Quality Review of the Department of Biology and Institute of Immunology

March 2009

Peer Review Report

Peer Review Group

External reviewers: **Professor Teresa Attwood, University of Manchester, U.K.;**
Professor Polly Matzinger, National Institute of Allergy and Infectious Diseases, Bethesda, U.S.A.

Internal reviewers: **Professor Jim Walsh, Deputy President, NUIM;**
Professor Ray O'Neill, Vice President for Research, NUIM.

Introduction

Sitting within the Faculty of Science and Engineering, the Department of Biology is a research-intensive teaching unit. With funding from the Higher Education Authority PRTLI, it hosts the Institute of Immunology, a University-designated research institute which is also part of this review; it is also working with the Dept. of Chemistry to establish a new Centre of Chemical Biology.

Roughly, the Department has a 70-strong staff, including academic lecturers, emeritus and adjunct professors, technical officers, a senior administrative officer, part-time technicians and secretarial staff, RAs and PDRAs. Amongst these, there are roughly equal numbers of permanent academic staff and PDRAs (50 in total); of the remaining 20 research-support and admin staff, a third are part-time. The staff are distributed across 2 North Campus buildings: Bioscience & Engineering, and Callan, the latter being shared with the Dept. of Computer Science and having been recently refurbished to accommodate bioinformatics and proteomics facilities.

Aiming to develop, enhance and retain teaching and research talent in Ireland, the Department has created innovative new denominated teaching degrees in the biological sciences; it also contributes modules to more than 15 different teaching programmes in NUIM and St. Patrick's College, including both Science and Arts degrees. Since the last Review, numbers of PG students (MSc and PhD) have increased; this trend has been facilitated, at least in part, by the direct recruitment of top students from the popular new UG science courses, such as the denominated *Biological & Biomedical Sciences* programme. The Department has consequently trained large numbers of students (UG and PG) and PDRAs, many of whom have gone on to employment in industrial and academic positions in Ireland, other EU countries and the US.

Over and above its teaching activities, the Department conducts nationally- and internationally-competitive research, and continues both to bring in large research grants (research in 2008/09 was supported by expenditure in excess of €5 million) and to actively translate new discoveries to commercial partners.

The goal of the Department is to build on these successes, to promote national links with biology teaching programmes, and to foster national and international research collaborations. Its mission is to give students and PDRAs a high-quality education in the biological and general biotechnological and biomedical sciences; it aims both to stimulate students to adopt critical and interdisciplinary ways of thinking, and to offer avenues for the pursuit of original research.

For the purpose of the Quality Review, we visited the Department from 4-6 March, 2009. On the morning of the 4th, we were welcomed by members of the Quality Review Office, who introduced us, first, to the President, and then to the internal reviewers; later, we met informally both with Department and with Institute of Immunology staff, before having 1:1 discussions with their respective Heads, Professors Kay Ohlendieck and Paul Moynagh; we were also given brief tours of some of the wet and dry labs. During March 5th, we met various different groupings (including academic and support staff, PDRAs and UG students); we also had discussions over lunch with the Heads of Mathematics, Chemistry, Geography, Anthropology and of the Hamilton Institute. On the final day, we met academic staff of the Institute of Immunology, and members of the Department's PG student cohort; we also made a brief visit to the mouse facility.

Response to the Self-Assessment

In conjunction with the site visit, the Quality Review process involved an analysis of the Department of Biology and Institute of Immunology self-assessment documents. Broadly, these described the work and achievements of the Department and Institute since the last Review, their strategic efforts to raise the profile of the biological sciences within NUIM, and their endeavours to align their Teaching/Learning, Research/Scholarship, Leadership/Management, and Health/Safety processes with the University's 2006-2011 Strategy; the assessment included a Quality Improvement Plan (QIP), with recommendations and actions necessary to realise the details of the Plan. The key findings under these headings are summarised below.

Alignment of Departmental Efforts with University Strategy

Briefly, the Department has made significant efforts to align with each of the key Strategic Goals (SG) of the University, by:

- improving the intake of high-points UG students, developing new denominated degrees, and extending its outreach activities – **SG1**;
- establishing a taught MSc in *Global Health & Immunology*, and proposing a *Chemical Biology* MSc as part of the new Centre of Chemical Biology – **SG2**;
- hosting the largest graduate school in NUIM and establishing a new structured programme for generic skills training of PG students – **SG3**;
- achieving significant research income and substantial outputs, making it one of the best equipped and resourced biological research Depts. in Ireland – **SG4**;
- actively recruiting mature students – **SG5**;
- participating in national and international collaborations, especially those funded by the EU – **SG6**;
- supplying well-trained research personnel to Irish bioindustry and increasing the visibility of the Irish bioresearch community – **SG7**;
- working with the Bursar's Office to ensure optimal use of its funds, it being the largest unit in NUIM, the unit with largest research income and among the largest research income per PI (despite substantial teaching loads) – **SG8**;
- including staff who are members of key University committees, actively involved in the management and organisational reform of NUIM – **SG9**.

