

The nature of the PhD : a discussion document / Advisory Board for the Research Councils.

Contributors

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**Advisory Board for
the Research Councils**

The Nature of the PhD

A Discussion Document

Office of Science and Technology

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ADVISORY BOARD FOR THE RESEARCH COUNCILS

Nature of the PhD: Discussion document

Introduction

1. Over the last century the PhD has established itself as a qualification recognised internationally, as the standard qualification for entry into the research and academic professions, and as an important qualification for other labour markets. Manpower issues are among the most pressing current concerns of those involved in the science base or higher education: they are certainly high on the list of concerns of the ABRC. And the PhD is the foundation stone, upon which other manpower policies have to be built.
2. The ABRC established a Manpower Sub-Committee in 1990 with a broad ranging remit to investigate its manpower concerns. The Sub-Committee is chaired by Professor Howard Newby, Chairman of the ESRC and ABRC Member, and includes also: Dr David Clark, SERC; Mr Glyn Davies, ESRC; Dr David Evered, MRC; Professor Charles Feinstein, All Souls College and Member of the Council of the British Academy; Dr Ashok Ganguly, Unilever plc, and Member of ABRC; Dr Brian Jamieson, AFRC; Professor Malcolm Jeeves, St Andrews University; Professor Don Kelly, NERC; Dr Judith Partington (OST assessor); Ms Helen Perkins, Price Waterhouse and former Chairman of the Association of Graduate Recruiters.
3. With the current changes in the ladder of education up to the PhD level, in the higher education system and its funding, and in labour markets (particularly the increasing numbers of PhD going into the private sector, and the opening of the European employment market) we consider a national debate on the PhD to be timely, and we would wish to play a part in that debate. We recognise that many have responsibilities in relation to PhD study: universities and polytechnics are themselves the custodians of academic standards, and have the responsibility to award the degree; the Funding Councils provide the underpinning resource to support PhD study; Research Councils are major providers of awards for those studying for the PhD; and there are many other significant players - the British Academy, charities, industry amongst these. All with an interest in the PhD, including individual students and supervisors, need to be involved in national discussion on the future of the degree.

4. Although the PhD has emerged as a very important qualification on the national and international stages, it is by no means an uncontroversial degree. The attached paper, developed by the Board through its Manpower Sub-Committee, summarises the history of the PhD, and highlights in its concluding paragraphs some of the key concerns about the degree - some of which have been long-standing questions since its "creation" in the last century. **As a contribution to national discussion on the PhD, we publish this discussion document, and would welcome comment on it.**

5. The Board has taken particular interest in the issue of the relevance of the PhD, and postgraduate qualifications more generally, to the increasing diversity of destinations of those obtaining qualifications, and to the wider labour markets which the qualifications now serve. The recent Research Council initiatives to make study broader, more practically focussed and more industrially relevant (the Engineering Doctorate scheme and the pilot training in IROs project) are examples relevant to these interests. With the PhD having to meet ever new purposes, and the considerable variation in the degree already (between subject areas, between different HEIs and between countries) we are concerned increasingly that students and employers cannot have full confidence in what they will get - in entering into study for the degree, or in employing a person with a PhD qualification. The introduction of a wider range of doctoral qualifications, which could be clearly labelled and recognised as for different purposes, might be one answer to this dilemma. **The Board would welcome views, in particular, on the issues of increasing the relevance of doctoral qualifications to labour markets, and the introduction of a wider range of such qualifications.**

6. Responses by 31 March 1993 would be most valuable. The Board hopes to publish a further statement as a contribution to debate, drawing on the replies to this discussion document. (Responses should be sent to: Ms Alice Frost, Advisory Board for the Research Councils, Sanctuary Buildings, Great Smith Street, LONDON SW1P 3BT.)

7. Statements by the five Research Councils on the nature of the PhD, commenting on this ABRC document, are also available from the above address, upon request.

