



NUI MAYNOOTH
Óilseolaí na hÉireann Mhá Nuad

Quality Review of the Department of Chemistry

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Peer Review Report

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Executive Summary

Chemistry is one of the central sciences and is important in almost all the issues that will be important in the 21st century including environment, health care and medicine, energy, materials, and food supply (fertilizers, etc.). This is recognised by NUI Maynooth Chemistry where many of these issues are already addressed in the research and teaching of the Department.

During our visit to the Department we were impressed by:

- the friendly and equitable atmosphere put forward by virtually all the faculty, staff, postdocs, and students.
- the success in improving student recruitment at all levels.
- the solid, well-funded programs of research including strong ties to industry.
- the attempts to connect with the strong biology Department at NUI Maynooth.

Many new initiatives, programs, research contacts, interactions, and courses have been recently introduced, and the University is justly proud of these. However, these new initiatives are not sustainable without growth and without more and better space. The Department is suffering because of its recent success and this is clearly evident in workloads and lack of space. Everything is right to grow the Department now (including Department spirit, new initiatives, and in particular the right leadership). If the University waits, an opportunity will be missed, and recent progress might be lost.

It is our opinion that the University should do everything possible to not only support, but promote chemistry, its growth, and its interactions with biology as the central players in science at NUI Maynooth.

We recommend the following short- and long-term strategies.

1. Hire an Executive Officer to support the Department Head and develop a strategy for long-term stability in the Department leadership.
2. Build a connecting building “bridging” between Chemistry and the Life Sciences to house core facilities and institute research groups. This should include student accommodation and some fluid research lab space.
3. Make this connecting building a foyer for the university and access foyer for the Departments.
4. We recommend that the Department increase the size of the faculty to twice its current size to maintain some pace with biology, to double the number of graduate students, and to increase the number of undergraduate majors by 50%.
5. The Department should work with the Department of Biology to obtain some new and much needed equipment (NMR, etc).

Introduction

It is clear that the Department of Chemistry is a jewel in the crown of the University, at least in the sciences. Together with the Department of Biology, these Departments make a very strong, albeit small, centre of excellence at NUI Maynooth. The history of the Department of Chemistry is unusual compared to most universities internationally in that it did not start as a core Department of the modern university but was added later. It grew from 1 staff member in 1957 to 3 members (2 academic, 1 technical) in 1977. In this way Maynooth Chemistry missed out on the growth in science departments that was common elsewhere post war. The previous Head of Department (appointed in 1997) grew the Department to 8 academic and 3 technical staff with a significant commitment to teaching in the form of a BSc general degree and 2 BSc honours degrees. After a period of growth, undergraduate student numbers fell through the 1990's. This was initially compensated by a rise in postgraduate numbers, but by the middle part of the current decade undergraduate numbers had stagnated and postgraduate numbers were falling. This picture was common to many chemistry departments internationally, and lead elsewhere to department closure or unsympathetic merger, which in hindsight has been detrimental to those institutions.

What has happened in NUI Maynooth is very different. In 2006 the current Head of Department was appointed. He has galvanized the efforts of the Department staff to double postgraduate numbers, increase undergraduate numbers by some 40% and dramatically increase research funding. He has also managed to attract young academics of international standing to the Department on short-term contracts. The current Department at the time of our visit was fizzing with vitality but also creaking at the seams in terms of space and staff work loads.

Department strengths

The Department contains an excellent and committed group of faculty, staff and students. This group has a good record of high quality research and high quality teaching at all levels. Several specific areas of strength exist.

The Leadership of the Department is outstanding at present. This is apparent in the willingness of the faculty, staff and even students to do what is needed to meet the needs of the Department. Additionally, staff and faculty are in many cases willing to work extremely long hours, far beyond what is typical and what is sustainable.

