Division of Information and Communication Sciences

Discipline Profile – Physics: Research-Only Staff[1]

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Overview of the Physics Discipline

Physics is fundamental to all the natural sciences and plays a central role in the development of new technologies. Together, theoretical and experimental research, investigate basic questions about the intrinsic laws of the universe. The results of this research are applied to interdisciplinary fields and to practical use. Physics is a core discipline for all science and technology students, and challenges students to explore the underlying principles of all physical phenomena as well as to develop analytic and problem solving skills, good laboratory techniques, numerical analysis, and technical writing and oral communication skills. A solid grounding in science is also important for all graduates not just those in the sciences. In particular, as technology plays a greater role in society and the economy, technological and scientific literacy is of increasing importance.

Macquarie University's Department of Physics has great strengths including:

- a highly motivated and well-qualified staff who are enthusiastic about and committed to the subject of physics and its related areas;
- high quality and innovative approaches to teaching;
- an international reputation for excellent research;
- a number of research-only staff, working either on their own fellowship research or on projects led by other staff;
- strong links and collaborations with other universities nationally and internationally, government research organizations and industry; and
- outstanding dedication and contributions to Macquarie University.

The research strength of the Department has led to a number of Research-Only staff joining the Department. These staff may work on projects supported by another staff member's research grant, or they may have been awarded Fellowships for their own projects. These staff are also Academic members of the Department, and, as well as participating in research, they may make a limited contribution to the teaching and administrative needs of the Department.

Qualifications

Research Academics at Level A would be appointed with at least a good Honours or Masters (Research) degree or equivalent, and with prospects for award of a PhD. All staff who hold a PhD degree or equivalent shall be appointed at Level A.6 or higher. Additionally two or more years of postdoctoral research experience (in a university or other organization) is normally expected for Level B and above. For appointment at Level C and above, a demonstrated capacity for independent research and/or postdoctoral research experience of at least 5 years is typical.

[1] This document deals with expectations for Research - Only staff. A separate document: 'Discipline profile for Physics: Teaching and Research Staff' deals with expectations for Teaching and Research staff.

Research and Scholarship

Physics research at Macquarie University is well respected nationally and internationally, and the Department is recognized within the University for its research areas of excellence. The Physics department is the site of two nodes of ARC funded Centres of Excellence: Centre for Quantum Computing Technology and Centre for Ultrahighbandwidth Devices for Optical Systems. The Department is also home to the Centre for Lasers and Applications and other highly successful research groups and individual researchers.

Research and scholarship in physics are demonstrated by at least one of the following:

- carrying out and publishing individual and team research;
- reflection and preparation for research;
- writing articles and other publications;
- scholarship and research for teaching;
- research in teaching (in line with the University's mission of research-based teaching);
- undertaking higher research degrees or appropriate qualifications;
- submitting research and teaching development proposals;
- research management; research supervision, including supervision of research students;
- consulting and forging industry links; presenting scholarly papers, addresses to conferences;
- editing journals and books;
- refereeing/reviewing grant proposals, journal articles and theses;
- professional development for research and scholarly activity; and
- travel associated with this work.

Research productivity in physics is generally measured by the dissemination of new results in internationally peer-reviewed journals and conferences, as well as the production of patents in some cases. Physics publications can include letters and longer articles, however in the physics discipline, letters in publications such as *Physical Review Letters, Europhysics Letters, Applied Physics Letters, Physics Letters, Optics Letters, Electronics Letters, Astrophysical Journal Letters, Monthly Notices of the Royal Astronomical Society, Astronomy & Astrophysics Letters,* and *Nature* are often regarded as having higher impact than articles and may be seen as evidence of timeliness and importance of the research reported. Joint-authored papers are common, reflecting the collaborative nature of much experimental research in particular. Conventions on the order of authors vary. The publication of monographs is less common in the discipline.

International collaboration is well established in the discipline. Expertise and leadership are recognized by invitations to write major topic reviews, and to give key presentations at conferences and workshops, and editorship of journals or conference proceedings. The rate of publication varies between areas of physics, but an active researcher would be expected to publish one or more articles in peer-reviewed journals annually. A leader of a research team would expect to produce proportionately more publications per year, depending on the number, standard, and experience of the team members. Prolonged lead times are common in experimental work and projects such as astronomical surveys for research purposes, so that publication rates can be sporadic. Expert assessment is appropriate to assess the quality of the published work, and, for example, journal impact factors vary between different sections of the discipline, depending on the size of the field and conventions for citations.