THE NATURE OF THE PHD

Policy on the PhD

1. The Winfield Report (1987), which was the result of an inquiry into ESRC submission rates, commented on the PhD: "The absence of a research-based literature on doctoral study may have contributed to the apparent uncertainty about the nature, form and purpose of the degree. The purpose (or purposes) of the PhD have not been set down in such a way as would attract unequivocal and widespread agreement." The report also drew attention to the many different statements on the purpose of the PhD contained in universities' statutes. And it concluded that what was needed was consideration of the PhD in its "educational, social or political context". The Report noted further that "official UK comment on the PhD has ignored the historical background and has continued the British tendency to ignore policy, argument and practice in other countries".

2. Although there seems some consensus between commentators on the lack of an agreed definition of the purpose of the PhD in the UK, and the lack of underpinning research to inform and clarify decision-making¹, commentators differ on the extent to which other countries had addressed the relevant questions with regard to the degree. Undoubtedly the United States is quoted in most of the literature on the subject as the forerunner in acknowledging the historical development of the PhD, in developing the model for graduate study (the "graduate school"), and in exploring the widest possibilities for the degree (for example, an entirely taught PhD, without thesis, at the University of Texas). However, a recent report sponsored by the Netherlands Government² on new structures for postgraduate education comments that policy development on doctoral training in Europe is a comparatively recent phenomenon, and that many new initiatives are informed by American theories and practices.

3. The same Dutch report makes an interesting suggestion on the reasons for lack of policy development relating to postgraduate education:

¹ We note that many of the leading statements on this subject have commented on the social sciences (eg the Winfield report); these statements are of interest, even for science areas, but appropriate caveats need to be borne in mind. Even for the social sciences, we must note, the conclusions from such documentation are not completely clear.

² "Postgraduate Research Training today: Emerging Structures for a changing Europe"

"Postgraduate training of researchers has always fitted uneasily between the traditional concerns and responsibilities of higher education policy (eg decisions taken about the universities and the conditions of study within their walls), and those of science policy (eg decisions about the allocation of research funds). Effective coordination between these two areas of decision-making was often lacking, so that postgraduate education "policy" was often no more than the unplanned consequence of interaction between these two sets of decision processes."

Postgraduate education policies are perceived in the Dutch Report as reflecting policies more generally for higher education; drives for efficiency, management and performance and output measures, for example, are displayed in concerns about submission rates, and in the pressure for vocational relevance for the PhD to serve labour markets outside academe. However, the report also comments on the role of postgraduate students in providing the "engine" for academic research more generally, and hence places the "issue" of the PhD also within science policy.

4. Blume, in his report for the OECD in 1986 on postgraduate education in the 1980s, did conclude that policy development explicitly on postgraduate education was underway in the UK. He quoted extensively from the report of the ABRC Working Party on Postgraduate Education (HMSO, 1982), chaired by Sir Peter Swinnerton Dyer, and suggested that this new attention by policy makers resulted from the "now almost critical uncertainty as to what education in research, and the doctorate, should be". The foci of the two major official inquiries of the 1980s - the Winfield report and the ABRC Working Party study - fit well with the analysis given in the report sponsored by the Netherlands Government. Winfield specifically looks at submission rates, and the Swinnerton-Dyer report considers both submission rates and the broader market demands for the PhD: hence efficiency and "relevance" factors applied in higher education policy impact on strategy for postgraduate education.

5. Initiatives in Europe³ have also focussed on the "situation" of the student (social and intellectual isolation) and the organization of postgraduate study (the development of "graduate schools"). Such policy developments have perhaps been slower in the UK. Some attention has been given to the issue of the taught element of the PhD - for example, in a CVCP report on the British PhD, and in the recently published ESRC training guidelines. However, consideration of optimum structures for the organization of postgraduate education has really only begun in the UK. The thrust for new organizations comes, at national

³ Initiatives summarised in the Netherlands report; the introduction of "graduate schools", for example in Germany and France, is also relevant.

level, from the science policy perspective: the graduate school as a vehicle for resource allocation. At local level - in individual HEIs - the graduate school relates to countering the problem of student isolation, as in European initiatives.

