

Institute *of* **Physics**

The MPhys/MSci Qualification

Current Views of UK Universities

A Standing Conference of Physics Professors
survey conducted by Professor John Edgington,
Queen Mary and Westfield College,
University of London

London
August 1998

Policy Paper 982

The MPhys/MSci Qualification

Current Views of UK Universities

**John Edgington, Queen Mary and Westfield College,
University of London**

**For The Standing Conference of Physics Professors
August 1998**

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The Standing Conference of Physics Professors consists of the heads of physics departments in UK Universities. The SCPP usually meets twice a year at the headquarters of the Institute of Physics where the SCPP secretariat is located.

The Institute of Physics is a learned society and the professional body for physicists in Great Britain and Ireland. With over 22,000 members, it looks after the interests of professional physicists and supports the education of the physicists of tomorrow. Institute of Physics Publishing, a wholly owned subsidiary, is a major publisher of physics.

I. Introduction

This report builds upon the previous work in this area by Professor WF Vinen of Birmingham University who in November 1996 informed the Standing Conference of Physics Professors of the emerging state and status of the MPhys/MSci degree. Awarded from the summer of 1996 these new first degrees in physics are typically of one year's longer duration than the traditional BSc or BA degree. The intention was always that universities would offer the new qualification alongside their existing Bachelors qualifications.

Students undertaking study towards an MPhys or MSci degree are able to investigate the subject in greater depth while also expanding their opportunities for developing transferable skills and performing a substantial research project.

An added benefit of the four year English MPhys or MSci degree is that it is a closer match to the types of undergraduate education available in other European Union countries.

The survey considered here was developed as a direct consequence of interesting profiles of two MPhys/MSci programmes at Bristol and Nottingham Universities published by Peter Main and Mike Priestley in the September 1997 issue of *Physics World*. It was clear from just these two institutions that there is some diversity of provision between MPhys/MSci programmes at different institutions.

Under the Chairmanship of Professor Springford the SCPP is keen to gain as full an understanding as possible of the emerging status of the MPhys/MSci qualification at UK universities. Therefore in consultation with Professor Vinen we formulated the questionnaire presented in section II of this report.

The results of the survey are reported in section V. as brief one-page summaries of the responses to each question, as they were presented on overhead transparencies to an audience. Some editing has been done but there is no attempt at a critical analysis. Comments which seemed particularly relevant or quotable have been included at the foot of some pages.

In the rest of this report all traditional first degrees in physics will be referred to as 'BSc' while all MPhys/Msci programmes will be termed 'MSci'. The timing of the survey was such that university responses were to be returned by April 17, 1998. This report has been updated to include a few responses received after the SCPP meeting in May 1998.

John Edgington, August 1998

II. The survey questionnaire

1 Structure

MSci degrees are recognised for mandatory 4-year awards by the DfEE on the basis that they are "separate and distinct" from 3-year degrees. Please explain briefly how your course satisfies this requirement:

- A a totally distinct programme
- B curricula diverge after 1 year
- C curricula diverge after 2 years
- D similar curricula for 3 years but separate assessment and progression requirements
- E other (please elaborate)

Please outline briefly the nature of any divergence *eg* "separate provision for BSc and MSci", "additional compulsory courses for MSc", "compulsory MSci courses within a range of BSc options" *etc.*

2 Regulations

At what stages (if any) may students transfer between MSci and BSc programmes? Please tick the relevant box(es) or add a brief note:

	MSci → BSc	BSc → MSci
after 1 year		
after 2 years		
after 3 years		
after 4 years*		

* *eg* if requirements for award of MSci not satisfied

3 Progression

Please specify the requirements for progression between years, using criteria appropriate to your own University *eg* overall percentages, numbers of modules passed, number of credits gained, success in term/semester/sessional exams:

	MSci	BSc
Year 1 → Year 2		
Year 2 → Year 3		
Year 3 → Year 4		

4 Preparation for final year

This question seeks to establish the knowledge and skills now taught in the first three years of a single-subject physics course. I am seeking precise data but hope that its provision will be a relatively easy exercise. Annex 2 (attached) of the IoP/SCPP/CHPP report of August 1990, *The Future Pattern of Higher Education in Physics*, lists topics that might be taught in a reduced-content BSc course. Please indicate the topics you teach BSc students, and those taught to MSci students during the first 3 years of their course, as follows:

Double sidelines down the left for compulsory BSc topics

Single sidelines down the left for optional BSc topics

Double sidelines down the right for compulsory MSci topics (first 3 years)

Single sidelines down the right for optional MSci topics (first 3 years)

The MSci topics should be inclusive, not exclusive, of BSc topics. Add any significant topics not mentioned in this list, again separating BSc and MSci.