Teaching & Learning

The biological and biomedical sciences are a major strength of NUIM; the University has consequently made a significant investment in the development and support of biological teaching initiatives. Coupled with the introduction of 3 new denominated degree programmes (*Biotechnology, Genetics & Bioinformatics, Biological & Biomedical Sciences*), this has spurred a significant (84%) increase in student intake in the Department since 2002.

From 2003/2004, all teaching programmes were modularised. This afforded an opportunity to restructure the existing units and to provide a more flexible format for creating future interdisciplinary degrees. Currently available modules now contribute to 15 other teaching programmes, highlighting the importance and popularity of the biological sciences with students across the University.

In terms of e-learning, Moodle was the platform of choice, but its reception amongst staff and students has been mixed: as a tool for 'communication', the system is primarily used to upload lecture materials so that they are continuously accessible. To further facilitate communication between staff and students, a committee structure has been implemented for each year and degree course. In addition, there are designated "office hours" every week when staff are on-hand for consultation.

Observations: While the number and scope of modules offered is impressive, there nevertheless appears to be some duplication. Given the increased teaching loads

accruing from all the changes since 2002, there is an opportunity here to reflect on whether some efficiency gains might be possible, which could mitigate current loads.

Teaching loads and infrastructural issues were also highlighted in the context of project work. In the 3rd and 4th years, the increased emphasis on independent work means that students undertake more literature- and lab-based projects. The question is whether all students who wish to undertake lab projects are able to do so (because these are not adequately resourced), and whether those who do opt for such projects get sufficient guidance in the lab once they're there (because staff loads preclude greater levels of interaction)?

The value of Moodle as it is currently used is questionable for various reasons: how could and should staff/students engage with the system to get the best out of their teaching/learning? Is Moodle just another onerous task for an already over-burdened staff? Is the ready access to online materials an excuse for students to avoid lectures? There is clearly another opportunity here, to reflect on whether the system is being used to its full potential, to ascertain what exactly staff wish to achieve with it (and whether Moodle is actually capable of delivering this), and potentially to explore other more innovative uses of e-learning approaches.

There is not enough dedicated lab space to teach the practical university course. The technicians borrowed lab space from the chemistry department, but this necessitated moving equipment from one building to another in time to teach one practical, and then back to the original building to teach the next one. Such a waste of time for a department that is already short of technicians and time!

Finally, despite the establishment of various committees and 'drop-in' times to facilitate communication between staff and students, communication, and especially access to staff, was a consistent issue for the students with whom we spoke.

Research & Scholarship

Most of the funding that supports the Department's research activities has been secured by competitive awards from national and international funding agencies, and from industrial collaborations (€39.5 million from 2004-2008). Currently, 20 research-active members of staff contribute to the funding and publication portfolio of the Department and its associated Institutes (3 chief technical officers and 2 part-time research technicians support their work). During 2004-2008, these PIs successfully mentored 56 PhD students and 11 MSc graduates. At the time of the Review, there were 58 PhD students, 24 MSc students and 25 PDRAs.

Changes to the research personnel since 1996 have seen a change of emphasis in Departmental research programmes, and in UG/PG training, such that there has been an intensification of molecular research activities. Nevertheless, 5 broad but overlapping themes have emerged:

- Animal genetics, genomics and proteomics
- Bioinformatics & computational biology
- Immunology
- Molecular & medical microbiology
- Plant biotechnology, evolution of development & molecular ecology

Within and between these themes, the inter-related research interests and experimental approaches of the different PIs have led to multiple successful project and equipment applications. In the last 8 years, they have secured funding for a significant array of large-scale equipment and core facilities, much of this via intra-departmental collaborative proposals to national, industrial and international funding agencies. In addition, the Department boasts a state-of-the-art computing (including Grid and distributed computing) infrastructure to support its bioinformatics activities.

Over the period 1997-2008 the department staff have authored 447 ISI recorded publications with 4738 citations to those publications over that time, including a number of publications in high-impact journals such as *Nature*, *PNAS*, *Current Biology*, *etc*. Similar numbers of conference proceedings, and numerous books and book chapters have been generated, together with some patents and invention disclosures, the latter with a view to commercialisation and manufacture in Ireland. Indeed, NUIM researchers have been involved in several successful collaborations with indigenous and international biotechnology companies, having facilitated new product development, technology transfer, intellectual property and employee up-skilling to MSc and PhD level.

