University College Dublin

Quality Improvement Plan

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UCD School of Physics

August 2018

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1. Introduction

Brief Methodology

The School sees the quality review process as an opportunity to reflect on the changes and developments of the last five years, to recognise challenges and to plan for the future, based on the resources available. A subset of the School of Physics Self-Assessment Report Co-ordinating Committee was called upon to coordinate the development of the Quality Improvement Plan. As with the preparation of the Self-Assessment Report and the School response to the Review Group Report, the process was made open and transparent to the School and all staff was encouraged to provide feedback and contribute to the development of the Quality Improvement Plan. Responses to recommendations were drafted by committee members based on inputs from staff and then opened to staff for further commenting.

Quality Improvement Committee

Chair: Professor Brian Rodriguez
Head of School & Head of Subject: Professor Martin Grünewald
Head of Research & previous Head of School: Professor Padraig Dunne
Chair of IOP Accreditation Committee: Associate Professor Luis León Vintro
Head of Teaching & Learning: Associate Professor Brian Vohnsen

Brief Timeline

The School of Physics Quality Review took place on 27 February - 2 March, 2017. A draft of the Review Group Report was provided to the School on 21 August and made available for comment to all staff from 24 August - 22 September. The School of Physics Self-Assessment Report Co-ordinating Committee used these comments to prepare a response to the prioritised recommendations. A draft response was circulated to staff on 25 September and presented to the School at the School meeting on 26 September. The draft remained open for comment until 29 September. A revised version was circulated to staff on 2 October for final commenting. The School submitted the response to the Quality Office and the College Principal on 4 October and 5 October, respectively. The final Review Group Report was sent to the School on 5 December.

The Quality Improvement Committee was established on 18 January, 2018 and met on 9 February for the first time. A preliminary draft Quality Improvement Plan was circulated to the School on 16 February and discussed at the School meeting on 6 March. A meeting open to all staff took place on 27 March to discuss specifically the School's prioritised resource requirements. Subsequently, a second draft of the Quality Improvement Plan was circulated to the School on 28 March in advance of the 9 April School meeting where again the Quality Improvement Plan was an agenda item. The Quality Improvement Plan was open for comment until 25 April, at which time the third draft was completed. This was sent to UCD Estate Services and UCD Science Operations on 27 April and quotations received have been included. This final submitted Quality Improvement Plan has been circulated to the School once more prior to submission. Throughout the process, the School has received regular updates at the School meeting.

Categories

1. Recommendations concerning academic, organisational and other matters which are entirely under the control of the unit
2. Recommendations concerning shortcomings in services, procedures and facilities which are outside the control of the unit
3. Recommendations concerning inadequate staffing, and/or facilities which require recurrent or capital funding

Timescale

A. Recommendation already implemented
B. Recommendations to be implemented within one year
C. Recommendations to be implemented within five years
D. Recommendations which will not be implemented

Report	RG Recommendation	Category	Action Taken/Action Planned/Reason for Not Implementing	Timescale
			ORGANISATION AND MANAGEMENT	
2.8	The School needs to be more vocal and proactive about its achievements and the supports that it requires, particularly in the areas of research and infrastructure. To that end, the School should actively engage with UMT and the relevant UMT officers on these issues, both through University fora (ELG, for example) and through individual meetings (Head of School/Head of Research could arrange to discuss issues with VP for Research, for example).	1	**Comment:** The School has and will more actively vocalise our achievements through established communication/dissemination routes including our website and recently established Twitter feed, and through normal communication channels within the College and University that result in positive stories about the School, such as the recent article in *UCD Today* on the visit of NASA's Robert Lightfoot. So far, on a case-by-case basis, discussions are ongoing with the College Principal and the University VP of Research regarding both achievements and required research and infrastructure supports and, when appropriate, relevant UMT officers will be invited to the School for meetings. We will continue to participate fully in the College effort on the Science Phase 3 development. **Action:** To strengthen our connection with the College of Science and the UMT, we propose two key initiatives. First, we propose that at the College of Science Executive Committee meeting, Heads of Schools will provide updates on achievements and required supports on a rotating basis - this has already been implemented by the College	**A and B**