5 Aims of final year

Please outline the overall aim (or aims) of the final year of your MSci course. This could be, for example, to:

- A Instil knowledge of subjects not covered at BSc level
- B Extend knowledge and understanding of topics previously taught at BSc level
- C Train students in skills with less emphasis on acquisition of knowledge
- D Some other aim (specify) or a combination of the above

6 Curriculum

Please describe the general nature of the fourth year course. If you wish, attach relevant sections of your Departmental handbook or similar publication. It would be helpful if you could indicate the approximate fraction devoted to:

- A Independent project work
- B Group or other collaborative work
- C Self-directed learning
- D Conventional classroom/laboratory teaching
- E Training in (subject-specific, transferable or inter-personal) skills
- F Other learning strategies not included in the above

Does any of this take place outside the University environment?

7 Assessment

Bearing in mind that the MSci may embrace techniques of teaching and learning that differ from those of the traditional BSc course, are you satisfied with the methods used to assess students, particularly in their final year? Please mention any difficulties you have encountered, or any novel assessment methods you have used.

8 Resources

The introduction of the MSci and the restructuring of the BSc has been carried out within a constant (or declining) level of resource for physics departments. Have you:

- A Reduced the resource dedicated to BSc teaching, over and above any change that flowed from restructuring the BSc itself?
- B Devoted, from whatever source, substantially more resource (staff or cash) per final year MSci student than used to be devoted to each final year BSc student?
- C Obtained any support for the MSci from non-Funding Council sources, whether private or public? If so, please elaborate.

9 Student numbers

Please give the number of graduates in physics (or a related field *eg* astronomy) since 1995 [the first MSci cohort graduated in 1996 at a few Universities]

	MSci	BSc
graduates in 1995	-----	
graduates in 1996		
graduates in 1997		
graduates in 1998 (est.)		

10 Careers for MSci graduates

There is little secure information yet on the careers of MSci graduates. Nevertheless it may be possible to draw tentative conclusions from the pooled experiences of many universities.

- A Have your students encountered difficulty in getting the MSci recognised by prospective employers?
- Bi Do you give your students copies of the IoP information sheet *Introducing the new MPhys and MSci degrees* (attached)?
- Bii Do you send this, or similar information, to prospective employers, or advertise it at career fairs etc?
- Ci Have you found that MSci graduates are more (or less) readily accepted as research students, than BSc graduates?
- Cii Would you advise an excellent student to take a BSc and proceed straight to a PhD course, or continue to an MSci before starting (possibly the same) course?

III. Response rates to the survey

MPhys/MSci

November 1996: Professor Joe Vinen discussed "MPhys anomalies". The first students graduated MPhys/MSci in 1996

Status at May 1998

55 universities offer both BSc and MSci degrees
[*Physics on Course: IoP, 1997*]

but 3 have now ceased admitting students

Of the 52 surveyed, 36 replied:

England	29	out of 41
Scotland	4	out of 7
Wales	2	out of 3
N Ireland	1	out of 1
"old"	30	out of 42
"new"	6	out of 10

Judging from the nature and size of the institutions which did and did not respond, it can be estimated that this survey relates to between 75% and 80% of the undergraduate physics students in the UK.

IV. The key issues

Differences between BSc and MSci

- 1 How are they "separate and distinct"?
- 2 When and how can students transfer?
- 3 What are progression requirements?
- 4 How do the (3-year) syllabuses differ?

The final year of the MSci

- 5 What are its overall aims?
- 6 What is the nature of the curriculum?
- 7 Is assessment satisfactory?
- 8 How has it been resourced?

Take-up and response

- 9 How many opt for the MSci?
- 10 How is the MSci perceived?

V. Results

How are BSc and MSci separate and distinct?

- all curricula are similar for years 1 and 2
- progression requirements to year 3 differ 20%
- curricula in year 3 differ substantially 80%
- generally 25% - 50% of third year is different

BSc project replaced by MSci courses 30%
advanced lab
mathematical physics
research/communication skills
synoptic physics

Additional compulsory MSci courses 25%
computing
group work

Some BSc options are compulsory for MSci 25%

Additional compulsory BSc courses (1 reply)
communication skills
group dynamics
relevance of physics

"They are distinct: one has 4 years, one has 3"

When can students transfer BSc \leftrightarrow MSci?

- nearly all allow transfer in years 1 and 2, but...
- there are major differences after 3 and 4 years

After 3 years

MSci \Rightarrow BSc

Yes, before end of session 16

exceptionally 7

No 12

BSc \Rightarrow MSci

Yes 4

No 30

After 4 years

MSci \Rightarrow BSc

Yes if requirements not met 16

Not normally 17

Consequences of 4th-year failure include award of ordinary MSci degree; and of non-specific BSc

"progression requirements imply failure in year 4 is only a mathematical possibility - need zero marks"

What are your progression requirements?