The atmosphere of the Department is friendly and extremely welcoming despite this highly hard working environment. This is clearly a reason that they have been so successful in recruiting a larger number of undergraduate students to the chemistry programs even while the trend is the opposite at almost every other university across Europe. This high spirit in the Department was reflected in the comments from every person we met in the Department.

The increasing number of students in the Department also reflects the energy of the individuals and the outreach carried out in the Department. The Department brings in groups of students for chemistry camps and has an introductory course for returning students that is outstanding. Such initiatives show a way forward for chemistry internationally.

All of the academic staff are funded from external sources. The Department has had a phenomenal increase in external funding in recent years to the level of 6.7 million Euro. On a per faculty basis, this rivals some of the best universities in the USA and Europe. The university should consider the amount of funds acquired per person in their hiring strategy.

The Department has a highly entrepreneurial vision with several industrial contacts and a research program that leans towards practical and useful results.

The Department has a great technical staff in terms of quality of the individuals.

The Department has embraced a fluid space arrangement to meet its needs. This was done out of necessity with such limited space, but it will serve them well if they are able to expand in the future.

The Department is diverse with 50% of the academic staff being female. This is outstanding for a chemistry Department anywhere.

Department weaknesses

The Department has several weaknesses that we feel could be addressed by more support and a plan to grow that is endorsed by the highest levels of the university.

The Department of Chemistry is relatively small compared to other Departments of similar research and teaching quality and load. This precludes them from funding opportunities that are available to larger collaborative groups. They do have an excellent funding record, but it could be even better.

It is our opinion that the University plan for space in the sciences is in a state of competitive disarray and that this will hurt the chances for productive growth in the Department, and the university more widely if it is not addressed. It seems that different factions in the sciences are making claims and pushing plans for space and that the facts about space are somewhat vague. A rigorous space audit is in order in this situation. Information of this kind can only help the overall picture. This can then lead to strategic plans being made by the centre rather than the current opportunistic addition to buildings. In the long run, the space issues could harm the excellent atmosphere that the Department and indeed the university now enjoy.

Looking more specifically at the Department, there are several weaknesses identified that can be addressed. These include a lack of basic instrumental facilities like modern NMR; a need to update the undergraduate practical's that seem somewhat redundant and perhaps out of date; and a need to better organize and formalize a mentoring program for new academic staff. Additionally, the time to publish when patenting needs to be shorter. Finally, and importantly, it seems that with the current small staff and large growth taking place, many are obviously overworked and care needs to be taken that this does not lead to burnout.

Growth goals for the Department

The long-term health of the Department of Chemistry at Maynooth and its ability to interact in the strong biology-chemistry environment as well as serve the needs of education and society requires several strategic goals to be set. We recommend the following with rationale.

1. The university should aim to double the size of the academic staff over the next 5 or perhaps 10 years. If chemistry is going to be useful to the initiative of growing interaction between biology and chemistry, it cannot be a significantly smaller sibling to the Biology Department. The Biology Department is approximately 2 to 3 times the size and growing. The per person funding of the Chemistry Academic Staff suggests also that growing this Department will lead to a significant increase in resources at the University. We recommend that new academic staff be recruited in areas of strengths in the Department with a balance with teaching needs. Clearly the first priority would be in the area of chemistry of life sciences followed closely by environmental chemistry/electrochemistry and pharmaceutical chemistry and related subjects, for example synthetic chemistry. In all this, the Department should recognize and maintain a balance between makers (synthetic, etc) and measurers (analysis). The best Departments always have this balance.
2. New building space is desperately needed for research in the Department, even without expansion. This is more important with expansion, of course. We have never seen a good Department like this in such dire need of reasonable research space. Experiments are currently ongoing on benches along the sides of the teaching labs and in rooms that look like they were more aimed at closet or storage space. We commend the Department for their creative solutions to keep the program going, but this needs to be rectified. It is critical that any new space plan works to connect chemistry and biology and does not succumb to pressure that will separate these strengths and separate further the Departments. As the department expands the quality of synthetic facilities will need to be improved to keep pace with pharmaceutical industry norms.