			Principal. Second, the School will consider preparing annual reports that document our achievements and required supports, which will be provided to the College of Science, the UMT, and other relevant stakeholders. We will follow-up with recipients to ensure that the information is received and to optimise its impact.	
2.9	The Review Group felt that there was scope for closer collaboration between the School and other decision-making entities across the University, and recommend that the School develop better connections with these bodies to help the School achieve its goals.	**2**	**Comment:** The School will improve its collaboration with other decision-making units across the University by proactively providing input, information and concerns in various fora, such as dedicated meetings on research, teaching and learning, engagement, etc. The School engages with and provides feedback on the academic regulations consultation process **Action:** Relevant staff within the School, as identified by their roles and responsibilities, will ensure that issues important to the School are raised at the corresponding College and University meetings in order to make our point of view known.	**A and B**
2.10	The College Principal and Executive Committee should support the School in improving its links with other Schools, disciplines and management groups. The Review Group recommends that the College senior management should be brought into these discussions, where relevant.	**2**	**Comment:** We fully agree that the School should be supported by the College Principal and the College Executive Committee in improving links with other Schools, disciplines, and management groups. The College has been informed of this recommendation. The proposal to rotate Head of School updates at the College of Science Executive Committee meeting will facilitate interactions between Schools and help the College Principal identify where supports are needed and opportunities that might be otherwise missed. We propose that the College reinstate catered research meetings between schools or across the College where one school serves as host and staff mingle while discussing enhancing links during, e.g., poster presentations highlighting research activities within the school. Since the Quality Review site visit, the School has already invited College senior management to the School meeting and will continue to seek out such interactions. The School has active engagement with the College HR Partner and furthermore recently invited the Research Finance Office to meet with the School. **Action:** We will discuss at a future School meeting whether sufficient links are present with Teaching and Learning at the University level and whether to request support from the College to facilitate interactions.	**A and B**
2.11	Whilst the day-to-day operations of the School are highly efficient, there is a need to embed strategic planning more securely into the School.	**1**	**Comment:** The Head of School typically draws on the expertise of an informal executive committee, comprising the incumbents of major School roles and responsibilities, in order to discuss various cross coordination areas. The main decision body remains the	**A**

			School meeting, with the informal executive committee preparing for it and executing its decisions when applicable.	
	In line with UCD Statute 6, the Review Group recommends the establishment of a small executive committee (5-6 people) tasked with articulating and implementing strategy on a rolling basis – this group should be drawn from the full range of grades and areas of specialisation in the School. Decisions/ recommendations should be clearly communicated to the body of the School, and the committee should be open to proposals and initiatives from the School.			
2.12	Incoming post-holders should shadow the current post-holder for a period appropriate to the role (e.g., for Head, this should be a period not less than 6 months). The Headship transition should take place in June, rather than September in order to facilitate the efficient management and development of the School.	1	**Comment:** Staff are appointed to new roles generally during the second semester of an academic year and take over the role fully from the start of the following academic year. This provides sufficient time to transfer knowledge, expertise and practical "how-to". Furthermore, the past incumbent is in most cases still a member of the School and thus available to advise the successor. The Head of School role requires a longer overlap period, requiring that the new Head of School is identified early in the second semester. **Action:** The School will consider if the overlap period should be lengthened.	**A and B**
2.13	The Review Group recommends greater transparency in appointments to roles in the School and that for career development and better decision-making these roles should be rotated amongst different groups and categories of staff.	1	**Comment:** Roles and responsibilities are typically taken on for three years (renewable) and are always advertised openly in School meetings and via e-mail to all staff. The Head of School encourages staff to take on different roles. In cases where there are several candidates for a role, the Head of School takes into account performance in previous roles, equality, diversity and inclusion aspects, as well as career stage, when appointing staff to roles.	**A**
2.14	The School currently does not operate a workload model. The Review Group recommends that the School investigate existing models and adapt them to the School's needs. The workload model should be viewed primarily as a developmental tool to enable recently appointed staff in particular, to focus on consolidating their research output and profiles.	1	**Comment:** The School operates a workload model comprising teaching and learning at undergraduate and graduate level, as well as academic engagement beyond teaching and research (e.g., roles like Head of Teaching and Learning, etc.). Research activities are currently captured by the university via OBRSS (based only on publications and PhD supervision). **Action:** The university may introduce an academic workload model in the future, which the School will discuss and would likely adopt depending on its complexity. The School	**A, B and C**

