

Study Abroad for students of Physics, Physics with Astrophysics, Physics with Technological Physics and Physics with Theoretical Physics

Students on these programmes may apply to spend part of their programme abroad. There are two possibilities, semester 2 of second year (MPhys or BSc students), and all of third year (as part of an MPhys programme). The University of Manchester has links with a number of Universities throughout the world, but access to exchanges is dependent on programme-specific constraints. In practice most Physics students go to Australia or California.

Students from the other streams are not a-priori excluded from this exchange (Physics with Study in Europe excepted!). However, we can not guarantee that suitable courses will be available for other streams at our usual exchange partners. Potential applicants would need to prove that their core material is covered for both their physics and their non-physics courses, and would need to obtain prior approval. Students have been known to apply, and to switch to the straight Physics programme at the end of the year if they are accepted for an exchange.

Applications are coordinated by the University of Manchester's Study Abroad Unit which will also advise on the practicalities (visas, finance, accommodation...) The Study Abroad Adviser to outgoing students is Ms Jenny Gonzalez Hogg. Academic advice is provided by the School of Physics Study Abroad Coordinator (currently Prof. Albert Zijlstra).

A large majority of students who go abroad have a wonderful time and recommend it highly. It is valuable to their personal development, and can broaden your physics knowledge. It is also valued by employers. However it is not for everyone; you do need to be resourceful and self-reliant to cope successfully with living and studying abroad. There are particular problems associated with Physics, which tends to be taught in a more mathematical fashion elsewhere. However good the fit on paper between courses abroad and in Manchester, you are bound to find that some knowledge is assumed that you do not have – both while abroad and on your return. You are also likely to find that the pace is faster and there are fewer support mechanisms (though this does vary). For that reason we only allow better than average students to go, and they must be prepared for more self-study than they have been used to. Finally, California and Australia can be expensive places to live, and flights aren't cheap either. You will need at least an extra £2000 or so compared with staying at home – more if you want to travel and see the country at the end of your studies. In spite of these caveats, the School of Physics strongly encourages suitable students to apply for these exchanges, and many Physics students have benefited greatly from them in the past.

This guide will first cover the types of exchanges possible, and the places Physics students can go to, then give an outline of the application process. Details of course choices at various places follow, then a note on record-keeping while abroad, and finally details of how we incorporate the marks obtained abroad into our final degree classification. It is intended to be complementary to the guides provided by the Study Abroad Unit; these cover all the details which are not specific to Physics.

Applications have to be made to the Study Abroad Unit and signed by the School Study Abroad Coordinator. *If you are intending to apply you must talk to the latter well in advance of the deadline.*

Semester 2 of second year:

The main exchange partner for this semester abroad has been *Melbourne*. However, Melbourne has very recently completely revised its physics curriculum, and there is no longer a sufficient match with the Manchester core courses. For the coming year, we do not envisage sending students there.

The *ANU* in Canberra is presently the recommended exchange partner. The ANU is the highest-ranked university in the world outside the USA and the UK (2009 Times University rankings). The matching courses are taken from the second and third year. Statistical Physics is a second year course and Fourier Optics a third year. Remember that our Spring semester corresponds to the first semester in Australia.

Sydney is another option in Australia. The Sydney exchange is more oversubscribed than Canberra and exchange places can not be guaranteed. The match is reasonable but not perfect, and some summer work may be needed to cover missing material.

Toronto has the disadvantage of a January start, so students have to sit their S1 exams abroad. The courses cover Manchester core quite well. However two of the necessary courses are third year, which proves to be pretty tough.

Singapore (NUS) is the top-ranked university in Asia. The physics courses cover the Manchester core well apart from Wave optics. Based on the experience of past exchange students, the courses are at the right level. Singapore shares with Toronto the disadvantage of a January start.

All exchanges depend on the courses which are available at the exchange partner, and this can change from year to year. The list above is based on recent experience, but particular exchanges may be withdrawn if substantial changes occur in the available courses.