History of the PhD

6. Until the 1870s the PhD was exclusively a German phenomenon, and was developed within the German scientific positivist school of thought. (And many commentators attribute the relative "unpopularity" of the degree in arts, humanities and social sciences fields as arising from this origin.) Blume in his 1986 report also comments that the PhD was developed in Germany within the European tradition of "the notion of becoming a scholar": the PhD was preparation for this calling.

7. Commentators are agreed that the PhD changed profoundly when it was taken up in the United States in the 1870s. The reason for the adoption of the degree in the US is attributed in most literature to a desire to wean students away from study in Germany, and provide homegrown academic experience of a similar nature. This desire grew more intense in the US, and the UK, at the beginning of the 20th century during the 1st World War. Blume comments that in the US the PhD emerged, against the German model, as "a distinct formal cycle of education, differing only in terms of its level from those preceding it". A taught component was introduced into the degree. The Dutch Government report attributes this change in perspective as arising from the need to "assimilate graduate to undergraduate work". And it further suggests that the initiative in the US - to organise PhD study and to fit it with undergraduate education - arose from the pressures of developing a mass higher education system in that country.

8. The PhD was by no means uncontroversial in the United States. W James referred to the "PhD Octopus" in 1903, complaining about the spread of the degree and the grip it had on entry to teaching in HEIs (and the metaphor of "the octopus" repeats itself in the US literature). Most recently, Ziolkowski summarises the history of US debate on the PhD, under the title "The PhD Squid (1990). James' original complaint about the PhD was that, while it was relevant to the development of the researcher, it was not clear that it should be the passport into teaching, which it was increasingly becoming in the US. Turning to discussions of the PhD in the 1980s, it is clear that James' complaint was in vain: Marris comments (in a paper to the Winfield inquiry) that the PhD "is a qualification not for research, but for teaching"; Blume states in his 1986 paper that doctoral study "has traditionally been seen as the process of preparation for a career in the university". Accepting this close relationship between the PhD and the academic career, against James,

Blume interestingly harks back to James' original complaint ie "neither the traditional doctorate nor its professionalised.. version is an adequate preparation for the modern academic career". Blume concludes that true preparation for an academic career would involve preparation in "administration, research management, advisory and consulting functions, seeking grants (including from industry)". Blume contrasts this with the actual preparation which the PhD provides - in fact, preparation for the "life of scholarship" reflecting back its origins in Germany.

9. In the development of the PhD in the US, the next issue of concern was that the degree had in fact moved too far from this origin in "scholarship". Babbitt argued that "the work that leads to a doctors degree is a constant temptation to sacrifice one's growth as a man to one's growth as a specialist". In the same vein Flemming West established a Graduate College at Princeton to counteract the specialization of the PhD by bringing scholars together in a community. (Such arguments repeat themselves in the present day; policies to establish graduate schools in France and Germany, for example, are backed by arguments that research is more robust and original in an interactive, interdisciplinary environment.) PhD regulations in the US can still require students to learn about a wide range of topics, requiring competencies in foreign languages for instance, but Ziolkowski comments that the general "cultural" approach to doctoral study is increasingly impossible as education prior to the doctoral period has narrowed.

10. The PhD was introduced to UK universities between 1917 and 1920, as a counter to the German PhD following the World War, and in order to attract US students wishing to study abroad. The PhD was viewed in the UK as an intermediate degree between the Masters and the D.Litt or D.SC. The latter degree was essentially an acknowledgement of an established body of work from a mature scholar - the German "habilitation" and French "doctorat d'Etat" were similar qualifications. The model of a 6-7 year period of university education, culminating in a degree comparable to the US/UK Master's, followed by a more substantial thesis whilst in academic employment, has continued in many European countries. However, the US structure of doctoral education - a structured PhD programme, completed much earlier in the research career is increasingly influential. For example, in the 1980s the French Government reorganised doctoral education: this now consists of two stages, the first lasting 3-5 years and equivalent to the PhD as it is in the US or UK, and the second stage similar to the DSc. The adoption of the US model in Europe is coupled with reducing the length of the period of study for the doctorate.