Department and Institute staff have a demonstrably consistent track-record in attracting funding from large-scale research initiatives. Notable amongst these, the *Combat Diseases of Poverty* Consortium, which is funded by the HEA and Irish Aid, is a unique cluster of scientific, academic and NGO professionals working with partners in the private sector to build educational capacities for combating diseases of poverty, focusing initially on east Africa.

The Department's future research plans fall into 4 main areas, aiming to: i) achieve greater integration with research in the Dept. of Chemistry, toward establishment of a new Institute for Chemical Biology; ii) establish an inter-institutional Graduate Research Education Programme in Chemical Biology, in conjunction with ITT Dublin and Dublin City University; iii) establish a new taught MSc in Chemical Biology, aiming to attract non-EU graduates and ultimately to encourage transfer to University PhD programmes; and iv) establish a genomic sequencing facility as a mission-critical focus of the new Institute of Chemical Biology. Strategically, realisation of these plans will help NUIM to attract large-scale institution funding, will contribute to Ireland's goal of becoming a knowledge-intensive economy, will help the University to increase PhD student numbers by 2010, and will help to consolidate the medium and long-term research reputation of the Institution.

One staff member said ""The main focus of all Irish Universities is maximizing research income. I perceive myself and my fellow academics as income generating units for the University." A student said "I am unconvinced about the value all Irish Universities (especially University Administration) now place on undergraduate education. This is not a criticism- just a statement of fact." These statements suggest that there is a general view that the University Administration has other priorities than teaching and research. Better use of the overhead funds for grants is one area where this view could be addressed.

Observation: increasing the number of taught Masters could certainly contribute towards a system of tailored intake for PhDs; extending this to recruitment of non-EU students would also help to increase income from student fees. However, this will have an inevitable impact on teaching loads and a knock-on effect on the ability of the Department to meet its research goals.

Research Institutes

Institute of Immunology

Strengths

The Institute of Immunology is a jewel in Ireland's crown; an ivory tower with its base solidly planted in the soil of Ireland. Focused primarily on Immunological diseases prevalent in Ireland (MS, Asthma, RA and MRSA), it has expanded its view to global health and to the diseases of poverty, understanding that no nation today stands isolated, and that taking care of the planet is both wise and generous. It is also actively fostering collaborations with Irish industry, particularly biotechnology companies that can both gain and offer expertise in drug discovery and development, diagnostics, biopharmaceutical/ vaccine manufacturing and antibody-based therapeutics and services. Finally, the Institute has stepped across the barrier that

normally blocks communication between the Sciences and the Arts to promote collaboration with the Department of Anthropology at NUIM.

To further these goals, the department fosters basic and applied research, promotes partnerships with industry and government and offers a number of truly excellent coursework programs. This includes:

1. The only structured PhD program in Immunology in Ireland;
2. The only MSc program in Immunology and Global Health in Ireland;
3. A training program for students in which they pursue research and/or technical training at a private enterprise;
4. A partnership with the Department of Anthropology in which the two institutes lead a consortium of academic, business and NGO groups in the "Combat Diseases of Poverty Consortium (CDPC);
5. Publication of more than 35 primary peer-reviewed research papers, including such prestigious journals as *Nature Immunology*, *PNAS*, *J. Biological Chem*.

Altogether, this is an unusually excellent Institute, with global vision, a practical outlook, an excellent teaching program and state-of-the-art research.

Weaknesses

1. *The institute has 8 Principal Investigators (PIs) and a single technician.* This ratio is unheard of in any other Immunology department or Institute world-wide. Most immunology laboratories have at least one, and more often two, technicians per PI. Because of the current setup in the immunology institute at NUIM, PIs wash their own glassware, make their own buffers, husband their own mice, perform their own (often tedious) assays. This results in several problems: first, it is a waste of educated brilliance; second, with the time spent writing grants, and teaching students, the PIs no longer have time to do their own research because it would entail taking so much of their time to create the necessary reagents and run the assays (not to mention washing their own glassware). Thus the best and most educated minds in the labs are relegated to the office, trudging through the grant process, while the students carry on the research. Although students definitely need to carry out their own research, they are 'green' and take far longer to finish a project than an educated PI with a competent technician. The research at the institute therefore suffers tremendously. It is quite amazing that the institute has the publication record that it has, given the handicaps under which it functions.
2. *Everyone is stretched to the limits of their abilities:* from the PIs to the technicians, to the secretarial staff. There are too many students, not enough technicians/demonstrators, not enough secretarial and administrative staff, and not enough lecturers. There are two ways to handle this, either hire more academics, or take in fewer students. The current ratio is unsustainable. It impacts on undergraduate and graduate education, on the fundamental research and on the morale of the personnel. The staff are amazingly loyal, but they are seriously concerned for the future.
3. *The laboratories of the Institute do not occupy contiguous space, but are spread across two different buildings.* This makes communication difficult, both between PIs and their students. This has several ramifications. First it slows and/or blocks effective communication between the scientists in different laboratories. Science is best done when communication flows easily and ideas pass without barriers. Second, it puts a burden on the technicians. The Institute needs to be housed in a single building with dedicated practical labs and contiguous research labs.
4. *The overhead funds from successful grants are not returned sufficiently to the laboratories.* It appears that the University returns only a limited amount to the investigators that obtain the funds. Although it is appropriate to use some of