Full third year

So far third year Physics students have only been sent to *North America*. Third year exchanges have to be for a full year because the chances of matching enough core within one semester is vanishingly small. The Study Abroad Unit discourages full year exchanges in general, because semesters away for Manchester students are rationed and a full year exchange take up two places. However the *University of California* only allows full year exchanges. Hence most Physics student go to the University of California. On application they have to nominate several of the participating campuses and will be allocated to one by the host University.

Students interested in going to other participating universities should speak to the Study Abroad Unit about their chances of acceptance; students have gone to *Illinois* and *Toronto* in the past.

Application Process

The deadline for applications to California is mid December, and to elsewhere, towards the end of January; the latter deadline also applies to students going abroad in the second semester of their second year, even though it is almost a year in advance. Students should obtain an application form

from the Study Abroad Unit in early November. This will include a reference form to be passed on to the member of academic staff who knows you best; for first years this is almost always their Physics tutor; for second years it could be their first or second year tutor or personal tutor. You should provide a CV for them since they may not be familiar with your extra-curricular activities, but they will be asked whether they consider you an appropriate “ambassador” for Manchester. The application form requires you to specify which courses you intend to take; the School of Physics Study Abroad Coordinator will advise you and needs to approve the application on behalf of the School, before you can submit it.

In view of the academic difficulties of the exchange for Physics students we only encourage applicants with good academic performance. The School will only approve applications from students who are scoring above 65% in exams to date, with marks above 70% strongly preferred (in the case of 1st year students the opinion of the academic tutor will be sought, and if the January exam marks fall short the application will be withdrawn). Students planning to spend the 3rd year abroad must be eligible for the MPhys, and so will not be permitted to go if they fail to obtain 55% in June of their second year; Melbourne and California require 60%. However, in practice Manchester Physics sets a higher requirement than this.

In February the Study Abroad Unit decides on the successful applicants. Students going abroad for their third year have to fill in a host-specific application form at this point and should get final confirmation in May; those going for semester 2 apply formally over the summer and will receive their acceptance by November. Visas should be sought after receiving the final acceptance letter. Those going on S2 exchanges may find that the courses offered have changed since the initial application; in extreme cases this might require the exchange to be abandoned.

Across the University most eligible students are accepted on exchanges; however as Physics is more restricted in the places it send students to, success cannot be guaranteed.

Course choice

Below are notes on course choice at the different institutions. They apply to all programmes, but students on “physics with” programmes will in addition usually do one or more programme-specific courses.

Semester 2 of second year:

ANU

Physics courses on offer are:

Thermal and Statistical Physics PHYS2020

Quantum Mechanics PHYS2013

Fourier Systems and Optics PHYS3035

and some relevant mathematical courses:

Ordinary Differential Equations and Advanced Vector Calculus MATH2405

Theoretical Physics PHYS3001

From the syllabus, the Fourier course appears mathematically challenging. The courses include a laboratory component.

Toronto Currently recommended courses are
PHY 252S Thermal Physics
PHY 353S Electromagnetic waves
PHY 358S Atoms, molecules, and solids
and one other, typically PHY 225H Fundamental physics laboratory.
Standards are tough.

Singapore The current recommended courses include:
PC2133 Applied Solid State Physics
PC2230 Thermodynamics and Statistical Mechanics
PC2130B Applied Quantum Physics
PC2193 Experimental Physics
The two students who have been there found the courses were at a suitable level.

Full third year

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Students interested in going to other participating North American universities should speak to the Study Abroad Unit about their chances of acceptance; students have gone to Illinois and Toronto in the past. A list of all exchange partner universities, in a number of countries is available from the Study Abroad Unit. However, these may not offer physics at the correct level, and not all are English-language.