			will also lobby the university to include research indicators beyond OBRSS, for example, grant proposals and grant income or professional service such membership on editorial and other national and international boards, when making a statement about whether staff members are research active.	
2.15	The Review Group recommends that the School develop stronger supports in relation to career development and mentoring for all categories of staff, in keeping with the UCD Performance for Growth framework. To this end, the workload model recommended in 2.14 would support planning and career development.	1	**Comment:** This important issue was also raised as part of the Culture and Engagement Survey at UCD. The School is committed to leveraging the growing University/HR support to enhance career development and mentorship at UCD and College level and within the School. The UCD Performance for Growth (P4G) process is forthcoming and is expected to provide input into the promotions process, as well as performance review and discussions of future career development in the areas of research, teaching and learning, and academic engagement. **Action:** The School will participate fully in the forthcoming P4G process, prioritising and giving feedback especially to younger staff and staff needing additional support. The College of Science along with the College of Social Sciences and Law have recently introduced a mentoring programme for newly hired academic staff (Newly Appointed Assistant Professor Pilot Development Programme) that the School supports. Further supports are provided by the UCD Career Development Centre, which hosts career development workshops for staff and students.	**A and B**
2.16	The Review Group would like to see better and clearer communication at all levels from UMT/College down to the School (e.g. key officers should be invited to talk to the School) but also within the School (regarding, e.g., new promotions system, building plans).	2	**Comment:** This mainly requires a change in the UMT and College communication effort. **Action:** The School will invite specific presentations to cover various issues (promotions, alumni relations, P4G, building refurbishments, etc.), to be kept informed, and to provide its point of view.	**A and B**
2.17	The School should review and revise its Strategic Plan on a regular basis in tandem with, but independently of, the annual reviews required by UMT and the President.	1	**Comment:** An integrated planning process is foreseen to be rolled out by the University for all units from 2018 onward, to consolidate and integrate the planning the areas of research, student enrolment and staffing, and to support the School's strategic initiatives and their reviews. **Action:** Research strategy will continue to be driven by the recent initiatives of the School (Centre for Physics in Health & Medicine, Thomas Preston Centre for Fundamental Physics, and the in-progress study of a UCD Space Science & Engineering	**A and B**

			Research Centre). The research planning process will continue with annual reviews to be led and implemented by the Head of Research, drawing on staff expertise.	
	STAFF AND FACILITIES			
3.11	The School and University should continue to engage with issues surrounding gender representation in the School and strongly engage with Athena SWAN (see also 3.1). *3.1 The Review Group strongly encourages the School and University to continue to engage with Athena SWAN/Juno, especially given that compliance with these frameworks will become a requirement of funding bodies.*	1	**Comment:** We fully agree with the recommendation and note the importance of Athena SWAN/IoP Juno both in terms of equality and future funding requirements. The School of Physics Juno lead played a major role in the roll out of the Athena SWAN process to Irish universities. UCD was successful in their application for the Bronze Award in 2017 (http://www.ucd.ie/equality/groups/athenaswan/). As part of the UCD action plan, the university committed to supporting School/Department applications and has now organised Data Group and HR support with responsibility for supporting Schools. The School of Physics Juno lead is also founding chair of the UCD Women in the Sciences (WiTS) (http://www.ucd.ie/wits/) group, which organised a number of successful events, including the first UCD Unconscious Bias training workshop delivered by Prof. Paul Walton in collaboration with the Institute of Physics Ireland. **Action:** With the support of UCD now in place, the School intends to submit its IOP Juno application by November 2018. Strengthened ties between the School, the College, and management groups, as outlined in other recommendations, will further benefit our School's IoP Juno application.	**A and B**
3.12	The School should develop a policy on induction, probation and mentoring for all new staff in keeping with relevant UCD policies.	1	**Comment:** New members of the School participate in a University-wide induction process and have full access to and are encouraged by the School to avail of career development information and opportunities provided by the College and University. The School has an informal induction process where new hires are informed about the norms of the School and the expectations of their roles. New hires also receive an organisational chart. **Action:** The School will formally assign an appropriate mentor, from a closely related field of work, to new staff for 6 to 18 months depending on staff cohort. This mentor will be a point of contact for navigating the School and University. Following this induction period, career development and mentorship as outlined in 2.15 will take place. Recent College initiatives will formalise new staff induction at the College level.	**A and B**