those overhead funds for maintenance of the buildings that house the laboratories, and to support university admin, it is also common practice to return some of the funds to the labs to be used for basic items, such as maintenance of equipment/purchase of new equipment, basic laboratory functions. Currently, it appears that much of the overhead funding from research grants is used to cover other university functions.

5. *The Institute (and in fact, the entire campus) is not fitted for wireless web access.* Wireless is inexpensive and incredibly useful! Not having it ties the scientists to the walls. It prevents them from congregating with other scientists and gathering/sharing/evaluating, information. It prevents visiting scientists from accessing the web, and gathering and sharing information. It prevents students from easily forming study groups with access to information. It is archaic!
6. Building security is problematical. The scientists (including PIs) do not have keys to the buildings. Postdoctoral fellows and postgraduate students often work at night, but their access to their laboratories depends on the good humor of the security personnel and this varies greatly. Students have been known to have to wait more than an hour for security to show up, at which point their experiments have been compromised by the delay.

Many of these weaknesses are not limited to the Institute for immunology, but are widespread in the department of Biology. The overall picture is of a department that has hired truly excellent people, and then overburdened them with a student ratio that is untenable, a severe lack of support staff, and a limited return on their hard-earned research grants.

Research Institutes

Institute of Chemical Biology

Strengths

With the creation of the Institute of Chemical Biology, The Department of Biology at NUIM is bringing itself squarely into the 3rd millennium. First, the aim (to make significant contributions to improved human, animal and plant health) is laudable. Research in biology has focused on human health for too long. We are beginning to realise that keeping ourselves free of cancer will do little good if we let the rest of the life forms on the planet die. It is encouraging to see that a new institute has a more global vision. Second, bringing together a group of people that includes not only basic chemists and biologists, but also experts in imaging, proteomics, neurochemistry, glycobiology, spectroscopy, molecular biology, plant molecular biology, molecular ecology, drug discovery, and bioinformatics, should lead to new conversations, new collaborations and the opening of new avenues of inquiry. Chemists and biologists have lived in separate worlds for too long. Third, incorporating input from other Institutions (Dublin City University's National Institute for Cellular Biotechnology, ITT Dublin's Centre for Applied Science in Health and Teagasc) will allow for both independent oversight and access to independent ideas. It increases the breadth of expertise available to the scientists at the Institute of Chemical Biology.

To further the goals of the institute, the group is planning to

1) develop three main themes (Proteomics and genomics, Biomedical and pharmaceutical chemistry, Environmental interactions and evolutionary biology), supported by four main technological areas (genomics, proteomics, analytical, computational);
2) Establish a Graduate Research Education Program that will offer a PhD program and a taught MSc;

3) Provide new Research support staff including Research Technicians and Laboratory Attendants. This will prevent the technological and experience drain associated with the current turnover of PhD graduates and Post-Doctoral Fellows and will align Chemical Biology infrastructure at NUIM with other national and international facilities. Obviously, the founding members have seen the hardship that lack of such support staff has created in the Immunology Institute;
4) Encourage commercialisation of research outputs (patent filings, technology transfer and potentially new company start-ups) and act as a beacon to attract the attention of major biopharmaceutical players to further develop, and initiate, valuable research collaborations with NUIM.

Altogether, the plan seems set to produce an excellent cross-disciplinary Institute.

Weaknesses

1) Although the plans for the Institute emphasise a "computational" arm, there is no strong representation of mathematics in the current staff list, nor any explicit plans to hire experts in this field. The algorithms needed to deal with the large sets of data that will be generated by genomics and proteomics are not simple, and are currently constantly being developed. If the Institute wants to be in the forefront of these fields, it will need to engage in the development of these mathematical processes, rather than simply waiting to use the processes developed by others. For this, it will need a strong section in the relevant computations.
2) Although there is wordage about patents, technology transfer *etc*., the Institute has planned for no partnerships with industry. This should be addressed.
3) The final sentence in the written proposal for this Institute reads, "*In summary, this new and integrated venture will strengthen the position of NUI Maynooth as a dynamic and innovative Institution - one which is capable of competing at both national and international level for future large-scale funding opportunities.*" Clearly, funding is the standard by which universities in general, and research institutes in particular, are measured in today's competitive academic climate. Nevertheless, against a growing atmosphere amongst researchers at NUIM that they are merely "income generating units" for the University, this vision perhaps needs to be tempered with other goals: *e.g*., producing the best research students (the kind that will change Irish academia and industry); performing nationally- and internationally-competitive research; serving as a resource for researchers in other institutes and for the community; and so on. Aspiring to these standards lies at the very heart of academia, and must not be allowed to be entirely overshadowed by fiscal considerations, essential though these are for the viability of every Academic Institute.