11. Apart from "spreading" to Europe, the PhD has also shown its popularity by the increasing numbers of students acquiring the degree, particularly in the US. Ziolkowski

comments that numbers of PhDs produced in the US have doubled in every decade this century, until the 1970s when numbers stabilised. The length of time to completion of the PhD has also grown in the period. In 1860 the Yale doctorate was usually completed in around 2 years, and Ziolkowski comments that the PhD was considered generally then as a "short degree". By the turn of the century the length of study had crept up to three years, arising, Ziolkowski suggests, from the efforts of various national organizations of HEIs and students to standardise the degree. Four years had become the norm for the period of study to the PhD by the 1960s, and the length of study has continued to lengthen since then. Ziolkowski further suggests that many PhDs, especially in humanities and social sciences, took much longer than the various "norms". The differences between subjects in length of time taken to complete the degree has continued to be an issue in debate on the degree.

Issues and problems

12. The Winfield report, concurring with an argument in Berelson's substantial text on the US PhD (1960), states: "there is an inherent tension within the degree and ..the balance has shifted over time, between cultures and according to changing attitudes and policies". Most commentators, attempting to define the nature of the PhD, approach this problem by contrasting two antithetical descriptions ie training v. the original contribution to knowledge, part of the education cycle v. an apprenticeship in scholarship, etc. Moreover such definitions are shaped largely by the contextual problems at any particular time ie changes in the labour market, changes in the numbers of postgraduate students, and change in the organization of postgraduate education.

13. The Winfield report gives a good summary of the various dichotomies arising in the literature on the PhD. Blume contrasted the PhD as part of the cycle of education versus the PhD as an apprenticeship in scholarship. As described above, this dichotomy has its roots in the difference between the development of the scholar in the European tradition, and the mass education of doctoral students in the US. As Ziolkowski comments, the notion of the scholar as a broad ranging thinker lost ground in the 20th century because of the increasing specialization in higher education. (However, it is interesting to note that while European countries have followed the US and UK in making study for the PhD a more formal part of the education process - eg by setting out its "position" with regard to undergraduate and Master's study, and determining the length of study - candidates for the PhD are less and less being supported by awards or grants, in the way of undergraduate students, and more and more are supported as assistants on specific research projects.

Instead of being an apprentice in scholarship, the PhD student in Europe, and increasingly in the US, will be an apprentice in research.)

14. Cox notes the relevance of a different distinction in discussion of the PhD - one of general debate in education policy - that between education and training. Cox suggests that references to the "training" element of the PhD are somewhat paradoxical because "training" is often contrasted with education. "Education" is defined by Cox as "broadening our capacities and understanding": "training" as "learning specific skills to cope with clearly defined problems". The question of how far in fact study for the PhD should be a broadening experience (for example, that it should have a wide "cultural" element, or, should have a general vocational element), or alternatively should be specialised (acquiring specific research skills), runs throughout debate on the degree.

15. The Winfield report goes on to look at the contrast made by the ABRC Working Party on Postgraduate Education (chaired by Sir Peter Swinnerton-Dyer) between the PhD as a contribution to knowledge, and the PhD as a training degree, which has become the main focus for debate in this country. (In fact Winfield itself goes on to argue for two PhDs - one for training and one for research.) A survey of the attitudes of departments to the PhD, carried out for the Winfield inquiry, suggested that, although departments differed on many aspects of the PhD (eg whether it should be seen as vocational), all agreed that the thesis should represent an original contribution to knowledge. The definition of the PhD as a training degree, against this consensus, is linked in the literature on the subject, and in policy statements, with questions of the isolation of the PhD student, efficiency concerns (ie completion rates) and the changing nature of research.