3.13	The Review Group recommends the development of practices to integrate postdocs into the culture of the School and that postdocs be encouraged to take up relevant training opportunities.	1	**Comment:** A postdoc representative participates in School meetings. Postdocs are encouraged by staff to attend seminars and avail of University career development supports. Efforts are ongoing to improve the School culture as it relates to seminars for staff and students alike. Postdocs receive bespoke mentorship relevant to their career stage and research area from their supervisor. **Action:** The School postdocs will continue to be encouraged to organise as a group and will be given a budget to arrange research/social events. The School will solicit new postdocs to present seminars within the School. The postdoc group will also be encouraged to nominate speakers for seminar slots each semester. Every postdoc will be given a webpage on the School website.	**A and B**
3.14	The Review Group recommends that the School develop a staff handbook detailing key processes and operations.	1	**Comment:** Given the low rate of new staff hires, the School is committed to personalised training and induction for each staff member (see 3.12) as opposed to a staff handbook that will inevitably become outdated within a few months. Similarly, regarding School roles, staff members are appointed to new roles typically during the second semester of an academic year and take over the role fully in the following academic year, thereby providing enough time to transfer the expertise between staff (see 2.12). In this way, the School retains detailed information about key processes and operations. The College and University provide or plan to provide further documentation outlining expectations of staff (promotions workspace, development workspace, job families framework, P4G, etc.).	**A**
3.15	The Review Group recommends that the College and University reconsider the current policy on Administrative career development and promotion.	2	**Comment:** The School understands that the College and University are working on this policy noting the Job Families Framework initiative outlined in the Human Resources Strategy 2016-2020 document. According to the document, a "Job Family is a group of related roles, shown in order of career progression and detailing the functional skills required at each level" and the framework "will describe functional competencies for roles in a clear and consistent manner, as well as providing the basis for enhanced career and development planning." While this framework addresses career development, it does not address the issue of promotion within a unit.	**B and C**
3.16	The School should lobby UCD HR and the University Management Team to ensure supports for new staff/PhD students relocating to Ireland are developed.	1	**Comment:** The School strongly supports efforts to make international staff and students feel welcome and be more productive. UCD HR provides supports as it relates to incoming international staff and UCD International provides support to incoming international students. Staff and students are made aware of these supports and	**A**

			encouraged to avail of them.	
3.17	The School should be supported by the College of Science and UCD Estates in resolving the sub-optimal physical resources.	3	**Comment:** The School agrees and we have already formulated requests; however, support has been limited due to funding constraints.	A
3.18	The Review Group recommends that the Vice-President for Campus Development should be invited to a School meeting to provide context and clarity around the refurbishment and upgrade of Science North, with particular regard to the timeline, the consultation process and the need to take full account of the specific physical and research needs of the School.	1	**Comment:** We are fully committed to engaging with the College regarding Phase 3 development and a meeting with the VP for Campus Development took place in April 2017 following the site visit. While the engagement was positive, no concrete outcomes were established. Fund-raising efforts have started only recently. As this is a multiyear project, it is expected that discussions will be ongoing. Strengthened ties between the School, the College of Science, and management groups as outlined in other prioritised recommendations and increased visibility afforded by providing School updates at the College Executive meeting should make our voice heard in the Phase 3 development and design process. **Action:** We will invite the VP for Campus Development and the College Principal for another discussion in early 2019.	A and B
3.19	The School should be fully embedded in the development of any planned renovations and associated project management.	2	**Comment:** This has been communicated to the College and the School has met with the VP for Campus Development. The School is committed to being involved and supports any efforts by the College and UMT to embed the School in the development and implementation of these plans. **Action:** The School will outline requests for Phase 3 to the College and UMT within the 2018/19 academic year.	A and B
3.20	Notwithstanding the plans for renovation of the building, existing rooms and facilities need to be proactively maintained.	3	**Comment:** This has been communicated to the College. The School requires, as a matter of health and safety, new windows and heating in Science Centre North. Not all requests have been adequately addressed.	A
	TEACHING AND CURRICULUM			
4.16	The School should make more explicit the transferable skills students acquire.	1	**Comment:** The curriculum review exercise has resulted in a clear definition of skills acquired. This will be communicated to students via the UCD and School of Physics websites to provide maximum visibility. This was also stressed by the recent Institute of	A, B and C

			Physics (IOP) Accreditation Report that identified the need to embed "group work" and "writing for a non-specialist" audience into the programmes. Group work and presentation skills are already present in Principles of Scientific Enquiry (SCI10010) and in laboratories, but financial constraints, staff-student ratio, and lack of suitable space limit a more widespread adoption. This could be resolved with more project-based learning, group rooms, writing and presentation skills throughout the programme that will prepare students better for collaboration, research and societal values in agreement with the UCD Mission, Vision and Values statement. **Action:** The skills that are expected to be acquired by students will be communicated to students via the UCD and School of Physics websites.	
4.17	As more of the campus develops, the state of the building will make it more difficult to attract students. As set out in section 3 above, there is need for clarity about the likely timetable for refurbishment.	2, 3	**Comment:** The School has no direct control on the process. The School is dependent on the realisation of the UCD campus development plan. **Action:** The School will make continued efforts to accelerate the process with either partial improvements to solve the most pertinent building problems (windows, heating) or initiate the refurbishment in the way required by the School as soon as possible.	**C**
4.18	Some 'small group' tutorials have c50 students; the School needs to address this by using any budget surplus to support a better staff-student ratio.	3	**Comment:** More financial support is needed to improve the situation significantly. The increased load in student numbers and teaching provided by the School is not matched with a corresponding staff increase. The number of paid student demonstrators will be increased to the extent that the School budget and graduate research activities allow. As also identified by the IOP Accreditation Report more group work would be ideal, but this will require an increased budget for supervisors and availability of adequate teaching space. **Action:** The School will address this as far as the School budget and workload model allows. Support from the College and University is required.	**B and C**
4.19	Falling PhD numbers is impacting on the number of graduate students able to help deliver courses through demonstrating and tutoring; the School needs to find work-arounds. Proper remuneration and training would make these roles more attractive to graduate students.	1, 2	**Comment:** The funding situation in the past decade has had a negative impact on the number of PhD students and thus the availability of demonstrators and tutors. Yet, the School offers a module on "Physics Demonstrating & Tutoring" (PHYC40570) that involves 60h of practical demonstrating/tutoring. Also, the School has graduate students on SIRAT scholarships with larger teaching loads and two full-time teaching fellows that carry a major part of the load. This ensures that graduate students are not	**A, B and C**