Leadership & Management

As one of the largest teaching and research units within NUIM, the Department faces significant managerial and leadership challenges. In recent years, the success of PIs in bringing in substantial research funding, coupled with increased student numbers, changes to teaching delivery structures (modularisation, introduction of new degree programmes, *etc.*), and the concomitant increase in admin duties at all levels, have conspired to increase the time-management burdens on all staff. The administrative and executive support for these activities falls to 1 senior administrator, 1 half-time administrator, 1 half-time executive assistant, 3 chief technical officers, and their 8-strong staff. A testament to the commitment and motivation of all staff is that, despite punishing workloads, the Department's atmosphere remains collegial, stimulating and supportive.

As an experimental discipline, Biology has a large practical component, requiring both substantial financial support from the Department's central budget, and substantial managerial effort: smooth coordination of practicals requires them to be prepared in advance by technical staff, and supervised by a lecturer, a senior demonstrator and PG demonstrators. The volume of students often requires duplication of practicals, but pressure on space requires equipment to be dismantled after each class and set up again for subsequent repeat sessions.

In an expanding Department, effective channels of communication are essential, both between staff and between staff and students. Formal staff meetings, chaired by the Head of Department (HoD), are held every month for lecturers, chief technical officers and the administrative officer, who also takes the minutes. For students, specific staff-consultation slots are timetabled, and *ad hoc* meetings can be arranged on an individual basis; students also have access to staff via email. In addition, the HoD is available at a designated time every week for students with academic or personal problems, and can be referred, if necessary, to the University's Academic Counsellor or the Registrar's Office. Students defaulting on practicals and workshops are also invited for consultations, a practice that has helped retention of students who appear to be under-achieving.

Since 2005, the Department has gone through two rounds of NUIM's Performance Management Development System (PMDS), a process designed to help improve individual staff effectiveness and, in turn, to enhance the effectiveness of the Department. It requires staff to reflect on the aims of their work, and to review their progress in achieving those aims. The next round of PMDS-based interviews in the Department is scheduled for 2010, and an extension of the system to incorporate PDRAs is currently under discussion.

Observation: with growing numbers of UG and PG students, whatever staff review mechanisms are put in place, these must allow individuals to sensibly balance their research and teaching commitments, to prevent the latter from damaging both individual morale and the Department's overall research-excellence goals.

Feedback Surveys & Informal Discussions

Staff and student satisfaction was assessed via feedback from questionnaires, telephone surveys, *etc*. Informal discussions were also held as part of the site visit.

For UG courses, compared to modules taught elsewhere in NUIM and the performance of Biology lecturers relative to other teaching staff in the University, the feedback indicated a good to very good performance by lecturing staff. Responses were generally positive across all categories, including provision of background material, open class discussion, fairness of evaluation methods and module work-loads. Nevertheless, several concerns were voiced: some students felt that there was insufficient flexibility and/or choice of modules, that some modules were quite poor, and some were not assessed; that Moodle was not used effectively; that there were insufficient tutorials, no careers advice, and no formal grievance procedures; that some staff used "office hours" to catch up on other things, that some didn't respond to emails, and some were too distant from students as individual learners – in short, that the Department, in getting bigger, was losing touch with its students.

Feedback from PG students was generally positive, although there was some room for improvement in the level of satisfaction with supervisors and amount of supervision (it was felt that the introduction of a mentoring system might help with some of the supervisory concerns). There was a range of opinion on teaching-related activities, some PGs embracing these enthusiastically, others wishing to spend more time on research. Overall, there was a general wish for more structure to their studies (including both Departmental and lab induction courses, more comprehensive Health & Safety courses, formal reporting processes to monitor their

progress, a PG rep, and so on). One of the most pressing issues related to the lack of social facilities, and hence the limited interaction that currently takes place between PG students – the coffee rooms in Callan and Biosciences are clearly too small to support the Department's growing PG student population. Another frustration concerned out-of-hours access to buildings, their work being hindered by swipe-cards that don't work and security staff who are sometimes unhelpfully slow. PGs also bemoaned the lack of wireless technology in Callan.