During the year students should endeavor to cover as much of the core as possible, specifically they should be looking for replacements for
PHYS 30101 Quantum Mechanics
PHYS 30121 Particle Physics
PHYS 30151 Bose and Fermi Gases*
PHYS 30322 Nuclear Physics
PHYS 30342 Electromagnetic Radiation
PHYS 30352 Solid State Physics
PHYS 30392 Cosmology

* rarely offered as such but usually covered implicitly in solid state and cosmology courses

It will not be possible to cover all, and up to three may be deferred to fourth year. However students should make sure that they do cover all the prerequisites for the 4th year courses that they would like to do. Experience shows that course choice can be harder at Berkeley than elsewhere, partly because they package their material into fewer, larger units.

In view of the large number of campuses, no suggested course lists are given here. As a guide, third

year students in the US will have done less physics than those in Manchester, and the third year courses will appear to start at a lower level. In practice however the elementary material seems to be covered with greater rigour than our students are used to, and so you should not be put off taking a course because you have already covered some of the material on the syllabus. Students have to work very hard; there is often continuous assessment right from the start and sometimes other students are not as helpful as one might expect; the reason is that if the marking is such that only the top X% get a grade A, then the students are effectively competing against one another. Converting US grades to Manchester marks is not straightforward. None-the-less most students get year marks commensurate with their subsequent 4th year marks, and almost all thoroughly enjoy the experience – while saying that they have never worked so hard in their lives!

On arrival

You will need to register for the courses you have applied to take; some may not be available and changes may need to be made. Any changes however must be approved by the Physics Study Abroad Coordinator. Usually you register one term/semester at a time.

Throughout your studies you must keep a portfolio of work done, test papers etc, and of grades obtained. One reason for this is that it will be available to the external examiner if you are borderline for degree classification, another is that if you fail a module in the US your grade will be “F” and we will not otherwise know if that is equivalent, say, to 39% or 0%. As in Manchester one failing grade is not necessarily a disaster, but you must pass the year as a whole. If you do not you will have to repeat the year (as a BSc candidate in the case of a failed yr 3 exchange). This is unlikely to happen, though, if you don't neglect your academic work.

Students who experience personal or medical problems should make sure the School knows about them and that the circumstances are documented for consideration by Special Circumstances Committee.

Treatment of marks

Different systems use different marking schemes; American Universities for instance use grades (A-F) instead of percentages. Furthermore even when percentages are used, the assessments may be designed to obtain quite different averages (the Manchester 55-60% would be considered low in many places). For that reason converting marks or grades obtained abroad to marks which can be used the classification of Manchester degrees is not always a straightforward process. The notes below give some indication of how we treat the marks you obtain abroad.

Semester 2 of second year:

The marks obtained abroad replace those of Manchester semester 2, and are averaged with the S1 marks, with equal weighting, to give a mark for the year. The second year then counts 23.3% towards a BSc or 14% towards an MPhys (the same as if you stayed in Manchester). Marks obtained in Australia are usually considered comparable with ours and can be used without further translation. However Toronto marks have been lower, and we apply a conversion before using the Toronto marks in the year average.

Full third year

The year counts 24% toward an MPhys, as opposed to 40% for the third year if remaining in Manchester. The fine details of the grade-conversion process for marks from US universities will be discussed with students before they go. The main problem is lack of discrimination at the top and bottom of the scale: the top grade, A (A+) covers, in our terms, roughly 70% (80%) to 100%, and the bottom, F, 0%-39%.

It is important that you realise, therefore, that grade conversion cannot be an exact science. The UK system focuses on giving students the “right” degree classification, and much less on the overall average. Hence if at the end of 4th year a student were in danger of being pulled down from a 1st to a 2.i by their California mark, we would ask the External Examiner to give their case very careful scrutiny. But if the California mark comes out as 1st class, we are not so concerned about whether 75% or 85% is the “best” translation of the mark (as explained above, the grade system makes very high marks particularly hard to interpret). In the end, though, we cannot guarantee that you will not get a lower class of degree as a consequence of going abroad than you would if you had – hypothetically – stayed in Manchester. As mentioned above, if you do not pass the year you will need to repeat 3rd year for a BSc.

Version 1 Judith McGovern 02/11/06

Version 2 Albert Zijlstra 15/01/09

Version 3 Albert Zijlstra 01/11/09