			overburdened with teaching commitments and that they are paid for any extra hours beyond those involved in PHYC40570. **Action:** The School will continue to make use of Teaching Fellows to cover a large fraction of the demonstrating/tutoring load within the available budget and academic staff will continue to apply for research funding to alleviate the problem with more graduate students.	
4.20	The College and the School could usefully consider ways to improve the support system for postgraduate students, especially for those from overseas or on non-standard studentships. In particular, communication of available supports could be improved.	2	**Comment:** UCD HR and UCD International provides support for new staff, both national and international, and the School of Physics has implemented a mentoring scheme to provide additional support to new staff. An induction event has been put in place for new graduate students (see 5.7) that, along with the doctoral study panels, provide support and guidance in addition to the guidance and support from their supervisors. All MSc directors provide support to the different MSc streams in addition to the Head of Teaching and Learning, the Head of Research, and module coordinators. The School has social activities for new students and for recent graduate students that allow them to meet with each other and staff.	A
			RESEARCH ACTIVITY	
5.6	Despite the lack of SFI funding available for fundamental research in physics, it is essential that this activity continues and support for the Centre for Fundamental Physics may be a way in which funding support can be attracted.	3	**Comment:** Two Thomas Preston scholarships for the Centre for Fundamental Physics have just been announced and two further are in a planning and fundraising phase. We are actively engaged with our Alumni in this regard.	A
5.7	A more comprehensive and documented induction process for PhD students should be put in place as well as ensuring that the students have annual progress meetings and give annual seminars.	1	**Comment:** The School has and will continue to run an annual induction event for PhD students. School and University graduate guidelines are also provided to every student at the start of their PhD and synchronised with Graduate School events. PhD students make presentations annually during their Doctoral Studies Panel meetings and also deliver a School-wide seminar as part of their stage transfer assessment. Group seminars also take place at a frequency determined by the respective supervisor.	A
5.8	The Review Group recommends that additional consideration be given by College and University to the management of research overheads in	2	**Comment:** The overhead return to the School by the College and University is below 10%. The School would welcome a larger return and wants to develop a long-term plan for such funds. The College and University also make some funds available through a	B, C or D

	relation to long-term planning and sustainability such as keeping expensive equipment running.		seed funding scheme. The College has also initiated discussions around equipment maintenance needs across the College; however, no funding has been secured to date.	
5.9	There could be greater transparency at School level about how the overhead is distributed back to staff and recognition of the different types of support needed by the different research groups is important (e.g. travel, equipment, buy out, etc.).	1	**Comment:** See 5.8; the value of the overhead received by the School is very small, on the order of 20k per year. In some years, we have run a process to allocate the small amount among the groups based on need and an application by PIs; however, this has not been possible for several years as the funds are required for essential School operations. Budgetary constraints are discussed at School meetings.	**A**
5.10	A mechanical workshop is important for a school of physics for the construction and fabrication of novel instrumentation and devices. The School should consider how the machines in the workshop could be upgraded, including a water-jet cutter and/or a laser cutter. A high-quality 3D printer may also help in prototyping.	1	**Comment:** The School has leveraged School spin out companies to upgrade workshop equipment allowing the purchase of a new milling machine and a new lathe in the mechanical workshop. The teaching lab managers and electronics workshop are also essential to the on-going successful operation of the School.	**A**
	MANAGEMENT OF QUALITY AND ENHANCEMENT			
6.7	The Review Group recommends that the School develop more flexible methods for closing the feedback loop and improve ways of communicating subsequent changes to students, tutors and staff.	1	**Comment:** By having teaching team meetings for all Stages early in each semester, every effort is made to address any issues that may arise within that same semester, effectively closing the feedback loop. Student representatives report back to the class on the outcomes of the meetings and, if required, decisions are communicated to all students using the targeted e-mail system. However, by their very nature, some changes may only be possible to implement for the following academic year. Some module coordinators carry out their own online surveys of their courses early in the semester, allowing them to address any issues and respond to the feedback during the semester. Student feedback from module online surveys at University level only becomes available at the end of the semester, so any required changes arising from these cannot be implemented until the following year. Individual lecturers introduce module improvements based on this feedback and draw on the responses to these questionnaires when contributing to discussion at School level, but this may not be apparent to students taking the module in subsequent years.	**A and B**