PDRAs commented that there is an excellent spirit in the Department, staff being very supportive and willing to help. They felt that there was freedom to discuss their ideas, but that a social space to meet and talk was lacking. In terms of their level of satisfaction with the balance of teaching and research activities, PDRAs tended to be fairly positive, all considering that teaching is useful for their personal development and most feeling that such activities were not detrimental to their research (although it was suggested that UG students should be better prepared before undertaking lab projects). There was less satisfaction with Departmental infrastructure, various criticisms being levelled at office space, library facilities, at the availability of computational resources, and at the drive to embrace new technologies without the staff to support them. Particular areas identified for improvement were in Departmental efforts both to commercialise research results and, in general, to disseminate them (*e.g.*, through greater internal and external collaborations, improved seminar series, and outreach to the adult community). They also recommended greater levels of involvement of technical staff with research activities.

The responses of academic staff were also largely positive, with a number of areas being highlighted for improvement. A recurrent theme was the tension between the desire to engage meaningfully with students and the difficulty of doing so with large class sizes; moreover, time-tabling and financial issues appear to be placing the provision of suitable practical and field-work opportunities for 3rd and 4th year UGs under threat. There was a general feeling that because staff are now so busy, it is becoming increasingly difficult to step back, to review and hence to improve their current teaching practices. For some, there was a feeling of being driven by the University to do, and to achieve, more and more, with less and less resource; a reduction in quality across the entire spectrum of academic skills (writing papers and grants, supervising research students, teaching undergraduates, managing projects, industrial liaison, *etc.*) would be the inevitable outcome.

Feedback from technical staff was, again, both positive and negative. Most of the substantive issues were infrastructural, most a direct consequence of the Department's growth: buildings designed for much smaller numbers of students; lab space insufficient to accommodate large classes; insufficient basic teaching instrumentation (microscopes, incubators, computers, *etc.*), leading to the daily transfer of equipment between labs; inadequate storage facilities; insufficient space for core research instrumentation, culture rooms, etc.; suboptimal air handling in the Bioresource Unit; an inefficient, paper-based procurement and accounting system; broken lights and leaking taps remaining unfixed; and so on. It was also noted that specialised research equipment was without dedicated personnel either to manage it or to train researchers how to use it. Similarly, buildings were without porters to receive deliveries, process orders and deliver goods to relevant buildings – currently, the technical staff *are* the porters. Technical staff lamented the fact that they used to be able to spend some time supporting research projects, but demands on their time are such that this is no longer possible – this is evidently extremely de-motivating for staff who are qualified for more than mere 'porterage'.

Feedback from admin staff was also largely positive, but there were some concerns. Again, many of these were broadly infrastructural (lack of storage space for office supplies; inadequate air conditioning; the need for better building maintenance and

cleaning, improved organisation of recycling, better Security presence, *etc.*). As an undercurrent to all of these issues, a very keen note of professional frustration was also perceived, undoubtedly arising from the fact that staff at all levels are over-stretched: in particular, academic staff do not always respond to requests for information, which wastes time and puts admin staff under further strain – when there are insufficient staff to meet the daily demands on their time, problems like this quickly become significant aggravations. Also relating to the pressure on staff time was the fact that, although training courses are available, there is simply not enough time to attend them (the same issue was raised by technical staff). In the long-run, such situations erode morale and lead to staff skills falling behind the march of progress and technology innovation.

The growth of the Department, coupled with the proliferation of degree programmes and their modularisation has rendered admin far more complicated than it used to be. Consequently, most of the senior administrator's time is consumed with teaching (especially exams) support; this heavy workload is exacerbated by members of academic staff who are not good team players, and is made still worse by those who delegate to her the task of uploading their teaching materials to Moodle.

Observation: a note of urgency was felt here, not just in terms of the need for additional manpower, but also to address the professional frustrations, which, if unchecked, will undermine both the smooth running of the Department in general and its highly valuable collegial atmosphere.

Health & Safety

Radiological safety and GM compliance are subject to biennial inspection from the relevant State Inspectorate bodies; general Departmental safety is covered by a University-approved Safety Statement; risk assessments are completed by technical staff for all UG practicals; and a range of safety training courses is provided for all staff and PG students. Some areas were noted for improvement, including training in Chemical Safety and Risk Assessment, and Manual Handling; the need to tighten controls on provision of blood samples by volunteers, and to introduce a 'permit to work' system for Risk Group 2 and 3 biological agents was also highlighted.

Observation: appropriate Health & Safety training needs to filter down to all levels, including PG and UG students, some of whom felt that there should be more Health & Safety information for particular labs and particular projects in those labs, rather than just the current general training.