3. The current situation in the Department is such that the support staff and administrative staff are overworked. Their morale is an amazing testimony of their enthusiasm and the Department leadership. As the Department grows, we encourage the university to recognize the need to grow these groups as well. There are also immediate needs outlined below.

Immediate needs

We identified three areas of immediate need in the Department. These are areas where we feel there will be long-term and perhaps irreparable harm if these are not addressed in the near term. These include the need for immediate space help in addition to the long-term building plans, the need to stabilize and relieve some pressure on the leadership of the Department, and the need for a higher field NMR instrument.

1. The space situation as outlined above is seriously bad. The highest officials in the university should tour the space in chemistry. In the short term, perhaps some space can be made available by doing a space audit of the entire science building in which chemistry is located and moving some space around. Space should always be fluid, this is norm elsewhere.
2. The Department Head is seriously overworked in the sense that he is doing a great job, but has so much to focus on that his research appears to be placed on hold. The staff member employed to help lead his group is in fact spending her time helping to run the Department. This is a serious situation as the Head of the Department is one of the more creative people in the Department, has an excellent record, and has many of the Department's industrial contacts. This situation also does not bode well for maintaining long-term leadership at a high quality and with continuity. Other universities have solved this problem by hiring an Executive Officer who essentially runs the Department operations on a daily basis while the Head sets vision and oversees the direction of the Department, as well as making important decisions about academic staff. This should be implemented here. In addition, the Department has a couple of senior academic staff who also have leadership potential, seem to have been quiet owing to previous leadership conflicts, and who should be more involved.

One or two of these staff need to be and deserve to be promoted at this time and it was surprising that it has not happened.

3. It is difficult to maintain research programs in synthetic and pharmaceutical chemistry without access to high field NMR. Research in biology needs this more and more as well. We strongly recommend that these Departments with university help push to acquire this instrumentation and that they take a close look at what other equipment should be acquired.

Summary of large issues in the Department

The following is a list of the key problem issues for the Chemistry Department.

1. Lack of quantity and quality of space..
2. A real need for growth of the academic staff and related staff.
3. High teaching loads in the Department.
4. Lack of a means to maintain continuity in the current excellent leadership.
5. Lack of top-quality support instrumentation, most notably high-field NMR.

List of small but important issues in the Department

The following is a list of smaller issues that are also important in the Department.

General

1. The name of the institute between chemistry and biology is planned at this point to be the 'Chemical Biology Institute'. We feel a name that is less generic and that points more to the unique strengths of the group would be much better. This is important as 'Chemical Biology' is a defined sub-discipline that would not be the centre of the proposed institute.
2. We suggest revising the tutorials that are now given and to make a chemistry tutorial resource room in its place. This would provide more diverse service to the students and might be done without an increase in overall effort.

3. One person should be allocated the task of financial accounting as her/his sole responsibility
4. In accordance with comments above about equipment, access to a modern electron microscope is absent, there is only one HPLC for the postgraduate students, and the FTIR is quite old.

Postgraduate

5. It was not clear that the postgraduate students had any centrally organized advanced course work or transferable skills training. This could be a problem as this training load currently falls on individual supervisors.
6. The postgraduate students and postdoctoral researchers commented that they would like to see more funds available to go to conferences. This is an important part of career development.
7. We were told there is no "due process" if someone has a problem with a student or a supervisor. While the current Head is very approachable, there should be a formal process if someone has a problem with a supervisor.
8. Contact between students and supervisors is not as frequent as desired by the students as the supervisors are all extremely busy with other tasks in the Department. This was particularly reflected in delays in revising manuscripts for publication.

Undegraduate

9. Some of the undergraduate students commented that they would like to have more choice of modules in the 3rd year. General chemistry students have the least choice and they cannot do the Pharmaceutical Chemistry modules if they would like.
10. No clocks or periodic tables on the walls in the laboratories.
11. The laboratories do not apparently follow the lecture materials in some classes such as Organic Chemistry.