			Action: In order to improve communication and closing the feedback loop from the online surveys, the School will ensure that students are informed at the teaching team meetings of any changes arising from the feedback provided by students taking the modules in the previous year, so that they know that their feedback is being considered and that their input is appreciated and taken seriously by the School. The School will discuss whether implementing a peer observation of teaching process can facilitate closing the feedback loop.	
6.8	There are many operational committees within the School where, for example, all of the teaching team discuss activities. While this aids information sharing, the School should look for more academically time-efficient ways to do the necessary business and make time for strategic considerations.	1	**Comment:** As stated in the SAR, the School's main forum for communication, discussion, planning and major decision taking is the School meeting, attended by all academic staff, as well as representatives for the administrative and technical staff, postgraduate students and postdoctoral researchers. A small number of sub- committees (Curriculum, Communications/Outreach, Safety, Accreditation, SARC for School Quality Review) are drawn from the members of the School Committee, and these meet separately as required before reporting back to the School Meeting with proposals for discussion and approval. Teaching team meetings are a requirement for our programme accreditation by the Institute of Physics (IOP) and constitute the main forum for undergraduate student participation. The meetings, which are held once per semester and are attended by student representatives and module coordinators involved in the teaching of the Stage, provide an efficient way to identify and remedy any issues pertinent to a given Stage and to close the feedback loop. The minutes of these meetings are part of the documentation required for accreditation. The Teaching Team structure is also used to conduct an internal review of the examination papers before they are sent to the external examiners, acting as an effective check on the standard of the papers and the quality of the model answers provided.	D
		SUPPORT SERVICES		
7.4	The Review Group recommends that appropriately resourced IT support is provided in the School at a level relevant to the needs of	1	**Comment:** The School agrees that IT support for research is essential including data storage and backup, high performance computing, licence servers for software, and access to software and training. Research related IT issues are dealt with locally by	B

	Researchers.		academic, research or support staff. **Action:** The School will invite IT services to a forthcoming School meeting to match the needs of the researchers with the supports available.	
7.5	The Review Group recommends that the School develop its awareness of the changing technical environment for Physics Research and Teaching and that the School resource its internal technical supports at an appropriate level.	1	**Comment:** The School remains vigilant in monitoring the changing landscape of Physics Research and Teaching through a number of formal mechanisms, e.g., IOP accreditation, Quality Review process, School seminar series, Programme Board, and through external roles at other universities and agencies. The School has been involved in curriculum development activities including new methods in problem-based and group-based learning, in using ALE rooms, and in using online supported learning. The School will continue to engage with various stakeholders to understand how to meet the needs of, e.g., potential employers. The School notes its efforts to implement changes to address the changing technical environment is limited by existing resources.	A
			EXTERNAL RELATIONS	
8.4	The School should consider ways to more clearly identify their many external activities with the School and its research.	1	**Comment:** The annual report previously mentioned in response to Recommendation 2.8 will present and summarise the many external activities of the School and its staff. Such a document also serves to update external stakeholders and alumni of the School on our activities.	B
8.5	The School should consider setting up an external advisory board to help the School make informed strategic decisions in areas of emerging need as well as ensuring that graduates have all relevant skills for employment in a fast-developing industrial landscape.	1	**Comment:** The School does have an external board called the "Friends of Physics" which is actively involved in fund-raising activities, alumni engagement, and planning of our annual Physics50+ alumni event. Currently this group is heavily involved in the groundwork for the proposed Thomas Preston Centre and Scholarships. The Institute of Physics further serves as an advisory board in its capacity as an accreditation board with a strong focus on transferable skills relevant for employment. **Action:** The School will consider whether the "Friends of Physics" group can evolve into an advisory board that also assists the School with strategy, engagement with industry, and engagement with funding agencies to benefit the School and its graduates.	A and B