16. Wakeford in his 1985 study contrasts "the 'Gentleman Scholar' (who carries out an original contribution to scholarship" and who needs very little advice or supervision) with the apprentice (who is acquiring relevant research skills, and who will be required to make few independent decisions). Wakeford perceives the latter definition as prompted in defence against the PhD student's problems of "isolation and dependence"; redefining the PhD as essentially for training, and coupling this with a greater taught element and more organised study, would counter this isolation. The Swinnerton-Dyer report makes a recommendation that the PhD should be carried out primarily through group or project work (and that university PhD regulations should be amended to allow this) because of similar concerns. Cox, however, summing up this debate, draws attention to numerous commentators (Rudd, Stranks and Hirsh) who have concluded that learning to be independent is an important part of PhD study. Cox suggests that there should be three areas for the PhD: "firstly original research, secondly the development of more professional skills and independence, and thirdly

the acquisition of competent research techniques". The three elements need to be carefully balanced.

17. With a concern to bring down completion rates, the Swinnerton-Dyer Working Party recommended that 3 years should be established as the normal period of study to the PhD, and that the degree itself should be tailored so that it could be completed in that period. The report concludes that there is little problem with this in the natural sciences - a thesis which reflects the "amount of research that a competent and reasonably diligent candidate can do in 3 years" is considered satisfactory for the degree. The report also concludes that in the natural sciences "it is primarily the research rather than the thesis which is assessed". However, the report suggests that an aspiring social science researcher needs to achieve more in the PhD in order to establish research credentials; the social scientist does not need simply to show that they can produce a long, continuous exposition (because this will have been tested earlier in their education), but rather the PhD thesis is judged as a book (ie would it merit publication?) The Swinnerton-Dyer report concludes that the PhD in social sciences needs redefining as a research training degree, which would bring it into line with the natural sciences; some other designation might be given to the more substantial piece of research which has been traditionally been the PhD in social sciences.

18. The question of whether the PhD is appropriate to all subject areas, and whether the same conditions and practices can apply across all disciplines, continues as an issue of debate on the degree. The Winfield inquiry explored the issue extensively with regard to the social sciences. Ziolkowski notes that the presentation of the thesis is related to publication practices of the particular field; in social sciences and arts the book is still the significant medium for communicating research ideas, and hence the thesis is expected to be appropriate to publication in that form. Ziolkowski also comments that the student is meant to have "ripened" in arts and social science subjects, before presentation of the thesis, and so the PhD often reflects experience which is only gained in sciences in the post-doctoral period. He suggests that the PhD in arts and social science areas is more similar to the German "habilitation" or French "these d'Etat". The Dutch Government report also suggests that subject difference is an important issue - and an increasingly significant one as more vocational elements are introduced into PhD study (as the labour market orientation may be less appropriate in some subject areas than others). This report concludes that a delicate balance has to be drawn between the need to provide some standards for the PhD applicable to all subjects, and the need to reflect relevant differences in practices; in particular, further discussion is needed on the scale of original contribution that should be represented in the thesis in different subject areas.

19. Blume notes in his 1986 OECD report some resistance to the idea of the PhD as a primarily a training degree. He comments on the Dutch Government's decision to support doctoral students as "Assistants in Training (AIOs) that:

"So far as the university community is concerned, the AIO concept has not found universal favour. In the arts faculties, for example, the notion that research consists of a set of teachable skills is far from accepted."

Blume also notes the extreme to which the training concept of the PhD has been taken: the University of Texas PhD which involves 3 research "practicals, and for which no dissertation is required. Blume comments that the University of Texas "seeks to develop competence breadth and flexibility rather than highly specialised research competence", and goes on to conclude that such new types of doctorate are "to be found essentially in domains of activity where there is no clear demarcation between science-derived problem-solving and practice-derived problem-solving.

20. Blume also highlights an interesting side-effect of the emphasis on training, and hence provision of formal taught elements: the PhD student becomes much more "visible". He comments: "In countries where postgraduate education is an informal matter, involving less "training" than the preparation of a thesis in the course of scientific and educational work, statistics on financial support are more or less non-existent". In the UK and US, where PhD study is more formalised, it is possible to get a more accurate picture of numbers studying for the doctorate (and the financial support given to these), as compared with Germany where information of this kind is scanty. Allied to this, in countries where PhD is formalised, students are often supported on award schemes; Blume notes that provision of such award schemes by Governments give the latter a lever for implementing policies relating to doctoral education.