Some failures are usually allowed; requirements in terms of credits gained are now quite common

Year 1 \Rightarrow 2

- requirements usually identical for BSc and MSci

Year 2 \Rightarrow 3

- \Rightarrow MSci requires

$\geq 65\%$	1
$\geq 60\%$	6
$\geq 55\%$	11
$\geq 50\%$	10
- sometimes additionally pass (nearly) all courses

Year 3 \Rightarrow 4

- most institutions have explicit requirements, in terms of number of courses passed or credits gained, or an average mark
- if an average mark is required this is usually **lower** than for year 2 \Rightarrow 3. Examples include:
 - $\geq 50\%$ (2 \Rightarrow 3) becomes $\geq 40\%$ (3 \Rightarrow 4)
 - $\geq 55\%$ becomes $\geq 50\%$
 - $\geq 55\%$ becomes $\geq 40\%$
 - $\geq 50\%$ becomes $\geq 30\%$

How do the (3-year) syllabuses differ?

Topics apparently often omitted from BSc include:

- **general relativity**
- formal and advanced **quantum mechanics**
- advanced **optics**
physics of matter
thermodynamics

The survey revealed a wealth of information on the present physics syllabuses for both 3-year and 4-year degrees, which requires further analysis.

What are the aims of the final MSci year?

Most responses described the content, which can be generally characterised as:

More material taught to greater depth 75%

Where aims were explicit they tended to reveal a different objective, namely:

To instil skills with less emphasis on content 25%

Skills mentioned include...

- **research capability** through project work
- **student-centred learning** through teamwork, seminars, placements,...
- **"professional"** attributes and skills:
 - modelling
 - problem-solving
 - IT
 - communications
 - project management

"gain some experience of **real** research through an extended group project"

Please describe the final-year curriculum

The proportion of [time? effort? assessment?] devoted to different activities is very variable

- **Classroom teaching - just over half**
mean 55%, range 25%-75% (with one significant exception, noted below)
- **Independent project - one-third**
mean 32%, range 20%-50%
- **Teamwork mentioned by 12**
mean 20% but up to 40%
- **Self-directed learning mentioned by 12**
mean 15% but up to 40%
- **Skills (usually embedded) mentioned by 10**
- **"Other" mentioned by very few**

industrial placement
case-study/work-shadowing
study abroad

One significant exception

"Less than 10% formal lectures; continuous assessment, no final exam; student-centered learning *via* groupwork and projects"

Is assessment of the MSci satisfactory?

In May 1998 the first MSci cohort had not yet graduated from some institutions, who had no experience to report. Most other respondents were generally satisfied.

Difficulties reported included

- comparability in assessment of
written reports
seminars and talks } peer assessment is
group contributions } being used in some
institutions
- plagiarism is reportedly a growing problem

Innovations include

- take-home exams (plagiarism issue noted)
- pre-set exam topics - notes allowed
- attempts to assess research skills
"conferencing" - poster session, talk, ...
quantum mechanics - computer modelling

"the conventional unseen written examination is not very appropriate in year 4"

How has the MSci been resourced?

- This question attracted the greatest number of quotable comments, some reproduced below
 - Most responses stated that the resource devoted to the BSc was unchanged
 - ... but, asked if a larger resource was devoted to the final MSci year than to the final BSc year, 17 said "Yes" and 12 said "No".
 - Only 1 case of external support (for final year industrial projects) was reported
-

"resource not increased but needs to be"

"we discontinued a taught MSc"

"we all work harder"

"initial capital expenditure"

"some courses shared with a nearby University"

How many students opt for the MSci?

The Table gives the total number of graduates reported. The final column is the percentage of a year's entry who graduated MSci 4 years later, their peers graduating BSc in the previous year.

	MSci	BSc	% cohort
1995	29 (1)	1801 (30)	-
1996	76 (7)	1382 (33)	4%
1997	678 (27)	1206 (33)	33%
1998 (est)	728 (29)	1181 (31)	38%

- Slightly over one-third now opt for the MSci
- The number of graduates is roughly stable

the 1992 cohort produced 1877 graduates
the 1993 cohort produced 2060 graduates
the 1994 cohort produced 1934 graduates

- Hence the FTE population has increased by about 12%, from roughly 5700 (three times 1900) BSc students, to roughly 6400 (three times 1200 plus four times 700) BSc/MSci students.
- **This is a (self-imposed) increase in teaching load at constant Funding Council resource**

VI. Perceptions of the MSci

- No respondent reported problems of recognition - employers are interested in the **person** and the **experience**, not the degree title
 - Two out of three respondents think the MSci is more desirable than the BSc as preparation for research - but all agree that the choice is up to the student once the options and consequences have been explained. Only one institution reported that an MSci was *required* for admission to a PhD programme.
-

The MSci ...

"... is necessary for theory research"

"... gives better preparation for a PhD"

"... gets students off to a flying start"

"... we insist on the experience"

But ...

"... what effect will the extra £1000 fee have?"

"... The 4-year experiment could be undermined if there is a perception that the MSci is not needed"

THE INSTITUTE OF PHYSICS

76 Portland Place, London W1N 3DH

Tel: 0171 470 4800

Fax: 0171 470 4848

E-Mail: physics@iop.org

WWW: <http://www.iop.org>

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