3.   Prioritised Resource Requirements

The School has identified the following equally-weighted areas that require additional resources to address the recommendations outlined in the Review Group Report: Building, Teaching, and Research. Within each of these areas we provide below descriptions and cost estimates of prioritised resource requirements. It is important to note that the specific improvements requested in these areas will assist in addressing initially recommendations 3.17 & 3.20 related to sub-optimal physical resources available to the School. The improvements will have further positive implications for attracting and retaining students (recommendation 4.17) and securing funding for research (recommendation 5.6), the income from which helps to address issues related to student-to-staff ratio and falling PhD student numbers (recommendations 4.18 & 4.19). It is equally important to note that the infrastructure-related requests below are urgent and cannot wait for the development and implementation of Phase 3 of the Science Centre Redevelopment Plan, for which the Review Group recommends the University invite the active involvement of the School (recommendations 2.8, 2.9, 2.16, 3.18, 3.19, 3.20 & 4.17)

Building

This category includes issues related to health and safety and sub-optimal physical resources that should, in principle, be or have already been dealt with by the University independent of a quality review process (recommendations 3.17, 3.20 & 4.17). The School has identified several issues related to heating, leaking water and draughty windows, and notes that the University has provided very welcome but only short-term fixes for many of these issues that could lead to more problems in the future rather than fundamentally addressing the issues raised. We have already been in discussions with UCD Estate Services and UCD Science Operations to address or obtain cost estimates to address some of these issues; these are included where available. These issues have implications on the ability of the School to attract students with further implications on income and student-to-staff ratios.

1. **All windows on the north side of the third floor (SCN 326 and 328-337 inclusive) should be replaced.** These single-pane windows are draughty and date back to original building in some cases. Water often leaks into rooms from the ceiling or around the windows – see below. Replacing them will partially address the heating and cleanliness (dust) issues – see below.

   We have been in discussions with UCD Estate Services and UCD Science Operations. Cost estimates are being prepared (1) to replace windows and (2) to maintain existing windows. We are told the whole cladding system on the façade needs to be changed in order to replace the windows at a cost of €8k per linear meter, which for the north façade would amount to over €1.6M. Resealing existing windows will be cheaper but may not have the desired effect. Estate Services is in discussions with a windows specialist.

2. Despite recent interventions relating to the central heating, previously documented heating issues have not been fully resolved. During working hours in winter time, the temperature in the building is still often below the minimum legal requirement, especially on the third floor. Bleeding the radiators and replacing the windows should at least partially address the issue; however, if the heating situation does not improve, further measures, e.g., insulation should be implemented preferably during the summer. As part of the Quality Review process, we have already been in discussions with UCD Estate Services and UCD Science Operations who have assured us that radiators are bled and that they are now on from 4am to 9pm Mon–Wed and 6am to 9pm Thu–Fri at our request. Estates has also agreed to cover the cost of adding sensors in SCN 331 and 337 to improve the heating situation. **We request that SCN radiators continue to be bled routinely and that further actions are taken if the measures do not resolve the heating issues.**

   Further measures to provide adequate heating may be needed following the implementation of

these initial requests.

3. There is significant water damage throughout the building, particularly near windows and on the third floor (through the roof). This manifests as cracks that are occasionally sealed and also as rotten wood and loose tiles in SCN toilets. It appears that over time, several roof drains have been blocked being broken themselves, leaving water to find other paths to the ground.

   We have already been in discussions with UCD Estate Services and UCD Science Operations. Estate Services has agreed to repair cracks in plastering on the wall and ceiling of SCN 329 and bubbling of paint on the wall in SCN 311. Estate Services has proposed that the rot is caused by leaking windows and has stated that they will seal the windows and repair the damaged timber. To rule out whether the damage is facilitated by blocked roof drains the School recommends that an independent assessment is conducted and, if applicable, that UCD Science Operations provides an action plan to address the issue and origin of rotting woodwork. Full cost to be determined following the proposed independent assessment to be paid for by UCD.

4. Following an audit by the Garda Crime Prevention Unit and the EPA's Office of Radiation Protection, we require the installation of CCTV monitoring, alarm and secure access to the room containing High Activity Sealed Sources (SCN 226) in order to comply with the HASS Directive and IAEA requirements. These measures are currently underway, paid half by the School and half by the College. **For safety and security, further installation of a CCTV system covering the ground floor and 1st floor lobby are requested.**

   Based on quotations received, the cost to carry out this additional work is 3k.

5. With the provision of a new lathe (recommendation 5.10) it will be no longer possible to do welding in the same room, due to contamination of the new machine. Therefore, if the workshop is to continue to be able to provide welding and vacuum pump servicing, it will have to make a provision for this elsewhere in the building where this activity can be continued. This capability is required for many/most of the experimental research groups and to support vacuum experiments in the 3rd/4th year lab. A room of $\sim 15 - 20$ m^2 area equipped with an air exchange facility and an overhead extractor is requested.

   A suitable room on the ground floor of SCN and 10k for refit is requested.