21. In looking at the "contribution to knowledge" aspect of the PhD the Winfield inquiry commissioned an analysis of the numbers of publications arising from PhD theses, and the impact of these. This analysis by Professor Hay on four fields of social science concluded that "work published as a result of theses work in the UK makes an appreciable impact in the wider literature of the disciplines". In two of the areas investigated the mean citation frequency was much the same for postgraduate students as for established members of academic staff. The role of the PhD student as the generator of research was in fact criticised in the 1946 Clapham Report; that report suggested that postgraduate provision was insufficient to guarantee research capacity, but rather it was important to allow mature

scholars sufficient time for research. The recent Dutch Government report makes a similar point, that PhD students are not only training to become the country's highly skilled manpower, but are also carrying out "the major part of university research". (For example, a report by the Australian Academy of Science in 1974 noted estimates by senior academics that 95% of all research done in chemistry departments was carried out by postgraduate students.) The role of PhD students as the "dynamios" of research has impacted in recent years on science policy debate. In the US, the "crisis" in science funding has been attributed by some commentators to the growth in research personnel, and, in particular, the increase in numbers of PhD students, which provide increased research capacity, and hence greater demands for science funding.

22. The role of the PhD as a labour market qualification has also been explored in recent literature. As outlined above, the PhD emerged very early in its history as a qualification related to entry to the academic or higher education teaching profession. However, Blume notes the dearth of academic jobs in the 1970s and 1980s in OECD countries. The Dutch Government report suggests that:

"Research training is being gradually decoupled from what in Europe has always been its major function: that of preparation for a career in academic research and teaching. This attempt to make research training relevant to a wider range of occupational positions...is central to many of the initiatives which we shall examine.....Moreover, decoupling PhD training from preparation for an academic career must in some way correspond to the emergence of a broader market for research skills."

Continuing the theme of a tension between specialization and breadth in debate on the PhD, the report concludes that making the PhD relevant to a number of occupations necessitates a much more wide-ranging education for the postgraduate student, but also acknowledges that many argue for greater specialization so that the student acquires fully a particular disciplinary culture.

23. Many commentators suggest that industry in particular, which wants PhD students for their research awareness and training, for some specific skills and for technology transfer, has encouraged a broadening of PhD study. For example engineering companies have been critical of the PhD in that discipline; the SERC report on the engineering PhD concluded that a distinct PhD was required, which would include a broad range of training, partnership with industry in the project, teamwork and management training.

24. Finally, recent changes in the pre-doctoral period of education in the UK need to be taken into consideration with regard to their impact on the PhD. The trend in school education, feeding into undergraduate study, is for broader curricula which cover greater numbers of subjects, and focus on learning skills with a reduction in course content. The suggestion has been made, for instance by subject associations, that the pattern of undergraduate/postgraduate study may have to change, with either a 3 + 1 model for undergraduate education (a broader Bachelors degree, followed by a more specialised Masters), or a 1 + 3 model for postgraduate education (with a "training" masters before embarking on PhD research study). The skills or subject-knowledge of students entering PhD study may hence change in the future, with implications for the nature of the PhD.

25. The diversity of university regulations relating to the PhD must also be noted. Considerable variations in statutes and practices exist, for example, in relation to: the period of study (minima and maxima); the requirements to be met for award of the degree; and whether there is a specified length for the thesis (although, most universities which do specify this, put the maximum length at 100,000 words).

Recent initiatives

26. The taught element of the PhD has continued to be the object of policy development; the CVCP 1988 report was on this theme, and the ESRC has recently published training guidelines for its studentships in the social sciences. In 1991 the CVCP and British Academy set up a Working Group to examine the "nature, purpose and structure of doctoral programmes in the humanities". The responses to a consultation paper issued by that Group in January 1992 indicated widespread agreement on the need to take steps to improve the performance of doctoral students in the humanities. The Group's report recommends that all institutions should review their regulations to make explicit that, without any lowering of the standards of scholarship or rigour, a doctoral thesis should be a piece of work which a capable, well-qualified and diligent student, who is properly supported and supervised, can complete in three or four years. It also makes a number of recommendations to improve the preparation, supervision and training of research students. Finally, the Group concludes that students' performance at first degree level is not an adequate test of their suitability and commitment to undertake doctoral research. It therefore recommends that students should not receive an award to undertake doctoral research until they have undertaken an initial year of postgraduate study.

