benefits, and develop significantly in their chosen career, may also choose not to become Chartered Chemists.

Ultimately, however, the customer will decide. Students will weigh up the merits or otherwise of degree courses relative to their own career aspirations and employment opportunities. External developments, such as Bologna and the qualifications frameworks, and the transparency that they provide can only assist further. Additionally the RSC continues to produce a range of educational and career guidance material to help students make an informed choice.

Publications

Recognition and accreditation of degree courses

Accredited courses

The Chemical Sciences - Choosing a degree

These publications can be downloaded from the RSC website at www.rsc.org

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