

The thesis that won't go away

SIR—Beverley Halstead (*Nature* 331, 497; 1988) appears to favour the abolition of the PhD thesis and its replacement with mainly published work. There are, however, several potential shortcomings of a method based solely or largely on publications.

A paper does not necessarily convey the amount of work, or more importantly, the scientific thought and method required to obtain the published results. Those working to establish a new research project or a novel method may demonstrate greater research prowess but produce less publishable material than subsequent workers who can build upon these foundations. A thesis should not contain every failed experiment but it should provide a forum for areas of work that are not publishable.

An equally serious objection is that a student with a long list of publications may obtain a PhD without having actually reached the required standards. This may sound paradoxical, but if the candidate is working in a large, well-established research group, there exists the possibility of the student being carried along by the group as a whole. In these days of papers with several authors, how is the examiner to assess the contribution made to the research by the candidate?

I believe that the PhD thesis in (essentially) its present form does still have a major role to play. But there should be a move away from the belief that thesis weight is directly proportional to scientific quality and students should be directed towards brevity and clarity in their writing.

Moreover, having just recovered from the trauma of completing a (relatively short but as yet unexamined) thesis, I would hate to think that all that effort was a waste of time.

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SIR—It is generally recognized that a doctoral thesis is in want of a readership. The Swedish university system, however, offers definite advantages over the British. Indeed, it satisfies most of the points raised by Beverley Halstead.

In Sweden, a thesis is normally based on four or five articles published in major international refereed journals. These are bound as part of the thesis. The candidate also writes a review, which defines the problem, surveys the literature and discusses the work in context. Practical details and methods described in the papers are not reiterated. The thesis is given an ISBN number, and printed and distributed at the faculty's expense. Doctoral theses in

scientific subjects are rarely based on unpublished work.

My review was about 8,000 words, excluding references. This is average. There have, however, been shorter essays, and candidates are encouraged to keep to the point. Also, before presenting a thesis candidates have, among other things, to attend practical and lecture courses.

The candidate must physically nail the printed thesis to a specified wall or door of the university. This mediaeval ceremony, in a country not obsessed with tradition, conjures up Martin Luther.

The oral defence of a thesis is a public proceeding. There were probably fifty people at my disputation. The opponent (external examiner) summarized the thesis and proceeded with questions. The other examiners also joined in.

Up to about 25 years ago, a thesis had to be original work. The defence could be a very fiery affair — truly a disputation. There were three opponents. The quality of the doctorate was judged not only on the written thesis but also on its oral defence. Some of these theses, for example Robin Fåhræus's "The suspension stability of the blood", are scientific classics. The system was revised after the war because of changing research patterns.

Thus many of the reforms which Halstead advocates can be observed in the Swedish doctoral system, which is worth studying before the British system is revised. But Swedish doctoral students have no illusions that their circle of readership is any wider than in Britain.

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SIR—Beverley Halstead's arguments against PhD by thesis suffer from an horizon constrained by the university.

If 50 per cent of first-degree candidates failed there would be an outcry. But a loud and prominent part of it would be a burst of cheering from technical interviewers of candidates for employment in industry, who at present conclude that many graduates should have failed.

Second, most PhDs are not going into academic research and the publication of academic papers. Even of those who continue in research, most will go into industry where they write reports, not papers, and proposals for further action. By the standards of an effective report, academic papers are intolerably verbose, indefinite and indigestible. Papers are full of hedges and provisos, ifs and buts, and erudite circumlocutions; effective proposals are not. Moreover, the approved style for papers is intolerably dull. It would be very surprising if Halstead's

arguments could not be put more forcefully in a third of the words he has employed.

Writing a cogent argument would be useful training for most PhDs, writing a typical learned paper is not. And the inevitable result of Halstead's proposals would be more papers, in more specialist journals with even lower editorial standards. It takes a lot to make an external examiner fail a thesis; if papers were the criterion, editors and reviewers would be under the same moral pressure.

Do even the academics want ever more trivial and unreadable 'learned' papers?

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SIR—The discussion by Beverley Halstead prompts a related question about the function in Britain of the PhD studentship, especially because of the recent trend to employ research assistants with the specific guarantee of a PhD registration. This trend has invidious and undesirable consequences for the unity and morale of PhD students in a department and also for the training of young scientists for independent research.

There are now two classes of students: those who exist on a grant of about £3,500 a year, and those who live in relative comfort on approximately twice as much disposable income. This situation is divisive and illogical. Many of the best graduate students compete for studentships, only to find subsequently that less well qualified individuals have been offered the same opportunity to complete a PhD, but as paid research assistants.

This leads to resentment and outright disbelief in the system. The chief problem is that roles are confused, and not simply in the unfortunate financial discrepancy. The PhD student has traditionally been considered as one who, while contributing to the overall scientific achievement of his or her group and department, is obliged to pursue independent research at the highest level, free from the constraints of grant applications, teaching duties and, most importantly, who is able to pursue a scientific theme without fear of being reprimanded by short-sighted employers for irrelevance or lack of results.

Traditionally, research assistants have been considered as apprentices to this form of training. In practice, the research assistant PhD student is often subject to constraints that are at odds with the true concept of the PhD degree. His or her project may be geared solely towards the benefit of the group, possibly involving repetitive, incoherent and tenuously related pieces of research, wholly inappropriate for a PhD thesis.

The undoubted discrimination, both financially and functionally, between the PhD studentship and the research assistant-