12. The undergraduate students commented that printing documents and assignments was difficult at the library and they would like to have easier access to a printer.
13. The undergraduate students commented that they would like the teaching to be more relevant to life sciences and industry.
14. The undergraduate students commented there was not enough private study space in the Department. Things are very crowded.
15. The Undergraduate students commented that they were surprised that only their final year marks determined their degree class. This seems strange for a degree such as the chemistry with pharmaceutical sciences honours degree, as the final year is dominated by the pharmaceutical science material.

Staff

16. The staff undertaking administrative roles within the Department are unsustainably overloaded with tasks. They constantly are forced to switch time between budgeting, examinations, student problems and other tasks that are typically 'must do now' to the detriment of their job satisfaction for their primary job. This situation is not at all robust in the event of an unforeseen crisis.
17. The staff dislike having to go to the "solvent shed" to decant solvents from large drums. Most would like to see the Department purchase smaller bottles instead of drums.
18. The technicians feel they should be consulted more before major purchases are made. They occasionally feel left in the dark and think they could help more here. They also feel they are not consulted before new equipment is purchased and then that those in charge assume they will be ready to set it up and run it. It appears a little ownership in these decisions needs to be passed to the staff.

Recommendations

We recommend both short- and long-term strategies. We feel that with the current momentum in the Chemistry Department, as well as in Biology, plans should be laid out to improve the size, space, and facilities of the Department. This is a time of opportunity. Plans should be made now and implemented as funds become available. We recommend the following.

1. Hire an Executive Officer to support the Department Head and develop a strategy for long-term stability in the Department leadership. This plan should include speedy promotion of at least one of the senior academic staff and a plan to get these staff involved in the Department leadership. The Executive Officer will coordinate interactions, oversee the nonacademic staff, oversee budgets, and carry out day-to-day operations in the Department. They will also provide a consistent focal point for Departmental operations making it much easier for staff and students to make contact, address issues, and to rapidly make decisions.
2. Build a connecting building “bridging” between Chemistry and the Life Sciences to house core facilities and institute research groups. This should include student accommodation and some fluid research lab space. Linking chemistry and biology is the key to the future of both of these Departments. These seem to be the core strengths of science at Maynooth and these are the Departments that will play the largest role in the expansion of science research to meet the needs of the 21st century. We feel the chances of obtaining a major grant to build a new building will be most sellable with such a plan, especially if this building is connecting the Departments. This is certainly superior to expanding any building that is only a small part of the overall picture in science. As part of this assessment, we were told that buildings are currently organized in ways that do not promote interactions where they could be strongest. Engineering shares space with immunology, computer science with biology, chemistry with math and physics, psychology with geography, and the Hamilton Center with student residences. We recommend a space audit across all of science and development of a plan that will promote interactions where they have the best possibility of success.

3. Make the connecting building a foyer for the university and access foyer for the Departments. We think that a new building connecting biology and chemistry would make a great showcase for science in the university. Such a building could be built with a foyer that would be a real asset; it is in an ideal place on campus for such a foyer.
4. To really meet the needs of the university, address the central position of chemistry in issues facing society, and take advantage of the momentum the currently present in the Chemistry Department, we recommend that the Department increase the size of the faculty to twice its current size over the next five to ten years. The current growth in responsibility and productivity of the Department is clearly not sustainable without this kind of increase in the academic staff. This will also enable it to maintain some pace with biology, which is extremely important if they are to interact with success as equals. We feel one of the hires should be a senior person that can bring some added leadership, vision, and visibility to the Department. We feel it is also reasonable to set a goal to double the number of graduate students in the Department, and the Department is already on pace to increase the number of undergraduate majors by 50%. Finally, the other departmental staff will need to be increased in parallel and a plan for this growth should be developed.
5. The Department should work with the Department of Biology to obtain some new and needed equipment (NMR, FTIR, more HPLCs, etc.)

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