QIP & Recommendations

The long-term strategic plan of the Department is to consolidate the existing highly successful teaching and research programmes, to improve the physical infrastructure that supports them, and to expand PG research functions. The most significant barrier to success across all areas of teaching and research (*i.e.*, generating external funding, performing internationally competitive research, providing a 1st-class teaching environment for UG students, establishing properly structured PG schools, *etc.*) is the current limiting number of lecturing, technical and admin staff. Different strategies could be implemented to address this problem, but some of these would result in restriction or exclusion of choice for students. The proposed solution is to bring the Departmental student:staff ratio in line with the average FTE ratio in the Faculty of Science and Engineering, and also to seek 2 additional technical and 1 further admin post to support one of the most research-intense teaching units in the University.

The ability of the Department to maintain this position is undermined by its need for extra resources, without which it cannot maximise its potential. Based on the actual cost of projects relative to the funds made available by the University, the QIP recommendation is to increase levels of funding by €600/annum for 4th-year projects,

€1,000/annum for MSc projects, and €2,000/annum for PhD projects. Currently, all the Department's research projects are significantly under-funded; better support of the core Departmental budget, taking into account the number of 4th-year and PG students, would help to address this problem.

In terms of infrastructure, a significant efficiency gain could be achieved by extending the UG teaching lab in Callan by a further 50 slots, thereby reducing the number of 1st-year practical repeats. Further extension of Callan would also allow the establishment of several new research labs and a centralised bioanalytical core facility. To meet the ongoing maintenance costs of core equipment (~€380,000 over the next 3 years), the recommendation is to draw up a financial plan with the University's Central Administration.

Vision Statement of the NUIM Dept. of Biology

The vision of the Department is, "to attract highly motivated students and provide a stimulating environment through teaching and *state-of-the-art research* to produce the next generation of confident and highly capable Irish bioscientists." Given the excellent things we witnessed during the site visit, and the inspiration, drive and commitment of the staff we interviewed, perhaps a better vision would be to "provide a stimulating environment through *state-of-the-art teaching and research*"?

Conclusions

The self-assessment documentation, and especially the site visit, highlighted several key strengths of the Department of Biology. The staff are currently happy, they are clearly highly motivated, industrious and productive, and benefit both from the collegiality that comes from working in a small university and from their freedom to work, unhindered, across departments. Punching above its weight, the Department consequently enjoys an excellent reputation and has been able to attract first-rate research groups. Moreover, it provides a diversity of degree programmes that makes it distinctive from NUIG, UCD, UCC, and other Irish Universities, and is attracting more and better students through its new denominated degree programmes. Everyone must be congratulated for the Department's achievements.

Our discussions with staff and students provided a powerful reminder that people are both departmental assets and, above all, human: people need recognition, they need support to help them both to achieve and to maintain excellence, and they have limits. Partly as a consequence of their own success, the staff are now under considerable pressure: they are struggling for space; they face operational inefficiencies oscillating between different buildings for teaching, research, ordering supplies, and so on; they waste time moving equipment; they have too many students per head; they waste time repeating classes; there are too few technical and admin staff to help ease the burdens; they consequently rely heavily on PG students, RAs and PDRAs, who take expertise away from the Department when their contracts end; they have too little time to reflect on the quality of their teaching and their module content (much of which has become repetitious), let alone to innovate; they have less and less time to conceive and to write new grant proposals; and current staff-development protocols do not adequately nurture their talents. Students consequently have less and less access to staff who are more and more busy; UGs see inflexibility in the modules that are offered to them; PGs see more of their time spent on technical support than on research; all feel the lack of their own 'social space', where they can get refreshments, meet each other and talk, especially since the loss of the canteen.

Nevertheless, arising from the current situation, there are clearly many valuable opportunities to be grasped: *e.g.*, from the point of view of research, to work in interdisciplinary ways, to recruit more PG students, to attract further excellent groups, and to nurture world-class institutes; from the point of view of teaching, to increase

the quality of UG student intake, to review current teaching practices, to streamline module provision, to innovate and use Moodle or other ITs more effectively, and to engage with students in more imaginative ways. Perhaps most important for the Department are the opportunities to recognise and reward, motivate and retain excellent staff, and to make best use of an extremely supportive University President.