Other research activities may have outcomes that are not easily measured in terms of publications alone. Such activities include the development and commissioning of

instrumentation for collaborative facilities, establishment of new research directions, and production of astronomical survey results, which are used by a wider astronomical community. Commercial and collaborative activities such as liaison or consulting with companies or research organisations, and the generation of patents are also valued. External competitive and internal research grants are normally sought for most areas of research in Physics, and are essential for independent research-only staff. External grants include, for example, ARC Discovery and Linkage grants, and competitively awarded time on experimental facilities such as telescopes.

Postgraduate research and Honours student supervision is common in the department, (with a typical enrolment of ~25 postgraduate students and ~5 Honours students at any one time) and the Department values its postgraduate research students highly. Research-only academic staff are expected to spend 70-100% of their time engaged in research and scholarship, depending on the nature of their appointment.

Research Academics at Level A are expected to develop their research skills and to participate in conferences and workshops in the discipline, as well as submitting one or more journal articles per year, although it is recognized that significant lead times are involved in some research areas. Staff at Level B are expected to develop increasing independence in research (usually with mentoring by more senior research staff), as demonstrated by senior authorship on a number of publications. Research Academics at Level B and above are expected to publish two or more journal articles per year, with allowance for varying lead times and styles and lengths of published articles. Such staff are expected to apply for external and internal research funding if the opportunity arises. (Staff who are employed directly from another staff member’s research grant are rarely permitted to apply for additional funds; however such staff may have an authorship role in research funding applications.)

Staff at Level C and above are expected to develop a national reputation for their research, which may be demonstrated by, for example, leadership of a research team, supervision of completed Honours and higher degree students, examination of external higher degree theses, organization of workshops or conferences, invitation to speak at conferences, and record of success in attracting funding from internal and external funding bodies. Staff at Level D and above would develop an international profile for their research, with an expectation of a high level of productivity and research excellence as measured against international standards for the relevant sub-area of the discipline. Such staff are also expected to mentor the research of junior staff in the department. At Level E, international research leadership and performance in the discipline is expected. This may be demonstrated, for example, by organization of international conferences, recognition by professional societies, editorship of leading journals, publication of high impact journal articles and reviews, and leadership of a strong research team. Research Academics are expected to take a scholarly approach to their research. This would normally take the form of development of new understanding in the areas of pure or applied physics. Scholarship in research may be indicated by a record of cited publications.

Teaching

Due to the nature of their appointments, Research Academics are not expected to participate in undergraduate teaching, although more senior staff (Level B and above) may supervise research students and indeed often play a vital role in supervision of Honours and postgraduate research students. Some Research Academics may participate in undergraduate teaching activities, for example giving lectures in a specialist unit. Depending on the nature of their appointment, Research Academics are expected to spend 0- 15% of their time engaged in teaching/supervision of research students.

Service to the University and Community

Service to the Discipline of Physics is encouraged through participation in national or international professional societies (Australian Institute of Physics and other societies such as the Australian Optical Society and the Astronomical Society of Australia, as well as overseas counterparts). Service to Macquarie University takes a number of forms, including participation and leadership of committees, promotion and community outreach, and personnel advising and appointment. The Physics Department regards itself as an essential component of the University, and strongly encourages staff members to serve the University. Research –Only staff at all levels are expected to spend approximately 0-30% of their time engaged in professional activities and research-related administration, depending on the nature of their appointment.

Staff at Level A and above are encouraged to be members of a professional society and to foster students' interest in the discipline. All Research Academics at Level B and above are expected to participate in department and divisional meetings. Staff at Level B and above are expected to promote the university to prospective research students as the opportunity arises. Staff at Level B and above manage their research budgets and accounts and prepare documentation related to their research grants. Staff at Level B or above often manage research laboratories. It is recognized that coordination or management of an externally funded Research Centre (or node) involves significant administrative effort.

Staff at Level C and above might act as consultants for outside organizations, and might also serve on committees of professional societies. Staff at Level C and above may serve on divisional committees as the opportunity arises, and may also act on selection and promotion committees for academic and general staff. Such staff may act as personnel advisers for junior staff. Staff at Level D and above might demonstrate leadership in professional societies. Staff at Level D and above may represent the department or division at policy– making levels inside or outside the University, and chair committee meetings. Staff at Level E are expected to demonstrate leadership in the Department, the Division, and the University.