27. Other recent initiatives concerning the PhD consider its overseas dimension: either the appropriateness of the UK PhD for overseas students studying in this country (the British

Council have suggested that such an initiative is needed); or the impact of 1992 and the need to harmonise the PhD in Europe. Last year a "EURODOCT" conference was held in Saclay, France, to bring together doctoral scientists to consider the nature of the PhD and PhD study in Europe. On more detailed matters, a recent paper by Breimer and Mikhailidis suggests that some publication and examination practices should be standardised in Europe: whether a thesis made up of a number of published papers is acceptable; whether PhDs should be publicly examined; and how PhD theses should be published in order to make them available to the scientific community.

28. The SERC has introduced a number of new schemes to enhance the the industrial relevance of higher degrees, both through the content and nature of courses, and through diversifying the setting in which training can take place. The first intake of students on the new Engineering Doctorate - proposed in the Parnaby report - occurred in October 1992.

This course is a new departure in the UK: students tackle a major engineering problem, or set of problems, to be undertaken in close association with industry, but also spend 25% of their time on assessable taught coursework both in technical and broadening subjects. SERC, in conjunction with the DTI, plans to introduce studentships in industrial research organisations (Pilot Scheme in IROs) also in 1992; groups of students will carry out research, for either the MSc or PhD, by undertaking their practical work in the IRO; the IRO will work in partnership with an higher education establishment in the supervision of the student.

Conclusions

29. It seems generally accepted by commentators and policy-makers that the development of the PhD, and of postgraduate education more generally, has suffered because this issue lies at the interface between the science, and higher education, policy areas. Changes in the nature and practice of the PhD have arisen because of "indirect" pressures, rather than from a clearly defined study of the degree itself. Moreover there has been little research which could underpin explicit policy-making on the subject.

30. A number of significant debates run through the literature and policy-making on the PhD:

- a. Throughout its history, the issue of whether study for the PhD should be broad or specialised has arisen. To begin with, study for the PhD was conceived in Europe as a broad cultural experience, carried out largely independently - and it was assumed that the student could progress to becoming a researcher simply by working in a

productive environment. The development of the degree in the US and then the UK has put more emphasis on formalised study, and greater attention to the acquisition of particular skills. In the last decade, the broadening of the PhD, to include vocational elements, has been mooted.

b. The tension between the training element of the PhD, and the requirement for an original contribution to knowledge has continued to be discussed. On the whole, proposals to create several different kinds of doctorates have generally been rejected (possibly because the PhD is a "popular" degree) and the emphasis has turned to trying to reconcile the two elements by introducing regulations or standards such that the piece of original work can be completed within a period of time acceptable to the funders of postgraduate students, and can be appropriate to the subject area of study.

c. Thirdly, debate has continued on how to carry out and organise postgraduate education. Obviously there is a relationship here to the training aspect of the PhD, as more formalised PhD study programmes are usually based around skills training. In the early years of the PhD a more formalised doctoral programme developed in the US, and that model has since been adopted in Europe. Other forms of organising graduate study - the graduate school - have also been discussed in the science policy arena (linking with mechanisms for resource allocation), and in the higher education policy sphere (to counter the social and intellectual isolation of students).

d. With the CVCP/BA initiative the debate on whether, and how, to standardise conditions and practices for the PhD in different subject areas continues.

e. The labour market for PhDs has changed considerably since the degree was first introduced. Originally recognised as a qualification for research, the PhD gradually emerged in the first half of this century as a passport to higher education teaching. As opportunities for academic employment have declined, the PhD market has broadened and increasingly vocational PhDs have emerged.

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