6. **Sinks in SCN 312, 326, and 329 need to be replaced.**

   Maintenance has visited these three locations and according to Estates, repairs are underway.

7. **Additional office and research laboratory space in SCN is needed for a new lecturer, currently being advertised.**

8. **Additional research laboratory space is needed, especially on the ground floor of SCN with its special isolated foundation on the east wing, and with the aim to keep staff as close as possible and in the same building.**

Teaching

Our teaching laboratories for stages 2, 3 and 4 require significant investment to attract and retain new students and improve the student experience to an internationally competitive level comparable to that of

the stage 1 laboratories housed in Science East with further implications on income and student-to-staff ratios (recommendations 3.17, 3.20 & 4.17). Underfunding over the past 10+ years means that significant funds to update many experiments are urgently needed, with continued funds available for maintenance into the future.

1. **In order to develop modern teaching equipment/laboratory experiments we request 20k per stage (2,3,4) per year over 5 years (total of 300k), and academic support at the level of a full-time teaching fellow over these 5 years (total of 220k) to support the development of the laboratories and other teaching activities (further addressing recommendations 4.18 & 4.19).** Based on our experience, the laboratory experiments should not be sourced from third parties but need to be developed in-house, for increased flexibility and allowing cost-effective in-house maintenance and repairs.

   Total request: 520k.

2. **Recurring investment of 50k per year to maintain/repair/update the laboratory experiments in all stages** – for example, replacements of photomultiplier tubes and other detectors, microwave generators, other components and devices, etc. In the first year, an additional 50k is needed to upgrade all experiment control and data acquisition and analysis PCs in both the general and the advanced teaching labs such as Atomic Force Microscopy such that they will be supported by the University and by Microsoft (currently Windows XP systems are not allowed on the University network and by 2019, all computers running Windows XP and Windows 7 will no longer be supported).

   100k in year 1, 50k recurring.

3. In order to create and maintain the teaching laboratory experiments and support also the research efforts of the School, the Electronics Workshop designs and constructs equipment which is either not available or uneconomic to purchase off the shelf. **The Electronics Workshop anticipates that it will need new equipment (~20k total for a reflow oven and 3D printed circuit board (PCB) printer) to support the teaching and research efforts of the School and to keep up with the changing landscape of prototyping modern electronics (recommendations 5.10, 7.5).** A reflow oven is used to secure electronic components to printed PCBs. A 3D PCB printer enables rapid prototyping of PCBs using additive manufacturing.

   20k is requested.

4. Demonstration equipment and experiments are critical for use in classroom lectures. **A dedicated room with shelving is requested to house the equipment. Furthermore, the development of new demonstration experiments and multiple sets of popular items necessitates an investment of 20k now with recurring annual support of 4k.**

5. **Repair of blinds/curtains for lecture theatres in SCN 128, 231, and 232.**

   We have been in discussions with UCD Estate Services and UCD Science Operations and a quote of ~7k including VAT was provided**.**

6. **Projectors with modern video input options in SCN 128, 231, and 232 and proper maintenance.**

We understand these issues will be dealt with by UCD AV Support upon request and stress the need for replacement when needed and continued maintenance. We have confirmed that a new screen and laser projector will be installed by AV Support in SCN 231 by the end of the summer.

7. We have noted that, according to module descriptors, several modules taught by other Schools appear to be physics modules. This is contrary to disciplinary ownership of modules. Further, if School of Physics staff were to teach these modules, the School would have more fee income and could hire more staff to cover that teaching with implications for School research as well (recommendations 4.49 & 5.6). This issue needs to be looked at in more detail.

Research

In general, due to the state of the SCN building, the research laboratories in SCN are no longer up to the specifications required for cutting-edge research. As discussed above, most notable drawbacks are deficiencies in temperature (heating), dust (windows, ceiling and floors) and laboratory services (e.g., compressed air, clean/chilled water supply, supply of gases, 3-phase electricity). These issues all have implications on the ability of the School to attract students with further implications on income and student-to-staff ratios (recommendations 3.17, 3.20 & 4.17). Detailed requirements for specific rooms resulting from their current usage are listed here:

1. Regarding research requirements of SCN laboratories:
   - **Access to clean water for cooling lasers is required in G25**
   - **Pressurised argon gas lines are required in rooms 326 and 329**
   - **3-phase electrical outlets are required in rooms 326 and 329**

   17k is requested for provision of filtered water, pressurised gas lines and 3 phase electrical outlets including power distribution board and installation

2. **Recent safety audits highlighted a lack of safety compliant chemical storage, which should be provided in SCN 326.**

   8k is requested for chemical storage cabinets, flow filters, and safety compliant measures.