The consequences of not building on the Department's obvious strengths and of not seizing these vital opportunities could be considerable. The most significant impacts and threats are likely to be erosion of morale and loss of staff owing to: onerous teaching loads, where too few academics are required to sustain an expanding student population without adequate technical and admin support; inefficient research practices, where short-term contract staff inherit the burden of running and maintaining core equipment, valuable equipment then becoming unusable in the face of breakdown and no ongoing technical support; the inhibition of interdisciplinary work and loss of collegiality through imposition of inappropriate FEC models, which render inter-departmental teaching and research complicated, competitive and costly; the failure to recoup adequate overhead costs from research grants; unsustainable funding models to support the growth of new institutes; the loss of intimacy/collegiality through, and inadequacy of current infrastructures to support, unchecked Departmental expansion; the failure to reward staff who try to achieve excellence in spite of such obstacles. Another key threat concerns student choice: if issues relating to the over-stretching of teaching staff become entrenched, students will choose not to take up degrees in NUIM Biology, but will go elsewhere instead. A further, unrelated, issue concerns the animal house, which, without adequate ventilation, could be closed down if it were to fail to meet EU regulations. The current poor economic climate clearly poses an additional threat, at a time when many of the problems that need to be addressed require an injection of funds or development of more appropriate funding models.

The Department seems, then, to be poised on a knife-edge, where there is everything still to be gained, or where everything gained to date could simply be lost. The recommendations that follow are largely people-centric, but some are operational, and all are presented with an appreciation of the very real difficulties imposed by fall-out from the current global economic crisis.

Recommendations

The Department of Biology currently enjoys an excellent reputation for the quality of its research achievements and the distinctiveness of its degree programmes, setting it apart from other Irish Universities. In a tough economic climate, maintaining this position is crucial, and it will be impossible to do so without an injection of additional resources. The bitter-sweet circumstances we observed during our visit to NUIM Biology make this a tough call, and render the recommendations of the QIP a matter of urgency.

It has been observed that there are 3 things that make the workplace bearable: sufficient autonomy, sufficient complexity (*i.e.*, not drudgery), and sufficient reward for effort. From the discussions during our visit, staff gave the impression of having a lot of autonomy and a lot of complexity, but of not receiving sufficient rewards for their efforts. Without positive incentives, without further support, staff will ultimately become demoralised, the quality of their research will drop, the quality and number of publications will decrease, and the Department's commendable research goals will begin to recede. In light of our analysis, we endorse the QIP and also offer further recommendations: *i.e.*, efficiency gains not only through establishment of new posts and recruitment of new staff, but also through infrastructural/procedural changes; and morale gains through improvement of staff progression protocols, and development of a culture of recognition of hard work and excellent achievement. The specific recommendations under these headings are set out below, very roughly in order of

their resource implications. Failure to make appropriate investments will engender the most significant impacts to the ability of the Department to attract and retain the best UG and PG students, to create and sustain new MSc programmes, to turn out well-trained personnel for Irish bioindustry, to become involved in national and international collaborations, to attract significant research income and maintain substantial research outputs, and to remain one of the best equipped and resourced biological research departments in Ireland (these impacts primarily relate to NUIM's Strategic Goals SG1, SG2, SG3, SG4, SG6, SG7).

Efficiency gains through creation of posts/appointment of staff

To make an immediate and demonstrable impact on the efficiency of the Department in terms of their current teaching, research and admin practices, some additional staff resources are badly needed. Each of the following would make an important contribution, and we recommend that the order of ranking and prioritization within any resources that become available should be a matter for the Head of Department.

i) appointment of a porter
ii) appointment of another full-time admin post
iii) appointment of an additional equipment technician
iv) appointment of an animal technician
v) establishment of a permanent senior demonstrator position
vi) appointment of additional lecturing staff to bring the staff:student ratio into line with the average in the faculty of science and engineering.

Efficiency gains through infrastructural/procedural change

To address the infrastructural and procedural barriers to efficiency currently experienced by the technical staff, we recommend:

i) implementation of an online procurement system
ii) planning for the future creation of a dedicated bioinformatics teaching lab
iii) establishment of a dedicated teaching lab to obviate time wasted setting up classes in different places
iv) establishment of central stores for bulk supplies, paperwork, refrigeration, and so on
v) establishment of a tea room
vi) establishment of a core facility to house high-end equipment, specialist culture rooms, *etc*.
vii) investment in a separate building for an SPF facility.

Morale gains through staff-progression protocols/recognition of excellence

To demonstrate to staff in the Department that their contributions matter and that they are valued, we recommend:

i) encouragement of a culture that recognises and rewards excellence
ii) improvement of staff career-progression protocols, and
iii) ensure that promotion opportunities are available to all staff who qualify against established benchmarks.

Comments on the methodology of the review process

The review process was extremely impressive: it was conducted in a highly professional way and was excellent in almost every aspect. In view of the intensive nature of the site visit, two points might be considered to facilitate and expedite future reviews: i) to schedule more time for the external reviewers to discuss their findings with each other during the visit, and ii) to concentrate more of the group meetings in one place, to avoid losing time in moving between different meeting locations.

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Professor Polly Matzinger
External Reviewer

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Professor Teresa Attwood
External Reviewer

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Professor Jim Walsh
Internal Reviewer

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Professor Ray O'Neill
Internal Reviewer